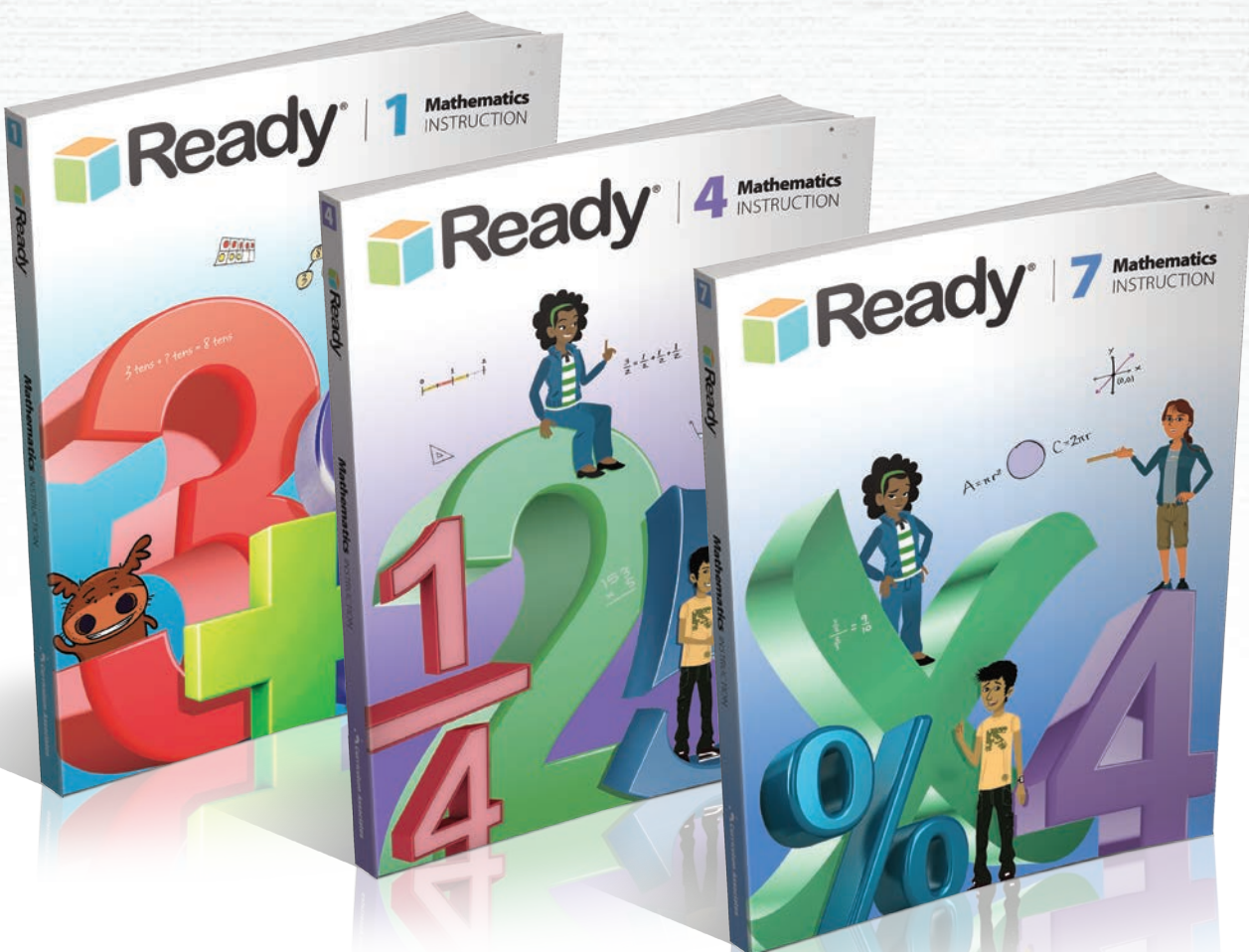# Ready | Mathematics

2017–2018
Learner's Notebook

Who we are. What we do.

Curriculum Associates was founded in 1969 by a small group of passionate educators with a singular mission: to make classrooms better places for teachers and students. We hold tight to this founding value and remain focused on the long term, introducing innovative products that give every student the chance to succeed.

- We measure our success by the impact we make in schools
- We are committed to world-class, research-based materials
- We build our materials from scratch
- We pride ourselves on providing the industry's best service
- We offer a 100% money-back guarantee

Best,

Rob Waldron
CEO, Curriculum Associates

How *Ready* and *i-Ready* Work Together to Help Students Succeed

2

Assessment System & Reports

i-Ready **Assessment System:**

- *i-Ready Diagnostic* identifies areas where each student is struggling and automatically generates personalized instructional paths.
- *i-Ready Standards Mastery* provides targeted insight into a student's mastery of individual grade-level standards.
- *i-Ready Growth Monitoring* shows student growth, making it possible to predict end-of-year performance and growth for each student.

1

Whole Class Instruction

- **Student Instruction** and **Teacher Resource Books** provide discourse-based instruction that integrates multiple strategies and promotes a growth mindset.
- **Practice & Problem Solving** provides practice for each day of a lesson as well as fluency practice, unit practice, games, and vocabulary support.
- *Online Teacher Toolbox* provides access to all K–8 *Ready* resources for every teacher, including tutorial videos, center activities, and more.
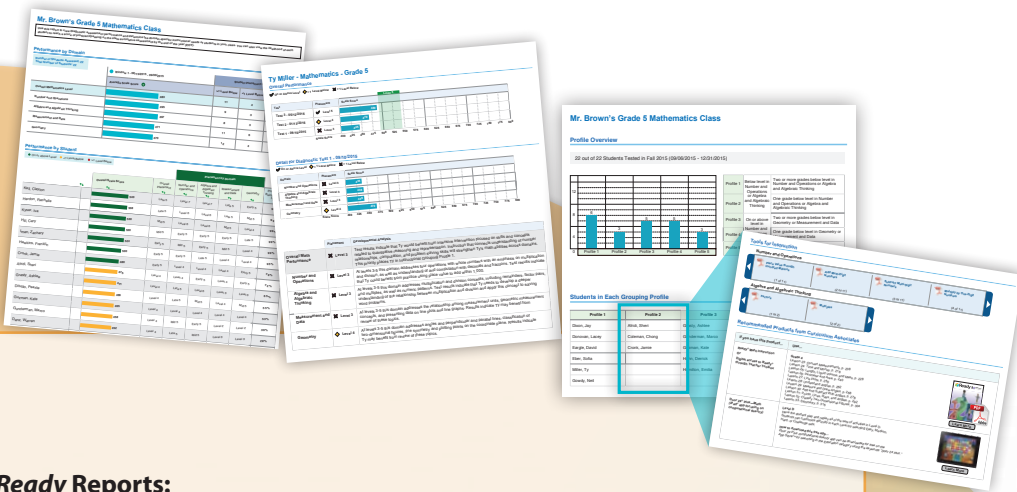
i-Ready Reports:

- The **Class Profile** gives an overview of the instructional needs for the entire class.

- The **Student Profile** shows students' strengths and needs and guides teachers to targeted resources.

- The **Instructional Grouping Profile** automatically groups students based on common needs and provides targeted resources to use with each group.
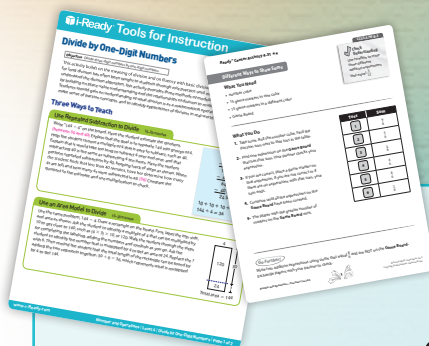
3

Small Group & Personalized Instruction

Small Group Instruction:

- **Teacher-led small groups** can use on-level or prerequisite Teacher Toolbox resources, such as Tools for Instruction, Interactive Tutorials, and activities from the Teacher Resource Book.

- **Student-led small groups** can utilize on-level or prerequisite center activities and unit games.

Personalized Instruction:

- **i-Ready Instruction** provides engaging real-world videos to help fill individual student gaps.

- **Door 24 Plus** iPad® app provides computational and fluency practice games for individuals or partners.

iPad® is a trademark of Apple Inc.

Ready Mathematics Resources

The *Ready Mathematics* program supports instruction, practice, differentiation, and assessment. All resources were designed to work together seamlessly, helping teachers provide rigorous, targeted instruction for every student.
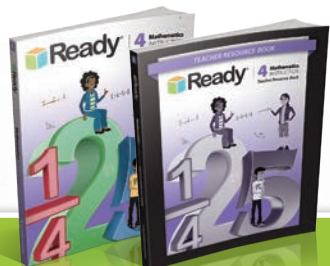
Ready Instruction Book

Student Instruction Book lessons use a research-based, proven-effective instructional model that engages students and builds confidence and mastery.

An accompanying **Teacher Resource Book** supports teachers with easy-to-understand, step-by-step lesson support, point-of-use strategies, tips, and mathematical discourse questions for teaching every step of every lesson.

Ready Practice & Problem Solving Book

More than a typical "workbook," the robust **Practice & Problem Solving book** enriches student learning with extended problem solving, fluency practice, games, vocabulary support, and practice that can be assigned for use in class, after school, or at home.

An accompanying **Teacher Guide** helps teachers maximize the use of this resource.

Ready Teacher Toolbox

A virtual filing cabinet of instructional resources organized by standard puts differentiated tools for use during whole class instruction or differentiated small groups at teachers' fingertips, so they can easily find what they need to teach, review, or reinforce learning.

Teachers have instant access to all K–8 *Ready* math lessons, hands-on student-led activities, teacher-led activities, and interactive tutorial lessons to help meet the needs of all students.
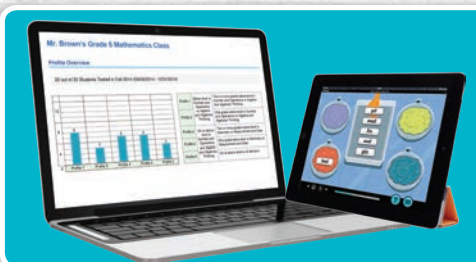
i-Ready

A proven and powerful online program with assessments that can pinpoint student needs and help monitor progress on grade-level standards, reports that inform teachers' instructional plans, and online lessons that allow students to work independently on lessons that target their unique needs.

Putting it all together

Use the *Ready Mathematics* resources to support the structures and routines you have in place in your class. All of the resources are designed to work together, so you can choose the resource that works best for you to support whole class instruction, small group differentiation, assessment, or practice.

Whole Class Instruction

Activities from the Teacher Resource Book
- Step By Step
- Mathematical Discourse
- Hands-On Activities
- Concept Extensions

Practice pages in the Practice & Problem Solving book
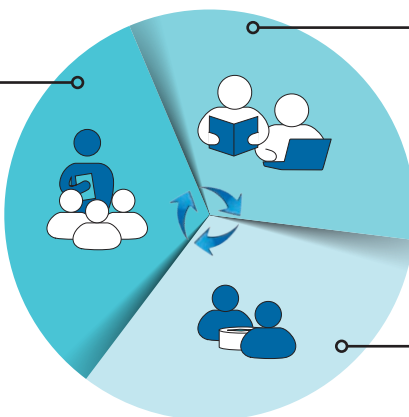
Interactive Tutorials
- Use prerequisite lessons on Day 1
- Use on-level lessons on Day 4 or 5

Small Group Differentiation*

Teacher-Led Station
Teacher-led small groups
- Activities in the Teacher Resource Book
- Tools for Instruction
- Interactive Tutorials
- Parts of prerequisite lessons

* Use on-level and/or prerequisite lesson resources for stations

Independent Station
Individual student work
- Practice pages in the Student Instruction Book
- Practice pages and Fluency Practice in the Practice & Problem Solving book
- *i-Ready* online lessons
- *Door 24 Plus* iPad app

Student-Led Station
Student-led small group activities
- Center Activities
- Unit Games
- *Door 24 Plus* iPad app

Assessments
- Lesson Quizzes
- Interim Assessments in the Student Instruction Book
- Mid-Unit and Unit Assessments
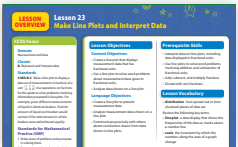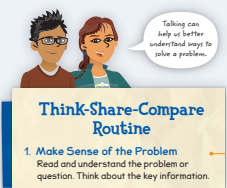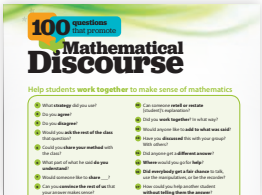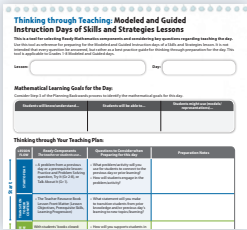- *i-Ready* Assessments

Homework
- Practice pages in the Student Instruction Book
- Lesson Practice, Fluency Practice, and Unit Practice in the Practice & Problem Solving book
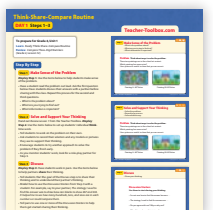- *i-Ready* online lessons
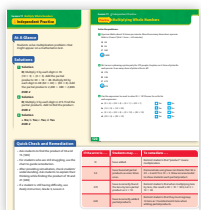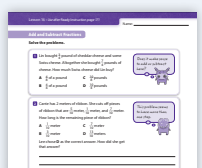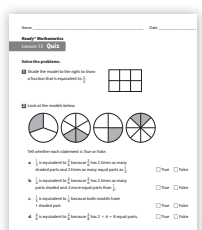
Family Connection
- Family Letters (available for every lesson in English and Spanish)
- *i-Ready* Family Center (i-ReadyCentral.com/FamilyCenter)
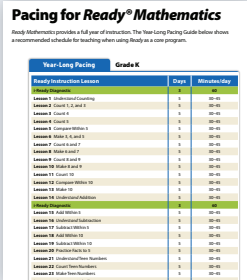
Where to find key resources
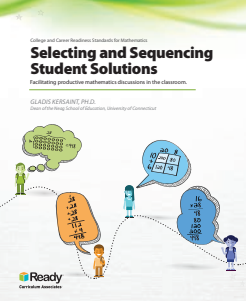
For Planning

Lesson Guidance	*Ready* Instructional Routines	100 Questions That Promote Mathematical Discourse	Lesson Preparation Guides	Additional Resources
Each lesson provides an overview, pacing guide, step-by-step guidance to facilitate instruction, mathematical discourse questions, hands-on activities, and concept extensions.	Structured ways in which students can interact with *Ready* math tasks and teachers can organize the conversation.	A list of questions and ideas for sentence starters that teachers can use—and encourage students to use—to facilitate mathematical discussions.	Templates that provide components to use and questions to consider when planning a day of instruction.	• Coherence charts • Lessons for the First Five Days (and Sample Videos)

Located in:

Teacher Resource Book Teacher Toolbox	*Ready Central* Teacher Toolbox *(Found within Lesson 0)*	*Ready Central* Teacher Toolbox	*Ready Central* Teacher Toolbox	*Ready Central* Teacher Toolbox

For Teaching

Lesson 0: Lessons for the First Five Days	Student Book Pages	Quick Check & Remediation	Practice Pages	Lesson Quizzes & Unit Assessments	Additional Resources
A set of lessons to use during the first five days of school to establish *Ready* instructional routines and review prerequisite skills.	A work text where students record their thinking and responses and reflect on their learning. (Digital version available to display in class on Toolbox.)	"Exit ticket" questions with suggestions for remediation targeted to specific answers and differentiated activities.	Opportunities for students to apply lesson skills and concepts to solve problems and demonstrate understanding independently in class and at home.	Lesson and Unit assessments with a variety of item types to evaluate mastery of concepts and skills.	• Tools for Instruction • Center Activities • Prerequisite lessons • Interactive tutorials • Fluency Practice • Unit Games

Located in:

Teacher Toolbox *(Found within Lesson 0)*	Teacher Resource Book Student Instruction Book Teacher Toolbox	Teacher Resource Book Teacher Toolbox	Teacher Resource Book Student Instruction Book Practice & Problem Solving book Teacher Toolbox	Teacher Toolbox	Teacher Toolbox

Want to learn more?
Go to ReadyCentral.com.

For Additional Support

Implementation Tips and Best Practices	Pacing Resources	Parent and Family Resources	Mathematics Whitepapers	Videos Showing *Ready* in the Classroom

Tips for success and recommended resources to help you learn about and get started with *Ready Mathematics*.

Recommended schedules for teaching ensure your instruction will proceed without a hitch.

Customizable resources to help explain the math strategies you are using in school and suggestions for ways families can support their children at home.

- Whitepaper: Selecting and Sequencing Student Solutions
- Whitepaper: Orchestrating Mathematical Discourse

These videos show how a teacher:

- Accesses prior knowledge
- Provides sufficient think time
- Promotes peer and whole class discourse
- Helps students connect various student strategies

Located in *Ready Central*®

ReadyCentral.com is the destination for everything teachers, site leaders, and district leaders need to implement *Ready Mathematics* successfully.

Log in to *Ready Central* with your *Ready Teacher Toolbox* username and password. If you are new to the Teacher Toolbox, here is how to register:

1. Go to **www.teacher-toolbox.com** and click **Register Now**.
2. Create an account with your information and click **Finish**.
3. Check your email and activate your account by clicking on the **link**.
4. Then log in using your **email address** and the **password** you created above and click **Log In**.
5. **Enter your license code** and click **Submit**.
   (Reach out to your school leader and/or district administrator if you do not yet have your license code.)

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Want to learn more?
Go to ReadyCentral.com.

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Supporting Productive Beliefs

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Ready Mathematics Lessons

Ready Mathematics Lesson Preparation Resources

Ready Mathematics Routines and Discourse Resources

Ready Mathematics Look-Fors

For Teachers

Preparing to Teach

Put your student hat on and try to solve the displayed problem as many ways as you can.

Facilitate Meaningful Mathematical Discourse

With a partner, review the teacher and student actions on the chart. Make note of key ideas and be prepared to summarize your thinking.

Facilitate meaningful mathematical discourse: teacher and student actions

What are teachers doing?

Engaging students in purposeful sharing of mathematical ideas, reasoning, and approaches using varied representations

Selecting and sequencing student approaches and solution strategies for whole class analysis and discussion

Facilitating discourse among students by positioning them as authors of ideas who explain and defend their approaches

Ensuring progress toward mathematical goals by making explicit connections to student approaches and reasoning

What are students doing?

Presenting and explaining ideas, reasoning, and representations to one another in pairs, small groups, or whole class discourse

Listening carefully to and critiquing the reasoning of peers using examples to support or counterexamples to refute arguments

Seeking to understand the approaches used by peers by asking clarifying questions, trying out others' strategies, and describing the approaches used by others

Identifying how different approaches to solving a task are the same and how they are different

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Source: National Council of Teachers of Mathematics (2014). *Principles to Actions: Ensuring Mathematical Success for All.* Reston, VA.

▶ **Notes**

What are some routines you currently use to structure a day of learning?

Notes

After watching the video, take a moment to pause and reflect on the following questions.

How do the first 3 steps of the Think-Share-Compare Routine make Step 4 possible?

Why do you think the student book was kept closed until students shared and discussed their own strategies?

How does the Think-Share-Compare Routine help you integrate the *Ready Mathematics* Educator Best Practices into instruction?

What are three things we discussed today that you will incorporate into your practice and why?

What do you still have questions about?

Want to learn more?
Go to ReadyCentral.com.

Planning Skills and Strategies Lessons

Activity | **Start at the End**

Complete the question(s) from the Lesson Quiz.

Identifying the Mathematics of a *Ready Mathematics* Lesson

What do students need to know/understand to solve this problem?

What do students need to be able to do to solve this problem?

What models/representations might students use when solving this problem?

Teaching Practices from the National Council of Teachers of Mathematics

NCTM's eight Mathematics Teaching Practices provide a framework for strengthening the teaching and learning of mathematics. The Mathematics Teaching Practices represent a core set of high-leverage practices and essential teaching skills necessary to promote deep learning of mathematics.

Establish mathematics goals to focus learning.	Effective teaching of mathematics establishes clear goals for the mathematics that students are learning, situates goals within learning progressions, and uses the goals to guide instructional decisions.
Implement tasks that promote reasoning and problem solving.	Effective teaching of mathematics engages students in solving and discussing tasks that promote mathematical reasoning and problem solving and allow multiple entry points and varied solution strategies.
Use and connect mathematical representations.	Effective teaching of mathematics engages students in making connections among mathematical representations to deepen understanding of mathematics concepts and procedures and as tools for problem solving.
Facilitate meaningful mathematical discourse.	Effective teaching of mathematics facilitates discourse among students to build shared understanding of mathematical ideas by analyzing and comparing student approaches and arguments.
Pose purposeful questions.	Effective teaching of mathematics uses purposeful questions to assess and advance students' reasoning and sense making about important mathematical ideas and relationships.
Build procedural fluency from conceptual understanding.	Effective teaching of mathematics builds fluency with procedures on a foundation of conceptual understanding so that students, over time, become skillful in using procedures flexibly as they solve contextual and mathematical problems.
Support productive struggle in learning mathematics.	Effective teaching of mathematics consistently provides students, individually and collectively, with opportunities and supports to engage in productive struggle as they grapple with mathematical ideas and relationships.
Elicit and use evidence of student thinking.	Effective teaching of mathematics uses evidence of student thinking to assess progress toward mathematical understanding and to adjust instruction continually in ways that support and extend learning.

Source: National Council of Teachers of Mathematics (2014). *Principles to Actions: Ensuring Mathematical Success for All*. Reston, VA: National Council of Teachers of Mathematics. (pp. 9–10)

Anticipating Student Thinking Best Practices

Consider the Five-Representation Star:

Anticipate correct solutions and misconceptions/incorrect solutions.

Anticipate questioning strategies to prompt student–student discourse on their thinking, reasoning, and strategies.
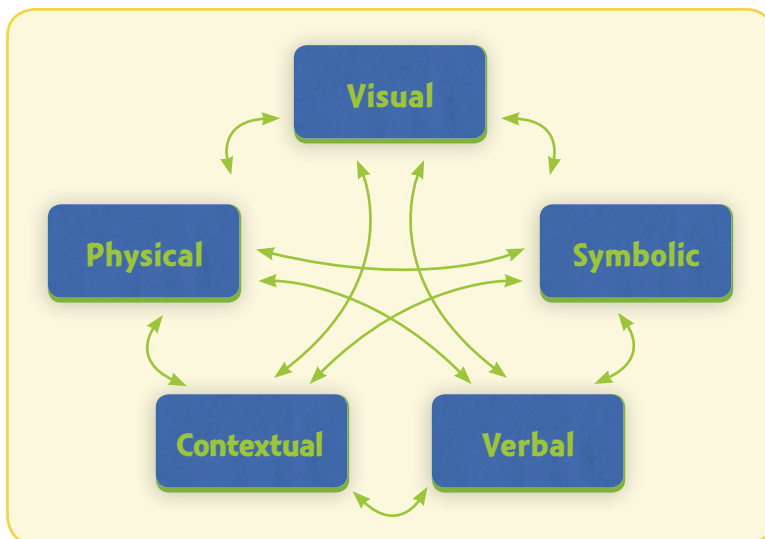
Source: Lesh, Richard, Tom Post, and Merlyn Behr. "Representations and Translations among Representations in Mathematics Learning and Problem Solving." In *Problems of Representation in the Teaching and Learning of Mathematics*, edited by Claude Janvier, pp. 33–40. Hillsdale, NJ: Erlbaum, 1987.

▶ **Notes**

Fostering a Discourse-Driven Ready Mathematics Classroom

✎ Activity — **Solve and Support Your Thinking**

Put your student hat on and try to solve the displayed problem as many ways as you can.

What is mathematical discourse?

Notes

As you watch the video clips record your thinking for each question in the table below. Remember to use Dr. Kersaint's seven strategies to support your thinking.

What step(s) of Think-Share-Compare are highlighted in the video clip?	What did the teacher do that employed one or more of Dr. Kersaint's seven strategies?	How did the steps of Think-Share-Compare and/or teacher moves foster mathematical discourse?

Dr. Kersaint's seven strategies for supporting students to become participants in mathematical discourse:

Strategy 1: Help students work with and rely on one another.

Strategy 2: Allow students to work independently before sharing in small or large groups.

Strategy 3: Teachers can use questions and prompts.

Strategy 4: Use questions strategically to engage students in mathematical discourse.

Strategy 5: Acknowledge the importance of mistakes in learning and understanding.

Strategy 6: Use collaborative learning strategies to support students in preparation for whole class discussions.

Strategy 7: Use a variety of pedagogical strategies to engage all students in whole class, teacher-led mathematics discussion.

Source: Kersaint, Gladis. "Orchestrating Mathematical Discourse to Enhance Student Learning." Billerica, MA: Curriculum Associates, 2015.

Best Practices for Fostering Mathematical Discourse

Skim through the list and identify best practices you use in your own classroom. If you do not see your best practice listed, add it to the list on the next page.

1. **Think-Share-Compare:** The steps of Think-Share-Compare structure a day of *Ready* to allow students time to be authors of their own mathematical ideas, to justify their thinking, to critique the thinking of others, and to engage in mathematical discussions on multiple mathematical representations. Over time, students see themselves as mathematicians and grow to understand that making mistakes is part of learning and doing mathematics. Students are supported to become participants in the mathematical discourse because their own thinking is consistently honored. *Ready Mathematics* provides Lesson 0 and the TSC slides for supporting students in engaging in Think-Share-Compare.

2. **Planning for What Students Might Do, Say, and Use when Solving Problems:** "… in orchestrating a class discussion of student approaches to solving a task, the teacher must decide which approaches to share, the order in which they should be shared, and the questions that help students make connections among different strategies and the key disciplinary ideas that are driving the lesson" (NCTM 2014). *Ready Mathematics* provides lesson preparation tools and graphic organizers for identifying mathematical learning goals and thinking through each day of a lesson, including anticipating student thinking and misconceptions.

3. **Make Sense of the Problem:** Students read the problem out loud. They independently think about the first question below, then discuss their answers with a partner before sharing with the class. The process is repeated for the second and third questions.
   - What is the problem about?
   - What are you trying to find out?
   - What information is important?

4. **Hand Signals:** Forms of nonverbal communication are used by students to agree/disagree, signal that they have ideas, or communicate their thinking.

5. **Wait Time:** Ample time is provided for students to think about a question or consider a statement or idea before the teacher asks a follow-up question or directs the question to another student.

6. **Agree/Kindly Disagree:** Students are consistently asked to agree/kindly disagree with the ideas of others.

7. **Think-Pair-Share:** Students have the opportunity to sort out their own ideas and discuss them with a peer before the whole class engages in a discussion on a mathematical question. This strategy reduces the anxiety around contributing to classroom discourse.

8. **Turn-and-Talk:** Students work in pairs to discuss their thoughts before having students share their ideas with the larger group.

9. **Discussion Starters/Sentence Starters/*Ready Mathematics* Discourse Cards:** Questions and sentence starters provide a way to engage all students in meaningful mathematical conversations. Teachers can post the cards around the classroom or hand them out to help students initiate and deepen conversations with partners, small groups, or the whole class.

10. **Discussion/Talk Moves Checklist:** Students self-monitor the questions they ask or the types of discussions they engage in throughout each class by checking them off on a checklist. The teacher can revise the checklist to change the focus on what students are incorporating into their mathematical discourse toolbox.

11. **Walk and Talk:** Students walk around the room while talking with a partner about a question. This strategy can energize students while they engage in mathematical discourse.

12. **Purposeful Grouping:** Teachers can organize students in different pairs or groups during various points in the lesson to provide peer-to-peer support with math conversations, activities, and assignments. For instance, carpet partners, table partners, and walk-and-talk partners are all different purposeful groupings.

13. **Equity Sticks:** Students write their names on popsicle sticks, and place them in a cup or bag. When calling on students to answer a question, the teacher randomly select a popsicle stick. Alternatively, each student can be given two to four popsicle sticks and each time they respond to a question they turn in a popsicle stick to the teacher so that by the end of class every student has turned in all of their popsicle sticks.

14. **Three before Me:** A standing rule like Three before Me can be used to require a student to pose his or her question to three other students before he or she can ask the teacher.

15. **Student Fishbowl:** The teacher selects students to act out how to use sentence starters in small group work, how to agree/kindly disagree, how to present their solution by referring to their work, and so on while other students observe and take notes on a graphic organizer. The Fishbowl concludes with a whole group discussion of how students in the fishbowl interacted and functioned.

16. **Assigning Roles in Group Work:** By formally assigning roles, students have a specific set of responsibilities. Some commonly used roles are Timekeeper, Gatekeeper/Taskmaster, Facilitator, Skeptic, Recorder, Summarizer, and Presenter.

17. **What Time Is It?:** Make a sign for each step of Think-Share-Compare and any other phase(s) of a normal day (warm-up, exit slip, independent assessment, and so on). Label each phase with 0, 1, or 2, where 0 means no one talks, 1 means one person at a time talks, and 2 means everyone can use accountable talk. Use some way to indicate the phase of the lesson throughout each class.

18.

Add Your Own!

19.

20.

Use this graphic organizer to plan for introducing some best practices for fostering mathematical discourse in your classroom. Consider the following questions as you plan what, when, and how to incorporate different best practices into your classroom:

- What best practices will you introduce into your classroom and on what days?
- At what times during the lesson will you employ the best practices?
- What will you need/need to do to use the best practices?
- What support will students need when you introduce the best practice?
- Will you to develop teamwide/gradewide/schoolwide initiatives for some best practices to be implemented? If so, what steps will you take?

(Optional) Steps for teamwide/gradewide/schoolwide initiatives:

Day 1

Day 6

Day 2	Day 3	Day 4	Day 5

Day 7	Day 8	Day 9	Day 10

Supporting Productive Struggle Every Day

Solve and Support Your Thinking

Put your student hat on and try to solve the displayed problem as many ways as you can. Try to anticipate misconceptions students may have and errors they may make when solving this problem.

What is "productive struggle" and why is it so important?

Notes

Support Productive Struggle in Learning Mathematics: Teacher and Student Actions

As you watch each video clip, note evidence of Teacher Moves and Student Actions that embrace struggle as a natural aspect of teaching and learning mathematics.

Evidence from the Videos of Teacher Moves	What are teachers doing?	What are students doing?	Evidence from the Videos of Student Actions
	Anticipating what students might struggle with during a lesson and being prepared to support them productively through the struggle.	Struggling at times with mathematics tasks but knowing that breakthroughs often emerge from confusion and struggle.	
	Giving students time to struggle with tasks and asking questions that scaffold students' thinking without stepping in to do the work for them.	Asking questions that are related to the sources of their struggles and will help them make progress in understanding and solving tasks.	
	Helping students realize that confusion and errors are a natural part of learning by facilitating discussions on mistakes, misconceptions, and struggles.	Persevering in solving problems and realizing that it is acceptable to say, "I don't know how to proceed here," but it is not acceptable to give up.	
	Praising students for their efforts in making sense of mathematical ideas and perseverance in reasoning through problems.	Helping one another without telling their classmates what the answer is or how to solve the problem.	

Adapted from National Council of Teachers of Mathematics (2014). *Principles to Actions: Ensuring Mathematical Success for All*. Reston, VA: National Council of Teachers of Mathematics. (p. 52)

Want to learn more?
Go to ReadyCentral.com.

Best Practices for Supporting Productive Struggle

Identify things you do in your classroom to support productive struggle. These can be best practices on this list or best practices that are not on this list. Be prepared to explain how the best practice supports productive struggle.

When planning for a lesson…

- Do the math and anticipate the strategies and misconceptions your students may have.
- Plan for questioning strategies that encourage and support students if they get "stuck" rather than telling them what to do.
- Determine what manipulatives/tools to make available to students.
- Utilize flexible grouping strategies.

Add Your Own!

When implementing the lesson…

- Avoid jumping in to "rescue" students by showing or telling them what to do when they get stuck.
- Implement lessons in a way that keeps the onus on students and honors their thinking by providing time for students to:
  - Independently solve the problem,
  - Share and discuss their solutions and thinking with a partner(s),
  - Share and make connections among student-generated solutions, and then
  - Analyze/make connections to Picture It/Model It strategies (when applicable).
- Regularly use routines that promote collaboration and mathematical discourse (i.e., Think-Pair-Share, Turn and Talk, Walk and Talk, etc.) within the overall structure of the day to allow students time to be authors of mathematical ideas and to critique the thinking of their classmates.
- Make manipulatives/tools available to students, without being prescriptive.

- If a lot of students have trouble getting started, scaffold the problem-solving strategies and/or representations by asking students to list strategies and representations that they might use.

- Monitor pair/small group work and ask questions to assess students' work/thinking, then ask follow-up questions based on their answers/work, even when they demonstrate a misconception or use a strategy that is less efficient than other strategies.

- Provide ample time for students to share, discuss, and make connections among their student-generated strategies, and then Picture It/Model It solutions.

- Consistently include analysis and discussion of errors and misconceptions during both pair/small group work and whole group discussions.

Add Your Own!

Grade 2 Classroom Scenario #1

Mrs. Gardner's Grade 2 lesson is on *Lesson 25: Solve Word Problems Involving Money* (Modeled and Guided Instruction Day 3). The mathematical goals for students are to use a tape diagram, bar model, or open number line to represent and solve a multi-step word problem about money and make connections among these representations and numeric equations that represent the situation.

Mrs. Gardner has students first read the problem silently and then has students read the problem aloud. She then has students work in small groups of three to work on the problem. As she monitors group work, she sees that two groups have started to use a number line, but several groups struggle to get started. Multiple students raise their hands to ask for help, and she hears others saying things like, "I don't know what to do," or "This isn't like the coins we counted yesterday. I can't do this."

Mrs. Gardner pulls the class back together. She draws an open number line on the board and guides the students to start at zero; make a jump to 20 and label it 20; then make another jump of 20 and label it 40; and then make a jump of 5 to 45.
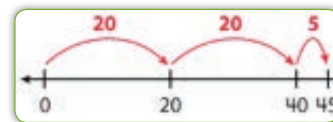
She asks a student to explain how this number line represents what is going on in the problem. She then tells students to return to their groups to complete the number line to solve the problem.

Grade 2 Classroom Scenario #2

Mrs. Jackson's Grade 2 lesson is on *Lesson 25: Solve Word Problems Involving Money* (Modeled and Guided Instruction Day 3). The mathematical goals for students are to use a tape diagram, bar model, or open number line to represent and solve a multi-step word problem about money, and make connections among these representations and numeric equations that represent the situation.

Mrs. Jackson implements the lesson using the Think-Share-Compare slides. In *Step 1: Make Sense of the Problem*, she has students turn and talk to discuss what the problem is about and what they are being asked to do. She then provides about five minutes of independent work time for *Step 2: Solve and Support Your Thinking*, monitoring students as they work. Mrs. Jackson then has students pair up for *Step 3: Discuss* so that they can share and discuss their strategies.

The following is a conversation between Mrs. Jackson and a pair of students during *Step 3: Discuss*:

Mrs. Jackson: Tell me about your number line.

Maria: I think he got 75 dollars. I started at 100 on a number line, then jumped back 20 for the 20-dollar bill then jumped back 5 more for the 5-dollar bill. So it landed at 75 for 75 dollars.

Mrs. Jackson: What do you think, Juan?

Juan: I didn't know what to do. I think Maria's answer is right.

Mrs. Jackson: Draw another number line and let's look at the problem. (Student draws an open number line.) Let's start at 0. Reread the problem and tell me the bills that Kane has.

Maria: He has two 20-dollar bills and one 5-dollar bill.

Mrs. Jackson: So what jumps can we make from 0, Juan?

Juan: 20, then 20, then 5.

Mrs. Jackson: So now you're at...

Juan: 45.

Mrs. Jackson: Now use the number line to solve the problem.

Mrs. Jackson then leaves to visit with another pair of students.

Grade 2 Classroom Scenario #3

Mrs. Wideman's Grade 2 lesson is on *Lesson 25: Solve Word Problems Involving Money* (Modeled and Guided Instruction Day 3). The mathematical goals for students are to use a tape diagram, bar model, or open number line to represent and solve a multi-step word problem about money and make connections among these representations and numeric equations that represent the situation.

Mrs. Wideman implements the lesson using the Think-Share-Compare slides. In *Step 1: Make Sense of the Problem*, she has students turn and talk to discuss what the problem is about and what they are being asked to do. For *Step 2: Solve and Support Your Thinking*, she passes out number lines and tells students they have about five minutes of independent work time. Mrs. Wideman then has students pair up for *Step 3: Discuss* so that they can share and discuss their strategies. As she monitors the pair work, Mrs. Wideman observes that some students use the number line to correctly model the problem and determine that the answer is $55; some students use the number line, but have not modeled the problem correctly and have arrived at an incorrect answer; and one group drew the following picture to arrive at the correct answer of $55:

$100			
$20	$20	$5	$55

Mrs. Wideman then pulls the class back together for *Step 4: Compare*. She shows the *Step 4: Compare* slide with the Picture It/Model It and asks for a volunteer to come to the whiteboard to explain the first Model It, and then for another volunteer to explain the second Model It. After the explanations, she works through the Connect It problems one at a time with the whole class, asking for volunteers for each question.

Analyzing Classroom Scenarios

Analyze the classroom scenario by identifying how the teacher tries to support productive struggle and what they might do differently by incorporating one of the best practices listed on the previous pages.

	How did this teacher try to support productive struggle?	What might this teacher try to do differently to support productive struggle?
Classroom Scenario #1		
Classroom Scenario #2		
Classroom Scenario #3		

Supporting Productive Struggle in Your Classroom

What three things will you do to support productive struggle in your *Ready Mathematics* classroom?

1

2

3

Passage on supporting productive struggle from NCTM's *Principles to Actions: Ensuring Mathematical Success for All*:

"Effective mathematics teaching supports students in struggling productively as they learn mathematics. Such instruction embraces a view of students' struggles as opportunities for delving more deeply into understanding the mathematical structure of problems and relationships among mathematical ideas, instead of simply seeking correct solutions. In contrast to productive struggle, unproductive struggle occurs when students "make no progress towards sense-making, explaining, or proceeding with a problem or task at hand" *(Warshauer 2011, p. 21)*. A focus on student struggle is a necessary component of teaching that supports students' learning of mathematics with understanding *(Hiebert and Grouws 2007)*. Teaching that embraces and uses productive struggle leads to long-term benefits, with students more able to apply their learning to new problem situations *(Kapur 2010)*.

… In comparisons of mathematics teaching in the United States and in high-achieving countries, U.S. mathematics instruction has been characterized as rarely asking students to think and reason with or about mathematical ideas *(Banilower et al. 2006; Hiebert and Stigler 2004)*. Teachers sometimes perceive student frustration or lack of immediate success as indicators that they have somehow failed their students. As a result, they jump in to "rescue" students by breaking down the task and guiding students step by step through difficulties. Although well intentioned, such "rescuing" undermines the efforts of students, lowers the cognitive demand of the task, and deprives students of opportunities to engage fully in making sense of the mathematics *(Reinhart 2000; Stein et al. 2009)*. As teachers plan lessons, key components for them to consider are the student struggles and misconceptions that might arise. Thinking about the these in advance allows teachers to plan ways to support students productively without removing the opportunities for students to develop deeper understanding of the mathematics."

Source: National Council of Teachers of Mathematics (2014). *Principles to Actions: Ensuring Mathematical Success for All*. Reston, VA: National Council of Teachers of Mathematics. (pp. 48–49)

Want to learn more?
Go to ReadyCentral.com.

Orchestrating Meaningful Whole Group Mathematical Discourse

Activity — **Solve and Support Your Thinking**

Put your student hat on and try to solve the displayed problem as many ways as you can.

What are some strategies and best practices you use to orchestrate mathematical discourse?

Strategies for Orchestrating Mathematical Discourse

Read this passage. What are some ways you are using some of these practices in your planning and teaching?

Planning and Leading Mathematical Discourse

To engage students in productive mathematical conversations, teachers must plan, initiate, and orchestrate discourse in ways that encourage student learning. It is not enough just to prepare the content of a math lesson. Teachers must select **worthwhile mathematical tasks** that provide opportunities for students to engage in rich mathematics discussions.

Smith and Stein (*2011*) identify five practices for orchestrating productive mathematical discourse:

- **Anticipating.** *"Actively envision how students might approach the mathematics task they will work on"(p. 8).* For example, teachers can consider the following questions:
  - "How might students interpret the problem?"
  - "What different strategies might they use?"
  - "What specific aspects of the subject matter do I want them to understand?"
  - "What errors or misconceptions might they make?"
- **Monitoring.** *"[Pay] close attention to students' mathematical thinking and solution strategies as students work the task"(p. 9)* individually or in small groups. For example, as teachers walk around the room to observe and interact with students, they can use a tablet to note which students use expected or unexpected strategies and when they use them. This helps teachers keep track of which student or group produces solutions and which ideas to emphasize during the whole class discussion.
- **Selecting.** *"Select particular students to share their work with the rest of the class to get specific mathematics into the open for examination"*

(p. 10). The selected students can be alerted in advance to give them time to gather and organize their thoughts.
- **Sequencing.** *"Make decisions regarding how to sequence the student presentation" (p. 10).* The goal is to maximize the connections between and among ideas. For example, a teacher may first call on a student or group with incorrect thinking or an incorrect answer to highlight a common misconception before the class discusses the correct answer.
- **Connecting.** *"Help students draw connections between their solution and other students' solutions as well as the key mathematical ideas in the lesson" (p. 11).* For example, they can ask the following questions:
  - "How are these two ideas similar?"
  - "How are they different?"
  - "How does this second idea build on or extend the idea we've just heard?"

These five practices build on each other to help teachers orchestrate mathematical discourse in meaningful ways. Although it is not possible to anticipate every strategy students might present, the five practices provide a way to capture, make sense of, and organize mathematical discourse in ways to maximize learning.

Source: Kersaint, Gladis. "Orchestrating Mathematical Discourse to Enhance Student Learning." Billerica, MA: Curriculum Associates, 2015.

Analyzing How a Teacher Sets up a *Ready Mathematics* Classroom to Promote Mathematical Discourse

Read through your grade-level scenario and reflect on these prompts independently.

How does the teacher's planning create a classroom environment that promotes mathematical discourse?

How does the teacher facilitate instruction in order to promote mathematical discourse?

Grade 1 Classroom Scenario for *Lesson 2 Day 3: Guided Instruction*

Mr. Nash is preparing to teach *Lesson 2 Day 3: Guided Instruction*. In planning for the lesson, he tried to solve the problem in different ways that his students might, including misconceptions and errors they might demonstrate. He also read through the TRB and studied the Model It solution. The solutions Mr. Nash anticipated included using counters or cubes to model the problem, a drawing showing the number of black bikes and red bikes, and a numerical equation. Mr. Nash also anticipated that some students might count on to subtract, since they've been learning about the relationship between addition and subtraction. The mathematical goals for the lesson are for students to understand that they can think of subtraction as an unknown addend problem and use the count on strategy to subtract.

Mr. Nash implements the lesson using the Think-Share-Compare slides. In *Step 1: Make Sense of the Problem*, he has students turn and talk to discuss what the problem is about and what they are being asked to do. For *Step 2: Solve and Support Your Thinking*, Mr. Nash gives students about five minutes of independent work time and makes manipulatives like counters and cubes available. He then has students pair up for *Step 3: Discuss* so that they can share and discuss their strategies. For *Step 4: Compare*, he intends to have several students present their solutions and make connections between their solutions before asking students to analyze and make connections to the Model It solution in the book.

As he monitors the pair work in *Step 3: Discuss* and prompts students to explain their work and their thinking, Mr. Nash observes pairs of students demonstrating the following work/thinking:

Three pairs of students demonstrated work similar to Pair A's work:	**Two pairs of students demonstrated work similar to Pair B's work:**	**Two pairs of students demonstrated work similar to Pair C's work:**	**Four pairs of students demonstrated work similar to Pair D's work:**
$7 = 4 + ?$ 3 bikes are black. $7 = 4 + 3$	$7 - 4 = 3$ 3 bikes are black.	$7 + 4 = 11$ 11 bikes are black.	

Grade 4 Classroom Scenario for *Lesson 14 Day 3: Modeled & Guided Instruction*

Ms. Grey is preparing to teach *Lesson 14 Day 3: Modeled & Guided Instruction*. In planning for the lesson, she tried to solve the problem in different ways that her students might, including misconceptions and errors they might demonstrate. She also read through the TRB and studied the Model It and Solve It solutions. The solutions Ms. Grey anticipated included using fraction bars, area models, or a number line either with or without a benchmark fraction like one-half. Ms. Grey also anticipated that some students might try to make equivalent fractions, maybe correctly or possibly incorrectly, to make the comparison. She anticipated that some students might just compare numerators or just denominators. She also thought that there might be some students who still use and interpret the greater than and less than symbols incorrectly. The mathematical goals for the lesson are for students to use models, number lines, or equivalent fractions to represent two fractions and use those representations to reason about and compare the size of the two fractions. She also wants students to use the representations to develop an understanding that when comparing fractions with different numerators or different denominators, the comparison is only valid when the size of the whole is the same.

Ms. Grey implements the lesson using the Think-Share-Compare slides. In *Step 1: Make Sense of the Problem*, she has students turn and talk to discuss what the problem is about and what they are being asked to do. For *Step 2: Solve and Support Your Thinking*, Ms. Grey gives students about five minutes of independent work time and makes manipulatives like fraction bars available. She then has students pair up for *Step 3: Discuss* so that they can share and discuss their strategies. For *Step 4: Compare*, she intends to have several students present their solutions and make connections between their solutions before asking students to analyze and make connections to the Model It and Solve It solutions in the book.

As she monitors the pair work in *Step 3: Discuss* and prompts students to explain their work and their thinking, Ms. Grey observes pairs of students demonstrating the following work/thinking:
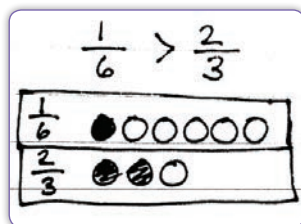
Two pairs of students demonstrated work similar to **Pair A**'s work:	Three pairs of students demonstrated work similar to **Pair B**'s work:	Four pairs of students demonstrated work similar to **Pair C**'s work:	**Pair D** was the only group to demonstrate this work:
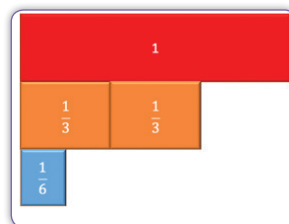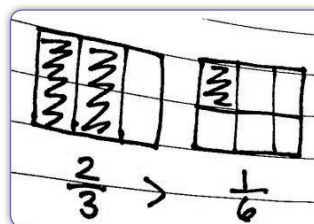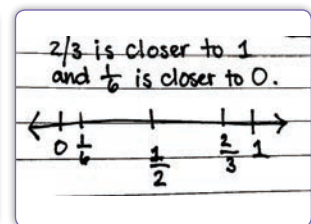
Grade 7 Classroom Scenario for *Lesson 12 Day 2: Modeled Instruction*

Mr. McBride is preparing to teach *Lesson 12 Day 2: Modeled Instruction*. In planning for the lesson, he tried to solve the problem in different ways that his students might, including misconceptions and errors they might demonstrate. He also read through the TRB and studied the Picture It and Model It solutions. The solutions Mr. McBride anticipated included a bar model, a numeric equation, and a proportion for solving for the unknown amount that Josh owed. Mr. McBride also anticipated that students might convert the percent to decimal incorrectly or not at all when trying to determine the interest amount, and that some students may just determine the amount of interest and say that is the answer. The mathematical goals for the lesson are for students to use a bar model and/or an equation to represent and solve a multi-step simple interest word problem, and make connections among these representations to understand that simple interest is a percent of an amount borrowed and that the total amount to be paid back to the lender is the amount borrowed plus the simple interest.

Mr. McBride implements the lesson using the Think-Share-Compare slides. In *Step 1: Make Sense of the Problem*, he has students turn and talk to discuss what the problem is about and what they are being asked to do. For *Step 2: Solve and Support Your Thinking*, Mr. McBride gives students about five minutes of independent work time. He then has students pair up for *Step 3: Discuss* so that they can share and discuss their strategies. For *Step 4: Compare*, he intends to have several students present their solutions and make connections between their solutions before asking students to analyze and make connections to the Picture It and Model It solutions in the book.

As he monitors the pair work in *Step 3: Discuss* and prompts students to explain their work and their thinking, Mr. McBride observes pairs of students demonstrating the following work/thinking:

Two pairs of students demonstrated work similar to **Pair A**'s work:

Four pairs of students demonstrated work similar to **Pair B**'s work:

Pair C was the only group to demonstrate this work:

Five pairs of students demonstrated work similar to **Pair D**'s work:

Pair E was the only group to demonstrate this work:

Selecting and Sequencing Student Strategies and Representations

Which solutions would you select to be shared during *Phase 4: Compare*, and in what sequence would you have students share and discuss these solutions? Explain your reasoning.

Best Practices for Sequencing Student Solutions

There is often more than one way to sequence solutions to help students make sense of the mathematical learning goals—don't stress about getting the sequence perfect!

Discussing the most commonly used solution methods first can spark the discussion because it allows a majority of the students to enter into the discussion.
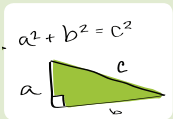
Moving from concrete solutions/representations *(i.e., pictures, models, graphs)* **to more abstract solutions/ideas** *(i.e., expressions, equations, generalizations)* **can allow more students to access the conversation and promote sense making**.
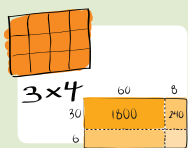
Similarly, moving from simpler solutions to more complex solutions can allow students to access the conversation and promote sense making.

Including multiple representations can help students deepen understanding as they make connections between the representations.

Including errors, misconceptions, and inefficient methods is important to honoring student thinking and, over the long run, supporting productive struggle since students grow to see mistakes as part of learning and doing mathematics.

Prompting Students to Make Connections among Representations

Review Pair D and Pair B's work. How could you support students with making connections between these two strategies?

Notes

Planning to Promote Mathematical Discourse

Work with your team to plan a day of *Ready Mathematics* instruction that integrates strategies for orchestrating mathematical discourse.

Mathematical Goals:

Anticipated Student Strategies, Including Misconceptions and Errors:

Possible Sequence in Which Solutions Might Be Shared and Discussed (actual sequence will depend on the strategies and misconceptions that students use during the lesson):

Identifying Formative Assessment Opportunities in Ready Mathematics

Activity **Do the Math**

Put your student hat on and try to solve the problem on the screen as many ways as you can.

Then, talk with a partner or table group to explain your thinking and strategies. Consider the following questions:

- How might students approach these problems?
- What visuals, models, or representations might students use?
- What misconceptions or errors might they make?

Activity — **Formative Assessment Scenario: Grade 1**

Independently read the scenario, then respond to the questions.

Formative Assessment Strategy 1: Pose a Problem to Observe Student Thinking

Mrs. Murray poses this problem from Day 3 of *Lesson 14: Make a Ten to Add*. She uses the Think-Share-Compare Routine to structure her lesson. After the whole class discusses what the problem is about and what they are being asked to do in *Step 1: Make Sense of the Problem*, Mrs. Murray provides about four minutes of private think time for *Step 2: Solve and Support Your Thinking*. Without being prescriptive, she makes counters, ten frames, and whiteboards available.

Mrs. Murray then has students pair up for *Step 3: Discuss* to share and discuss their strategies, asking partners to use either the Sentence Starters on the Think-Share-Compare slides or one of the *Ready Mathematics* Discourse Cards in their conversations. As she monitors pair work, Mrs. Murray talks with two students who say the following:

> 7 blocks are small. 5 blocks are big.
> How many blocks are there in all?
> How do you know?
>
> $7 + 5 = ?$
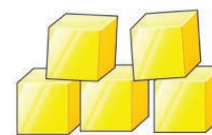
DeAndre: The strategy I used was make a ten. I made ten by adding 3 counters to fill my ten frame with 7 on it. Then, I only had 2 more counters. $10 + 2 = 12$.

Yesenia: I did it a different way using my fingers. I started at seven and counted on 5 more: 8, 9, 10, 11, 12. Twelve blocks.

Pause & Reflect:

1. What are the benefits of the teacher stepping back and giving students time to independently think and then explain their thinking to a partner?
2. What does the teacher know about students from just watching them work and listening to their conversations?

Formative Assessment Strategy 2: Ask Questions to Get Students Explaining the Mathematics

Mrs. Murray pulls the class back together for *Step 4: Compare* so that DeAndre and Yesenia can share their strategies with the class. She asks the class:

- Do you agree or disagree with their thinking?
- How are these strategies alike or different?

The class agrees that both ways result in the same answer, but there's some confusion about why Yesenia counts on five more and why DeAndre counts on two more.

Model It Find 7 + 5.

Start with 7.
Add 3 to make 10.
Then add 2 more.

$7 + 3 = 10$ $10 + 2 = 12$

6 ⑦ 8 9 10 11 12 13 14

For *Step 5: Connect & Reflect*, Mrs. Murray asks the class to open their books and look at the number path on their page.

She poses the question: "What does the number path show?" and monitors students' conversations. Mrs. Murray talks with two students who say the following:

Ricky
> The number path starts at 7, then shows 3 more which is ten. Then it goes up 2 more to make 12.

> That means that 7 + 5 is the same as 10 + 2. They both make 12.

Annalee

Mrs. Murray pulls the class back together to have Ricky and Annalee show everyone how 7 + 5 and 10 + 2 show the same total with a number path and counters on a ten frame.

Pause & Reflect:

1. How are the number path and ten frame similar? Why is it important to expose students to both representations?

2. What are the benefits of giving students a chance to turn and talk before whole group discussion? How did the questions help students explain their thinking and connect different representations?
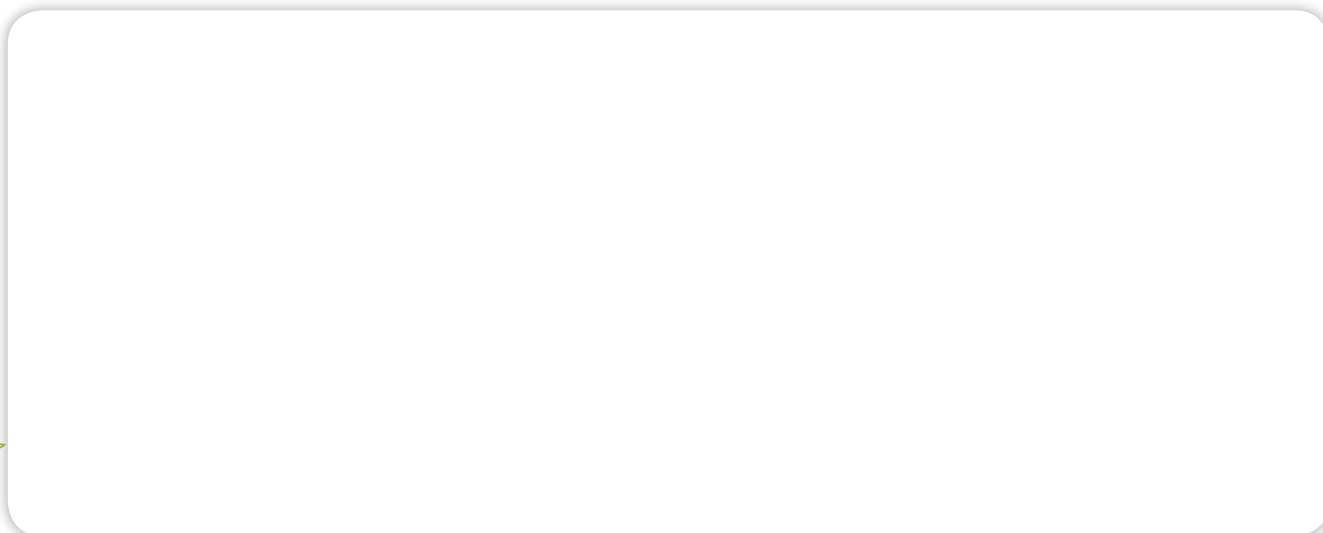
Formative Assessment Strategy 3: Analyze Student Work to Inform Next Steps

Talk About It Do you agree? Why or why not?

Boom says that $9 + 5 = 15$.
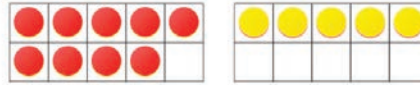
For *Step 6: Apply*, Mrs. Murray asks students to work with their partners on the Talk About It problem, emphasizing that they must show why they agree or disagree with Boom. She circulates the groups while thinking about who she will pull into small groups for extra support and which pieces of work she would like to share with the whole class when she pulls them back together. The following pieces of student work stand out to her as worth discussing with the whole class.

Sample 1
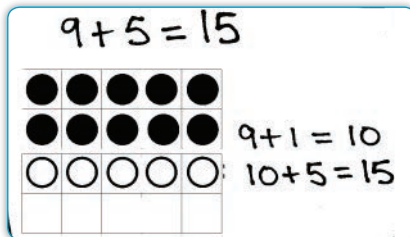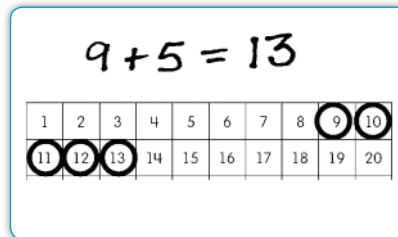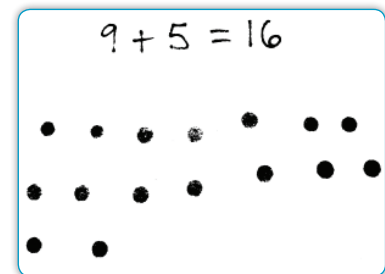
$9 + 5 = 15$

$9 + 1 = 10$
$10 + 5 = 15$

Sample 2

$9 + 5 = 13$

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |

Sample 3

$9 + 5 = 16$

Pause & Reflect:

1. What evidence is the teacher collecting in this final step of the routine?
2. What could a teacher do with this evidence?

Independently read the scenario, then respond to the questions.

Formative Assessment Strategy 1: Pose a Problem to Observe Student Thinking

> Folding chairs are set up in a school auditorium for a play. There are 16 rows of chairs, each with 28 chairs. How many folding chairs are there?

Ms. Rodriguez poses this problem from Day 3 of *Lesson 11: Multiply Whole Numbers*. She uses the Think-Share-Compare Routine to structure her lesson. After the whole class discusses what the problem is about and what they are being asked to do in *Step 1: Make Sense of the Problem*, Ms. Rodriguez provides about four minutes of private think time for *Step 2: Solve and Support Your Thinking*. She notices that some students are drawing models, writing numerical expressions, and other unique strategies.

Ms. Rodriguez then has students pair up for *Step 3: Discuss* to share and discuss their strategies, asking partners to use either the Sentence Starters on the Think-Share-Compare slides or one of the *Ready Mathematics* Discourse Cards in their conversations. As she monitors pair work, Ms. Rodriguez talks with two students who say the following:

Jason: So, I started by multiplying 10 x 20 and got 200. Then I multiplied 6 x 8 and got 48. I added 200 and 48 and that equals 248.

Emilio: I don't think you multiplied all the partial products. Look at my area model. There are four partial products to multiply, not two.

Pause & Reflect:

1. What are the benefits of the teacher stepping back and giving students time to independently think and then explain their thinking to a partner?

2. What does the teacher know about students from just watching them work and listening to their conversations?

Formative Assessment Strategy 2: Ask Questions to Get Students Explaining the Mathematics

Ms. Rodriguez pulls the class back together for *Step 4: Compare* so that Jason and Emilio can share their strategies with the class. She asks the class:

- Do you agree or disagree with their thinking? Why?
- Did anyone think about this a different way?

The class agrees that Jason used partial products but missed some of the factors.

For *Step 5: Connect & Reflect*, Ms. Rodriguez asks the class to open their books and look at the Picture It and Model It on their student page. She poses the Connect It questions for partners to discuss: *"Why is the area model divided into four sections?"* and *"How do the four steps in the partial products relate to the four sections in the area model?"*

Picture It You can use an area model to multiply two-digit numbers.

To solve this problem, multiply 16 × 28.

	10	+	6
20	20 × 10 2 tens × 1 ten = 2 hundreds 200		20 × 6 2 tens × 6 = 12 tens 120
+ 8	8 × 10 8 × 1 ten = 8 tens 80		8 × 6 = 48

200 + 80 + 120 + 48 = 448

Model It You can also multiply two-digit numbers using partial products.

$$\begin{array}{r} 16 \\ \times\ 28 \\ \hline 48 \\ 80 \\ 120 \\ +\ 200 \\ \hline 448 \end{array}$$

48 → 8 ones × 6 ones
80 → 8 ones × 1 ten
120 → 2 tens × 6 ones
200 → 2 tens × 1 ten

Ms. Rodriguez monitors conversations for understanding. She talks with two students who say:

Coral: Jason forgot to multiply 20 x 6 and 8 x 10. The partial products method shows what he forgot.

Tanisha: Yes, each part of the rectangle also shows all the parts you should multiply, then add together [points to the sections of the area model]. He only found two parts. That's why he said 248 chairs instead of 448 chairs.

Ms. Rodriguez pulls the class back together so that Coral and Tanisha can share their conversation. She asks the class to talk with their partners about the remaining Connect It questions and plans to pull them back together in a few minutes to share their thinking.

Pause & Reflect:

1. How are the area model and partial products similar? Why is it important to expose students to both representations?

2. What are the benefits of giving students a chance to turn and talk before whole group discussion? How did the questions help students explain their thinking and connect different representations?

Formative Assessment Strategy 3: Analyze Student Work to Inform Next Steps

For *Step 6: Apply*, Ms. Rodriguez asks students to independently solve Question 14 from the Try It feature on an index card, showing more than one way to solve. She collects the cards to determine which students she will conference with during workstations. Here are some samples of the work the teacher collected.

14 $27 \times 21 =$

Sample 1	Sample 2	Sample 3

Pause & Reflect:

1. What evidence is the teacher collecting in this final step of the routine?
2. What could a teacher do with this evidence?

Formative Assessment Scenario: Grade 7

Independently read the scenario, then respond to the questions.

Formative Assessment Strategy 1: Pose a Problem to Observe Student Thinking

> José's mother is trying to decide whether or not she should buy a 12-ounce package of coffee on sale for $7.50. She knows that she can buy the same coffee for $9.00 per pound. Which is the better buy?

Mr. Bailey poses this problem from Day 3 of *Lesson 9: Ratios Involving Complex Fractions.* He uses the Think-Share-Compare Routine to structure his lesson. After the whole class discusses what the problem is about and what they are being asked to do in *Step 1: Make Sense of the Problem*, Mr. Bailey provides about four minutes of private think time for *Step 2: Solve and Support Your Thinking*. He notices students drawing models and writing equations to show their thinking.

Mr. Bailey then has students pair up for *Step 3: Discuss* to share and discuss their strategies, asking partners to use either the Sentence Starters on the Think-Share-Compare slides or one of the *Ready Mathematics* Discourse Cards in their conversations. As he monitors pair work, Mr. Bailey talks with two students who say the following:

Shelby: I know that $7.50 is cheaper than $9.00 so that's a better buy. That was easy.

Kihaira: Look, the bags are different weights. [points to work] We know that there's 16 ounces in a pound, right? So, the 12-ounce bag is ¾ of a pound. If you divide 7 ½ by ¾ you get 60/6 which simplifies to 10/1 or $10. That means the $9 bag is the better buy.

Pause & Reflect:

1. What are the benefits of the teacher stepping back and giving students time to independently think and then explain their thinking to a partner?

2. What does the teacher know about students from just watching them work and listening to their conversations?

Formative Assessment Strategy 2: Ask Questions to Get Students Explaining the Mathematics

Mr. Bailey pulls the class back together for *Step 4: Compare* so that Shelby and Kihaira can share their thinking with the class. He asks the class:

- *Do you agree or disagree with their thinking? Why?*
- *Did anyone think about this a different way?*

Find the **cost for each quarter-pound of coffee**. Then find the **unit cost**.

The class agrees with Kihaira's statement about considering the weights of the bags of coffee, but when pressed by a classmate to explain how she knew to divide to find her answer, she has some difficulty explaining how she knew to divide 7 ½ and ¾. He decides that a visual might help Kihaira and the class make the connection.

For *Step 5: Connect & Reflect*, Mr. Bailey asks the class to open their books and look at the Model It on their student page. He poses the first Connect It question for partners to discuss: "The top number line is divided into three equal parts from 0 to 7 ½, and the bottom number line is divided into three equal parts from 0 to ¾. How can you use this to find the cost of one pound of coffee?"

Mr. Bailey monitors conversations for understanding. He talks with two students who say:

Fernando: So, when you line up 7 ½ and ¾ on the number line, you're really dividing it up into 3 equal parts that show fourths. Now that we know the answer is $10, I can see that halfway on the number line is $5. So if you double that you get $10.

Kris: Well, once you realize that each ¼ of a pound is $2.50, you can also multiply that by 4 to get $10.
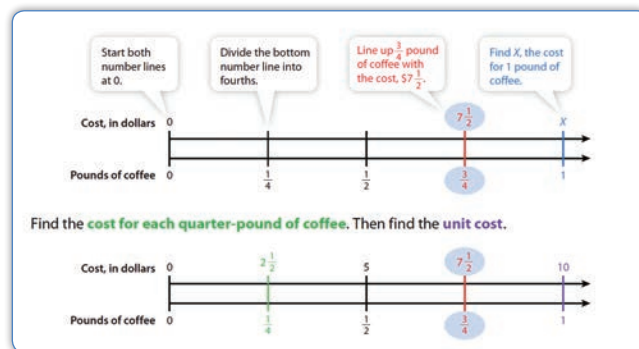
Pause & Reflect:

1. Why is it important to expose students to both the double number line and the algorithm for dividing complex fractions?

2. What are the benefits of giving students a chance to turn and talk before whole group discussion? How did the questions help students explain their thinking and connect different representations?
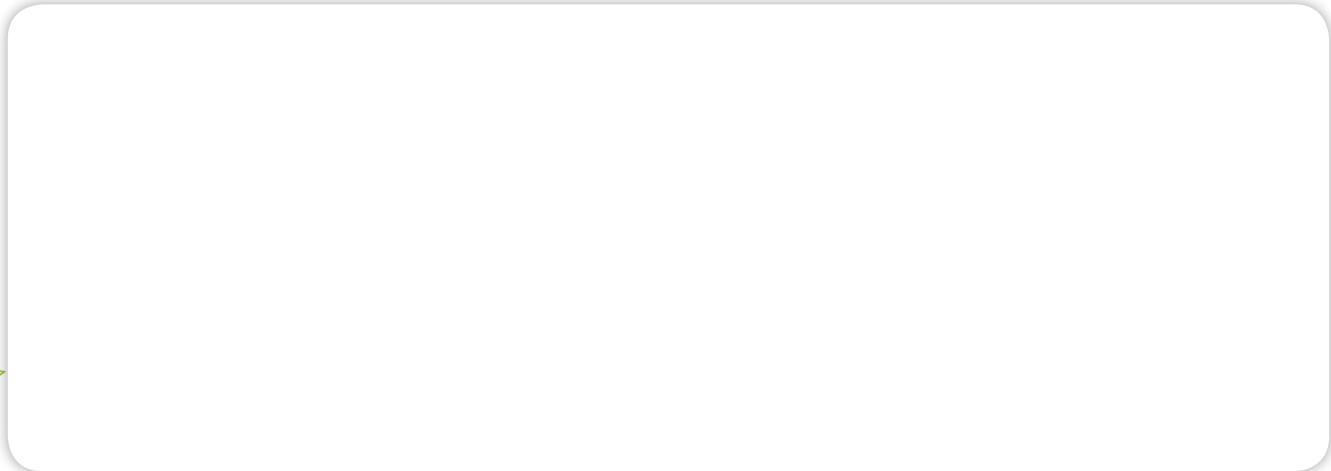
Formative Assessment Strategy 3: Analyze Student Work to Inform Next Steps

> **17** Rina's recipe uses 2 cups of sugar to make $2\frac{1}{2}$ dozen cookies. Jonah's recipe uses $2\frac{1}{4}$ cups of sugar to make 3 dozen cookies. Which recipe uses more sugar for a dozen cookies? Why? _____
>
> _____

After partners work through the Connect It questions, Mr. Bailey asks students to solve Question 17 from the Try It feature in their notebooks on their own. He circulates the room as students work, determining how he might use their responses to launch class discussion tomorrow. Below are a few samples of student work that stand out to Mr. Bailey.

Sample 1	Sample 2	Sample 3

Rina = 2 cups, $2\frac{1}{2}$ dozen 30 cookies
1 cup = 15 cookies

Jonah = $2\frac{1}{4}$ cups, 3 dozen 36 cookies
$1\frac{1}{8}$ cup = 18 cookies

Jonah uses more sugar than Rina.

RINA
$2\frac{1}{2} \div 2 = \frac{5}{2} \times \frac{1}{2} = \frac{5}{4}$ or $1\frac{1}{4}$

JONAH
$3 \div 2\frac{1}{4} = \frac{3}{1} \times \frac{4}{9} = \frac{12}{9} = 1\frac{1}{3}$

JONAH USES MORE SUGAR.

Rina's Recipe = $\frac{1}{2}$ sugar per dozen
Jonah's Recipe = $\frac{3}{4}$ sugar per dozen
Jonah used more sugar. $\frac{3}{4} > \frac{1}{2}$

Pause & Reflect:

1. What evidence is the teacher collecting in this final step of the routine?
2. What could a teacher do with this evidence?

Identifying Opportunities for Formative Assessment in an Upcoming Lesson

- Select a lesson you're preparing to teach that does not have "Understand" in the title.
- Zoom in on a Modeled & Guided Instruction Day.
- Identify opportunities for:
    - Posing a Problem to Observe Student Thinking
    - Asking Questions to Get Students Explaining the Mathematics
    - Analyzing Student Work Samples to Inform Next Steps

Use the chart below to record your plan for each formative assessment strategy.

Which problem will you use to observe student thinking and conversation?	
What questions will you ask to find out what students know and understand?	
What could you use as an exit slip to inform next steps?	

Planning for Differentiated Small Groups & Activities

Activity **Do the Math**

Put your student hat on and try to solve the problem on the screen as many ways as you can.

Then, talk with a partner or table group to explain your thinking and strategies. Consider the following questions:
- How might students approach these problems?
- What visuals, models, or representations might students use?
- What misconceptions or errors might they make?

Station Rotation: Grade 1, Lesson 14

Complete the activity for your assigned station. Be prepared to share your experience with the whole group.

Group 1: Teacher-Led Activity

1. Use your counters to show ten and some more for the number 12.

2. Now, show 8 + 7 with counters.

3. How could you change this model to show ten and some more?

4. Solve 9 + 4 = ? by making a ten.

Group 2: Math Center

1. Log in to Toolbox with your credentials.

2. Locate Grade 1, *Lesson 14: Make a Ten to Add*.

3. Click on "Math Center Activities."

4. Locate the "On Level" Math Center.

5. Open the center and review the directions and attached resources.

6. What are students learning about in this center?

7. If time permits, review the "Below" and "Above" level centers for this lesson. How are they different from the "On Level" center?
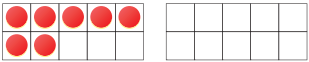
▶ **Notes**

Group 3: Independent Work

1. Log in to Toolbox with your credentials.

2. Locate Grade 1, *Lesson 14: Make a Ten to Add*.

3. Click on *Ready* Instruction Book and select the Student Book.

4. Work on the Independent Practice on page 93. You can use the blank note space or a separate sheet of paper.

5. If you finish early, check your work with a partner.

6. What mathematical understandings are students demonstrating with the independent work assignment?

7. If you were to assign independent work as a station, how might you check student work for accuracy and completion?

Practice by Myself
Make a Ten to Add

3 $7 + 6 = ?$

$7 +$ ____ $=$ ____
$10 +$ ____ $=$ ____
$7 + 6 =$ ____

4 $9 + 4 = ?$

| 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
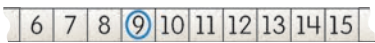
$9 + 4 =$ ____

5 $8 + 9 = ?$

$8 + 9 =$ ____

▶ **Notes**

Complete the activity for your assigned station. Be prepared to share your experience with the whole group.

Group 1: Teacher-Led Activity

1. What does the word "product" mean?

2. How can you break apart 36 and 15 into base ten units?

3. How can we draw an area model to show 36 x 15?

4. Now, draw an area model to find the product of 18 and 27.

Group 2: Math Center

1. Log in to Toolbox with your credentials.

2. Locate Grade 4, *Lesson 11: Multiply Whole Numbers*.

3. Click on "Math Center Activities."

4. Locate the "On Level" Math Center.

5. Open the center and review the directions and attached resources.

6. What are students learning about in this center?

7. If time permits, review the "Below" and "Above" level centers for this lesson. How are they different from the "On Level" center?

▶ **Notes**

Group 3: Independent Work

1. Log in to Toolbox with your credentials.

2. Locate Grade 4, *Lesson 11: Multiply Whole Numbers*.

3. Click on *Ready* Instruction Book and select the Student Book.

4. Work on the Independent Practice on pages 120–121. You can use the blank note space or a separate sheet of paper.

5. If you finish early, check your work with a partner.

6. What mathematical understandings are students demonstrating with the independent work assignment?

7. If you were to assign independent work as a station, how might you check student work for accuracy and completion?

Lesson 11 👤 Independent Practice

Practice ▶ Multiplying Whole Numbers

Solve the problems.

1 A person blinks about 16 times per minute. About how many times does a person blink in 3 hours? [Hint: 1 hour = 60 minutes]

A 48
B 96
C 960
D 2,880

2 Mr. Larson is planning a pizza party for 273 people. He plans on 3 slices of pizza for each person. How many slices of pizza is this in all?

A 276
B 546
C 619
D 819

3 Can the expression be used to ... each expression.

a. (9 × 4) + (20 × 4) + (9 × ...
b. (14 × 9) + (14 × 20)
c. (9 × 4) + (20 × 4) + (9 × ...
d. (29 × 4) + (29 × 10)

4 Which model(s) below could represent the solution to the problem 45 × 15? Circle the letter for all that apply.
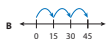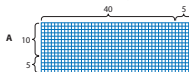
C (4 × 1) + (4 × 5) + (5 × 1) + (5 × 5)
D (4 × 1) + (5 × 5)
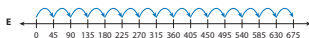
5 Mo had 14 tutoring sessions. Each session was 35 minutes long. How many minutes did Mo spend in the 14 sessions combined?

Show your work.

Answer Mo spent _____ minutes in the 14 sessions.

6 Fourth grade students held a recycling drive. During one week they collected 1,238 water bottles each day. How many water bottles did the fourth graders collect that week? [Hint: There are 7 days in one week.]

Show your work.

Answer The fourth grade students collected _____ water bottles.

✓ Self Check Go back and see what you can check off on the Self Check on page 111.

▶ **Notes**

Complete the activity for your assigned station. Be prepared to share your experience with the whole group.

Group 1: Teacher-Led Activity

1. What are we trying to find out? A recipe calls for 2 ¼ cups of sugar for 1 ½ dozen cookies. What is the amount of sugar per dozen?

2. What are the steps for dividing a complex fraction?

3. Now, solve this problem: Find Carlos's rate in laps per minute if he runs 6 ¼ laps in 10 minutes.

Group 2: Partner Game

1. Log in to Toolbox with your credentials.

2. Locate Grade 7

3. Click on "Mid and End of Unit Resources."

4. Locate the "Unit Game" (Teacher).

5. Open the center and review the directions and attached resources.

6. What are students learning in this game? How might using unit games keep skills alive throughout the year?

7. If time permits, locate unit games from other grades or units that could help students review skills.

▶ **Notes**

Group 3: Independent Work

1. Log in to Toolbox with your credentials.

2. Locate Grade 7, *Lesson 9: Ratios Involving Complex Fractions*.

3. Click on *Ready* Instruction Book and select the Student Book.

4. Work on the Independent Practice on pages 86–87. You can use the blank note space or a separate sheet of paper.

5. If you finish early, check your work with a partner.

6. What mathematical understandings are students demonstrating with the independent work assignment?

7. If you were to assign independent work as a station, how might you check student work for accuracy and completion?

Lesson 9 ⚇ Independent Practice

Practice **Finding Ratios Involving Complex Fractions**

Solve the problems.

1. One of the highest snowfall rates ever recorded was in Silver Lake, Colorado, in April 1921, when just over 7 feet of snow fell in $27\frac{1}{2}$ hours. What was that rate in inches per hour?

   A $\frac{14}{55}$ inch per hour

   B $\frac{55}{156}$ inch per hour

   C $3\frac{3}{55}$ inches per hour

   D $3\frac{13}{14}$ inches per hour

2. A grocery store sells different types of Trail Mix, as shown in the table below.

	Trail Mix A	Trail Mix B	Trail Mix C	
Cost ($)	6	8.50	2.25	
Weight	$\frac{3}{4}$ lb	1 lb	4 oz	**1 lb = 16 oz**

   Which statement is correct?

   A Trail Mix A is the best buy.

   B Trail Mix B is the best buy.

3. A treadmill counts $\frac{1}{2}$ mile as on of the treadmill indicates the n already completed and highligh the current lap has been compl display that shows a total of $\frac{13}{10}$

   • Write one number in the box number of laps already comp

   • Shade in one or more section indicate how much of the cu been completed.

4. A restaurant makes a special citrus dressing for its salads. Here is how the ingredients are mixed:

   $\frac{1}{3}$ of the mixture is oil $\frac{1}{4}$ of the mixture is orange juice

   $\frac{1}{6}$ of the mixture is vinegar $\frac{1}{4}$ of the mixture is lemon juice

   When the ingredients are mixed in the same ratio as shown above, every batch of dressing tastes the same. Study the measurements for each batch in the table. Fill in the blanks so that every batch will taste the same.

	Batch 1	Batch 2	Batch 3
Oil (cups)	1		
Vinegar (cups)		1	
Orange juice (cups)	$\frac{3}{4}$		1
Lemon juice (cups)			1

5. Two friends worked out on treadmills at the gym.

   • Alden walked 2 miles in $\frac{3}{4}$ hour.

   • Kira walked $1\frac{3}{4}$ miles in 30 minutes.

   Who walked at a faster rate? Explain your reasoning.

   Show your work.

   Answer _____

   ✓ **Self Check** Go back and see what you can check off on the Self Check on page 77.

Analyze Student Work and Instructional Plan: Grade 1

Analyze your assigned profile, then answer the Pause & Reflect questions.

Ready Mathematics Differentiated Instruction Planning Tool

Formative Assessment	*Quick Check & Remediation, Lesson 14:* Solve 8 + 7 = ? by making a ten.	
	Group 1: Remediate	**Group 2: Reinforce**
Do the Math: **How will you group students based on their responses?**	8 + 7 = 8 Used addend as sum. 8 + 7 = 14 Counted on incorrectly.	8+7=17 8+ 2=10 10+7 =17 Attempted to make a ten incorrectly. 8 + 7 = 15 Counted on correctly, did not make a ten.
Teacher-Led Activity	• Have students make ten and some more with counters for 12, 13, 15, and 16. • Then have them model 8 + 7 with counters. Ask how can you change this model to show 10 and some more? • Have students practice making ten with 9 + 4 using counters and ten frames. • If students still struggle with making a ten, use Hands-On Activity: Connecting Cubes to Model Making a Ten. *(Quick Check & Remediation in TRB)*	• Ask students to solve 8 + 7 = ? by making a ten. • Then, ask students to solve 9 + 4 by making a ten. *(Quick Check & Remediation in TRB)*
Student-Led Activity	• Math Center: Make a Ten–Below Level *(Online Teacher Toolbox)* • *i-Ready* iPad app *Door 24 Plus*	• Math Center: Make a Ten–On Level *(Online Teacher Toolbox)* • *i-Ready* iPad app *Door 24 Plus*
Independent Work	• Independent Work page 93 *(Student Book)* • Individualized *i-Ready* Online Lesson	• Independent Work page 93 *(Student Book)* • Individualized *i-Ready* Online Lesson
Rotation Schedule	1. Teacher-Led Activity 2. Student-Led Activity 3. Independent Work	1. Student-Led Activity 2. Teacher-Led Activity 3. Independent Work

Group 3: Challenge

 Made a ten with counters and ten frames.

 Used a number bond to break apart an addend to make a ten.

- Challenge Activity: Have students work in pairs to write word problems using teen numbers. *(Quick Check & Remediation in TRB)*

- Math Center: Make a Ten–Above Level *(Online Teacher Toolbox)*
- *i-Ready* iPad app *Door 24 Plus*

- Independent Work page 93 *(Student Book)*
- Individualized *i-Ready* Online Lesson

1. Independent Work
2. Student-Led Activity
3. Teacher-Led Activity

Pause & Reflect:

What can you determine about students' thinking based on their work from the Quick Check?

How does the teacher-led activity address students' identified learning needs?

What are students working on in the Student-Led and Individual stations? How do these activities address students' identified learning needs?
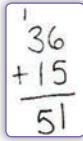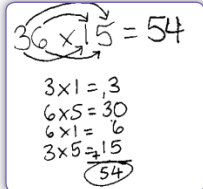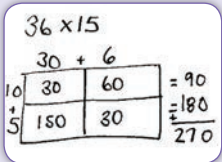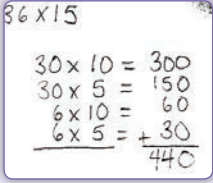
Analyze Student Work and Instructional Plan: Grade 4

Analyze your assigned profile, then answer the Pause & Reflect questions.

Ready Mathematics Differentiated Instruction Planning Tool

Formative Assessment	*Quick Check & Remediation, Lesson 11:* Find the product of 36 and 15.	
	Group 1: Remediate	**Group 2: Reinforce**
***Do the Math:* How will you group students based on their responses?**	Added products together. Did not consider the place values of the digits.	Computational error when multiplying factors. Computational error when regrouping the partial products.
Teacher-Led Activity	• Remind students that product means multiplication. • Demonstrate with base ten blocks that 36 is 30 + 6 and 15 is 10 + 5. Draw an area model to show each partial product. • Have students find the product of 18 and 27, using an area model. • If students still struggle, use Hands-On Activity: Play Money. *(Quick Check & Remediation in TRB)*	• Have students check work with a partner. • Remind them that when multiplying tens by tens, the result is 30 x 10 = 300, not 30. • Remind students that they must regroup 14 tens as 1 hundred and 4 tens when adding partial products. • Have students show two ways to find the product of 18 and 27. *(Quick Check & Remediation in TRB)*
Student-Led Activity	• Math Center: Multiply 2 Two-Digit Numbers–Below Level *(Online Teacher Toolbox)* • *i-Ready* iPad app *Door 24 Plus*	• Math Center: Multiply 2 Two-Digit Numbers–On Level *(Online Teacher Toolbox)* • *i-Ready* iPad app *Door 24 Plus*
Independent Work	• Independent Work pages 120–121 *(Student Book)* • Individualized *i-Ready* Online Lesson	• Independent Work pages 120–121 *(Student Book)* • Individualized *i-Ready* Online Lesson
Rotation Schedule	1. Teacher-Led Activity 2. Student-Led Activity 3. Independent Work	1. Student-Led Activity 2. Teacher-Led Activity 3. Independent Work

Group 3: Challenge

 Used partial products correctly.

 Used area model correctly.

- Challenge Activity: Solve two-step word problems involving multiplication. *(Quick Check & Remediation in TRB)*

- Math Center: Multiply 2 Two-Digit Numbers– Above Level *(Online Teacher Toolbox)*
- *i-Ready* iPad app *Door 24 Plus*

- Independent Work pages 120–121 *(Student Book)*
- Individualized *i-Ready* Online Lesson

1. Independent Work
2. Student-Led Activity
3. Teacher-Led Activity

Pause & Reflect:

What can you determine about students' thinking based on their work from the Quick Check?

How does the teacher-led activity address students' identified learning needs?

What are students working on in the Student-Led and Individual stations? How do these activities address students' identified learning needs?

Analyze Student Work and Instructional Plan: Grade 7

Analyze your assigned profile, then answer the Pause & Reflect questions.

Ready Mathematics Differentiated Instruction Planning Tool

Formative Assessment	*Quick Check & Remediation, Lesson 9:* A recipe calls for 2 ¼ cups of sugar for 1 ½ dozen cookies. What is the amount of sugar per dozen?	
	Group 1: Remediate	**Group 2: Reinforce**
Do the Math: How will you group students based on their responses?	$$\frac{2\frac{1}{4}}{1\frac{1}{2}} = \frac{9}{4} \times \frac{3}{2} = \frac{27}{8}$$ $$\frac{27}{8} = 3\frac{3}{8}$$ Multiplied instead of divided.	$$2\frac{1}{4} \div 18 \text{ or } \frac{9}{4} \div \frac{18}{1}$$ $$\frac{9}{4} \times \frac{1}{18} = \frac{9}{72} = \frac{1}{8}$$ Found the amount of sugar per cookie, not dozen. $$1\frac{1}{2} \div 2\frac{1}{4}$$ $$\frac{3}{2} \times \frac{4}{9} = \frac{12}{18} = \frac{2}{3}$$ Found the number of dozens per cups of sugar.
Teacher-Led Activity	• Remind students that they're trying to find the amount of sugar per dozen and that the fraction bar represents division. • Review the steps for dividing complex fractions. • Have students work on the Carlos Running Problem with a partner. • If students still struggle, use Hands-On Activity: Paper model to find unit rate: Sheila's gift basket problem. *(Quick Check & Remediation in TRB)*	• Remind students that they need to find the cups of sugar per dozen, not the number of dozens per cup or the amount of sugar per cookie. • Have students correct their errors with a partner, then work on the Carlos Running problem together. *(Quick Check & Remediation in TRB)*
Student-Led Activity	• Grade 7, Unit 1 Game *(Online Teacher Toolbox)* • *i-Ready* iPad app *Door 24 Plus*	• Grade 7, Unit 1 Game *(Online Teacher Toolbox)* • *i-Ready* iPad app *Door 24 Plus*
Independent Work	• Independent Work pages 86–87 *(Student Book)* • Individualized *i-Ready* Online Lesson	• Independent Work pages 86–87 *(Student Book)* • Individualized *i-Ready* Online Lesson
Rotation Schedule	1. Teacher-Led Activity 2. Student-Led Activity 3. Independent Work	1. Student-Led Activity 2. Teacher-Led Activity 3. Independent Work

Group 3: Challenge

Used a double number line to find the correct amount of sugar per dozen.

Divided by complex fractions to find the correct amount of sugar per dozen.

- Challenge Activity: Extend the concept of unit rate with the Ginger's Apples problem. *(Quick Check & Remediation in TRB)*

- Grade 7, Unit 1 Game *(Online Teacher Toolbox)*
- *i-Ready* iPad app *Door 24 Plus*

- Independent Work pages 86–87 *(Student Book)*
- Individualized *i-Ready* Online Lesson

1. Independent Work
2. Student-Led Activity
3. Teacher-Led Activity

Pause & Reflect:

What can you determine about students' thinking based on their work from the Quick Check?

How does the teacher-led activity address students' identified learning needs?

What are students working on in the Student-Led and Individual stations? How can these activities help students practice skills?

Pause & Reflect:

How does the Quick Check provide a formative assessment that informs planning and implementing the Independent Practice day?

Why do you think the teacher started with the group who needed the most support, then planned to move to groups who needed less support?

Example Time Frame for Weekly Differentiated Instruction

Ready Mathematics lessons are designed to take 45–60 minutes per day. To remediate, reinforce, and extend learning for all students, consider using the Independent Practice Day. Or, if you have a 90-minute block or additional learning time at the end of a lesson, consider using the extra time to work with a small group while the other students work at stations.

Day	If 45–60 minutes…	If 75–90 minutes…
Day 1: Introduction	• 45 minutes: Think-Share-Compare Routine • 15 minutes: Additional Instruction*	• Use suggestions at left • Extend additional instruction* opportunities
Day 2: Modeled & Guided Instruction	• 45 minutes: Think-Share-Compare Routine • 15 minutes: Additional Instruction*	• Use suggestions at left • Extend additional instruction* opportunities
Day 3: Modeled & Guided Instruction	• 45 minutes: Think-Share-Compare Routine • 15 minutes: Additional Instruction*	• Use suggestions at left • Extend additional instruction* opportunities
Day 4: Guided Practice	• 45 minutes: Think-Share-Compare Routine • 15 minutes: Quick Check	• Use suggestions at left • Extend additional instruction* opportunities
Day 5: Independent Practice	• 5 minutes: Review expectations for stations • 15 minutes: Teacher-Led Station • 15 minutes: Student-Led Station • 15 minutes: Independent Work Station • 10 minutes: Review key independent practice problems	• Extend time in stations and groups as needed

*Additional Learning Opportunities could include Hands-On Activities, Concept Extensions, Math Centers, etc. See additional instruction recommendations in "What Instruction Looks Like…" on pages 154–159.

- **Select a lesson you're preparing to teach that does not have "Understand" in the title.** Then, locate the Quick Check & Remediation feature.

- **Do the math for the Quick Check & Remediation problem** (including correct and incorrect answers, different strategies, and misconceptions).

- **Next, consider how you might group students based on these different approaches.**

- **Finally, select activities from the Quick Check & Remediation recommendations or Teacher Toolbox to support student needs based on their responses to the Quick Check problem.**

  - **Teacher-Led Activities (Small Groups):** Quick Check recommendations, Hands-On Activities, Challenge Activities, or Tools for Instruction

  - **Student-Led Activities (Partners):** Math Centers (K–5), Unit Games, Performance Tasks

  - **Independent Work:** Independent Practice page, Practice & Problem Solving fluency, *i-Ready* Lessons

Formative Assessment	Quick Check & Remediation Problem:
	Group 1: Remediate
Do the Math: **How will you group students based on their responses?**	
Teacher-Led Activity	
Student-Led Activity	
Independent Work	
Rotation Schedule	

	Group 2: Reinforce	Group 3: Challenge

Differentiated Small Groups & Activities: Tips for Success

- **Use multiple informal and formal data points** to flexibly group students.

- **Set expectations with students** for what small groups and stations will look and sound like.

- **Make sure students know what to do if they get stuck or finish early.**

- **At the end of each Teacher-Led Group, assign a partner/independent task to check for understanding.** This will free you up to circulate the room and check on students who are not working independently or in centers.

- **If you're short on time, meet with your group who needs reteaching first or more often.**

- **For optimal focus on student needs, consider the number of students in your teacher-led group.** If more than 6–8 students need the same support, you may need to split one large group into two smaller groups.

- **If using center activities or unit games, show students how to play the games ahead of time** so they remain engaged in the activity.

- **Start small and be patient with yourself and students—**integrate one change at a time if this is new for students.

Add Your Own!

For Leaders

Leading a New Implementation

Activity · **Facilitate Meaningful Mathematical Discourse**

Work with a partner to analyze this table. One partner reads the "What are teachers doing?" list of teacher actions and the other partner reads the "What are students doing?" list of actions. Make notes or highlight key ideas in the table. After identifying key ideas, share and discuss them with your partner.

Facilitate meaningful mathematical discourse: teacher and student actions

What are teachers doing?	What are students doing?
Engaging students in purposeful sharing of mathematical ideas, reasoning, and approaches using varied representations	Presenting and explaining ideas, reasoning, and representations to one another in pairs, small groups, or whole class discourse
Selecting and sequencing student approaches and solution strategies for whole class analysis and discussion	Listening carefully to and critiquing the reasoning of peers using examples to support or counterexamples to refute arguments
Facilitating discourse among students by positioning them as authors of ideas who explain and defend their approaches	Seeking to understand the approaches used by peers by asking clarifying questions, trying out others' strategies, and describing the approaches used by others
Ensuring progress toward mathematical goals by making explicit connections to student approaches and reasoning	Identifying how different approaches to solving a task are the same and how they are different

Source: National Council of Teachers of Mathematics (2014). *Principles to Actions: Ensuring Mathematical Success for All.* Reston, VA.

Which of these Teacher Moves and Student Actions are you seeing in your teachers' classrooms?

Are there any of these Teacher Moves and Student Actions that you are not seeing in your teachers' classrooms?

What are some routines your teachers currently use to structure a day of learning?

Put your student hat on and try to solve the problem on the screen as many ways as you can.

Think-Share-Compare Routine Steps 1–4

How do the first 3 steps of the Think-Share-Compare Routine make Step 4 possible?

How did working on the problem to anticipate solutions and discussing solutions with a partner help you to make sense of the different strategies that students presented?

Think-Share-Compare Debrief

How does the Think-Share-Compare Routine integrate the *Ready Mathematics* Best Practices into instruction?

Implementation Best Practices and Pitfalls to Avoid

Best Practices

Supporting Standards-aligned Instructional Practices *(including student discourse and multiple solution strategies)*:

Set expectations for use and communicate broadly

Align your Professional Development plan

Align classroom observations and coaching discussions

Align your assessment practices

Planning:

Help teachers understand learning progressions

Provide opportunities for teachers and coaches to plan collaboratively

Pacing:

Provide sufficient time for instruction and on-level differentiation

Closely monitor lesson and yearly pacing for consistency with district goals

Pitfalls to Avoid

Not providing enough guidance or support on the new methods or strategies, leading teachers to be confused, not recognize the benefits of the *Ready* program, and use resources that are more comfortable to them but not based on the current standards or instructional practices.

Waiting too long to monitor pacing, resulting in incomplete coverage of curriculum and students not having needed instruction before state assessments.

Teachers not planning lessons in advance with the support of colleagues and coaches, preventing them from incorporating standards-aligned instructional practices.

Must-Haves for Successful Implementations

Mathematics Instruction

Goals

Support teachers in delivering standards-based mathematics instruction that engages students and builds mastery.

Must-Haves

- Set expectations for, support, and monitor the use of standards-aligned instructional practices.
- Support teachers as they plan instruction purposefully.
- Monitor pacing to ensure consistency with district goals.
- Teachers use standards-based instructional practices including using student discourse and multiple solution strategies in their planning and teaching of daily lessons.

Assessment

Goals

Minimize student assessment time while delivering high-impact data.

Must-Haves

- Establish a comprehensive assessment calendar that eliminates any redundant tests.
- Actively monitor assessment administration and test all students in 2–4 week testing windows.
- Use consistent measures of success at the district, school, and class levels; start with growth and proficiency.

Differentiated Instruction

Goals

Enable teachers to enhance differentiation in their classrooms.

Provide all students with personalized digital learning support.

Must-Haves

- Teachers use formative assessments throughout *Ready* lessons and review reports after each *i-Ready Diagnostic* (and Standards Mastery assessment as applicable) to identify student needs.
- Teachers do weekly differentiation and remediation in the classroom using recommended *Ready Teacher Toolbox* resources.

- Set clear, reachable targets for growth, usage, and lesson pass rates and monitor regularly.
- Establish instructional schedules that allow for 45 minutes of *i-Ready Instruction* per week.
- Teachers actively monitor Online Instruction and work with students to set goals and celebrate growth and progress.

Foundation

To enable successful implementation, it is critical to have a few underlying conditions in place:

Ongoing communication with all key stakeholders to ensure shared responsibility.

Professional Development that provides educators with the right knowledge and support.

Technology infrastructure and account setup that adequately supports the program.

Clear owners and ongoing monitoring of implementation health.

Here are some of the goals *Ready Mathematics* **leaders have used for ensuring that teachers are prepared to successfully teach with** *Ready Mathematics***:**

- **Actively support teachers** so that they become comfortable using *Ready Mathematics*, Practice & Problem Solving, and the *Ready Teacher Toolbox* as the primary components of whole class instruction, and ask them to commit to not using outside resources while they become accustomed to the new program.

- **Set the expectation that teachers plan the entire weekly** *Ready Mathematics* **lesson** using the Teacher Resource Book and consider key planning questions outlined in the *Ready Mathematics* Planning Backwards and Lesson Preparation tools.

- **Ensure that teachers are using Lesson 0, the** *Ready Mathematics* **Think-Share-Compare Instructional Routine, and the Think-Share-Compare slides.**

- **Create opportunities for classroom observation and purposeful feedback** using the *Ready Mathematics* Look-Fors as a guide, and ensure that teachers clearly understand the evidence of practice outlined in the Look-Fors.

- **Create space in teachers' schedules for common planning time** to prepare *Ready Mathematics* instruction and share ideas.

Part 1:

Set at least two achievable near-term goals for leading your school or district's *Ready Mathematics* implementation. You may choose from the goals above and/or write your own. Refer to the Must-Haves, Best Practices, and Pitfalls when thinking about identifying your goals. If you are planning with a team, consider dividing goals and assigning areas of specific focus.

Goal 1:	Goal 2:

Part 2:

Given the goals you selected, plan your next steps. In your planning, consider how you can use existing meetings or support structures to communicate with and provide support to teachers. Also, consider which *Ready Mathematics* resources you will need to guide your work (e.g., Look-Fors, Lesson Preparation guides, Lesson 0s, Think-Share-Compare slides, etc.).

	Goal 1:	Goal 2:
Next Steps:		
Before the year starts		
In the first 2 weeks of school		
In the first 4–6 weeks of school		
Ongoing		

Supporting Teacher Best Practices

Habits of Effective Mathematics Instruction

What are some habits of effective mathematics instruction you look for in your classrooms?

As you think about each best practice, note the following information in the graphic organizer:

- *How a teacher might support each Best Practice, and*
- *How this Best Practice connects to the Standards for Mathematical Practice.*

Ready Mathematics Best Practices	How might a teacher support these educator best practices?	How do these educator best practices connect to the Standards for Mathematical Practice?
Purposeful preparation		
Supporting productive struggle		
Facilitating mathematical discourse		
Discussing multiple strategies		
Differentiating with targeted resources		

Video Viewing Graphic Organizer

As you watch each video clip, record the following information in the graphic organizer:

- Connections between best practices and what you see in the video.
- Opportunities to strengthen productive struggle, support mathematical discourse, and discuss multiple strategies.

	Supporting Productive Struggle	**Facilitating Meaningful Discourse**
	• Allows students a long enough time to think before they share their solutions or answers with partners or the class. • Does not ask a question and accept an answer from the first student to raise his or her hand. • Asks students questions to encourage and support them if they get "stuck" rather than telling them what to do.	• Poses purposeful questions that engage all students in doing the majority of thinking and talking. • Asks students to explain and critique their solution strategies and responses to questions as well as those of their peers. • Frequently has students engage in partner or small group conversations before discussing with the class.
Video 1		
Video 2		
Video 3		

Discussing Multiple Strategies
• Encourages students to solve problems in more than one way and become flexible with multiple models and strategies.
• Circulates during independent think time and partner discussions to select and sequence multiple solutions to share during whole class discussion that advance the lesson's goals.
• Compares and connects students' solution strategies to one another and to those shown in *Ready* instruction.

Pause & Reflect:

Which of these best practices do you think are the most challenging for teachers? Why?

Which were the most challenging for you to observe? Why?

How might you use the *Ready Mathematics* Look-Fors for planning, observation, and coaching?

Supporting Productive Beliefs

Activity

Identify Beliefs about Teaching & Learning Mathematics

Brainstorm examples of beliefs about each of these *Ready Mathematics* Best Practices.

Ready Mathematics Best Practices	Productive Beliefs *Promote effective teaching and learning*	Unproductive Beliefs *Hinder effective teaching and learning*
Planning mathematics instruction with purpose		
Allowing students to productively struggle		
Facilitating meaningful student discourse		
Helping students see multiple strategies and make connections		
Differentiating instruction		

Pause & Reflect:

Which of these productive beliefs have you seen or heard the most in your district?

Which of these unproductive beliefs have you seen or heard in your district?

Are there other topics that produce unproductive beliefs?

Addressing Common Concerns

Use the language in the *Ready Mathematics* Best Practices and Recommended Resources to respond to these common concerns that you might hear.

What you might hear…	Why you might be hearing this…	Recommended Resources	
• "My students are so behind that I need to teach all the prerequisites for this lesson first." • "There's not enough content. I have to supplement the lesson to fill up the time." • "There's too much to do. I can't get it all done." • "There aren't enough practice problems in the book." • "The expectations on the lesson quizzes are too high. This math is too challenging for my students."	Need support with purposeful preparation	• Lesson Preparation Guide • Teacher Resource Book pacing guidance • Practice & Problem Solving Teacher Guide • Pacing Articles on ReadyCentral.com	
• "I can't have my students attempt a word problem on their own. I need to teach them the strategies before they try a word problem." • "I need to guide my students through solving the problem so they don't get confused or frustrated." • "When students get stuck, it's just easier to show them how to do it correctly."	Need support with allowing students to productively struggle	• Teacher Resource Book Standards for Mathematical Practice (SMP 1)	
• "I use discourse but the lesson only takes ten minutes to do." • "My students can't handle discourse. They get off topic and say random things." • "Students don't talk or work in groups or pairs because I don't know if what they're saying is right or wrong. It's just easier to do discourse with the whole class."	Need support with facilitating meaningful discourse	• Think-Share-Compare Routine guidance and lesson slides • Discourse Cards • Best Practices for Math Talk	
• "Kids don't get all the different strategies, so I just show them the quickest or easiest way." • "Our main focus is on getting the procedures down and memorizing our facts." • "Manipulatives are too messy or cumbersome."	Need support with allowing students to make sense of multiple strategies	• Teacher Resource Book lesson guidance on Learning Progressions	
• "I don't really have time to look at the data. I know who my low kids are so I just group them by their abilities." • "I don't need to differentiate instruction for this lesson because all my students need to learn this topic."	Need support with differentiating instruction	• Quick Check & Remediation Guidance in Teacher Resource Book. • *i-Ready* data reports • 90-Minute Framework on ReadyCentral.com	

Ideas for Responding to What You Might Hear

What strategies can we put in place in advance to prevent these concerns from surfacing?

If some of these concerns already exist, how might we address them?

Developing Productive Beliefs: Tips for Success

This table outlines some tips for developing productive beliefs. Refer to these tips as you begin thinking about the next steps for supporting teachers.

Get Buy-in
Anticipate challenges and educate all stakeholders.

Implement Meaningful PLCs
Prepare a PLC focus, challenge teachers to act on their learning, and champion teachers to share their effective strategies in PLCs.

Build a Culture of Trust
Build on the positives, be visible and supportive.

Leverage Feedback for Change
Encourage a mindset that focuses on next steps and continuous improvement.

Want to learn more?
Go to ReadyCentral.com.

How will your team communicate the *Ready Mathematics* Best Practices?

How will your team support teachers with overcoming common concerns with implementing *Ready Mathematics*?

Resources

A Note to Educators

For educators in states using custom editions of *Ready Mathematics* (Florida, Georgia, Indiana, Louisiana, Mississippi, New Jersey, New York, Pennsylvania, Tennessee, West Virginia), some content in this document may not be representative of state-specific standards and language conventions (e.g., Indiana Process Standards). Please know that your teacher and student materials will reflect these state-level differences.

Ready Mathematics Lesson Types

Ready has three different types of lessons to address the unique approaches of the standards and to support a balance of conceptual understanding, application, and procedural fluency.

Understand Lessons

Understand lessons correspond to the standards that begin with the word "*Understand.*" These occur at critical points in the instructional sequence to slow down and help students deepen conceptual understanding of new ideas.

Skills and Strategy Lessons

Skills and Strategy lessons represent the majority of the lessons in *Ready* and focus on helping students persevere in solving problems, discuss solution strategies, and compare multiple representations to reinforce and connect understanding. They balance conceptual understanding, procedural fluency, and application.

Math in Action Lessons (Grades 2–5)

Math in Action lessons teach students how to approach and answer complex multi-step problems. Students interact with exemplary responses and then apply that thinking to solve complex problems that integrate multiple standards from the unit.

Flow of *Ready* Lessons

Introduction →	Guided Instruction →	Guided Practice →	Independent Practice
Students connect what they have learned to new ideas through teacher-led whole class conversations.	Students explore new ideas and concepts by answering questions and discussing ideas as a class.	Students deepen conceptual understanding and address common misconceptions in pairs and as a class.	Students work on a multi-step task independently to reinforce the concepts of the lesson.

Introduction →	Modeled & Guided Instruction →	Guided Practice →	Independent Practice
Students access prior knowledge by completing a prerequisite task individually and discussing it in pairs and with the class before connecting this idea to new ideas.	Students solve a single task individually, discuss in pairs, and make connections as a class using a discourse-based routine like Think-Share-Compare.	Students practice the topics of the lesson by solving problems individually, comparing and discussing strategies in pairs, and possibly discussing as a whole class.	Students complete practice problems with items in the formats of state assessment.

Introduction →	Guided Instruction →	Guided Practice →	Independent Practice
Students analyze a comprehensive solution to a multi-step task and answer questions about the approach.	Students are given a familiar multi-step task to solve in a different way with guiding prompts.	Students are given a new multi-step task to solve with guiding prompts.	Students are given two new multi-step tasks to solve without any support prompts.

Structure of a Skills and Strategy Lesson*

Introduction →	Modeled & Guided Instruction →	Guided Practice →	Independent Practice
Activates prior knowledge, connecting what students already know with the new skills and concepts they will be learning in the lesson.	Explores ways to solve problems using multiple representations and prompts students to reason and explain their thinking.	Models self-questioning and mathematical habits of mind as students solve problems and discuss their solution strategies.	Provides problems in a variety of assessment formats that integrate and extend concepts and skills.

Teacher Actions:

- Allows student think time
- Supports effective partner communication
- Facilitates whole class discourse of student discussions
- Guides students to connect multiple strategies
- Encourages effort
- Recognizes mistakes as opportunities for learning

- Observes student strategies
- Asks questions to guide or correct understanding
- Differentiates instruction as needed in stations or small groups

Student Actions:

- Perseveres in thinking about problems and questions
- Actively listens to partners and whole class conversations
- Participates in small group and whole class conversations, politely critiquing the reasoning of others
- Solves problems using multiple strategies or mathematical tools
- Recognizes mistakes as opportunities to learn
- Applies learning to new problems

* The structure for the *Understand* lessons and Math in Action lessons is slightly different. The majority of the lessons in *Ready Mathematics* follow the format shown above.

Notes

Lesson 26
Compare Length

CCSS Focus

Domain
Measurement and Data

Cluster
A. Describe and compare measurable attributes.

Standards
K.MD.A.1 Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object.

K.MD.A.2 Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. *For example, directly compare the heights of two children and describe one child as taller/shorter.*

Standards for Mathematical Practice (SMP)
1 Make sense of problems and persevere in solving them.
2 Reason abstractly and quantitatively.
3 Construct viable arguments and critique the reasoning of others.
4 Model with mathematics.
5 Use appropriate tools strategically.
6 Attend to precision.
7 Look for and make use of structure.

Lesson Objectives

Content Objectives
- Compare the length of two objects to identify which is longer and which is shorter.
- Compare the height of two objects to identify which is taller and which is shorter.
- Describe several measurable attributes of a single object.

Language Objectives
- Point to the longer (or taller) or shorter of two given objects.
- Use connecting cubes to build a tower that is taller or shorter than a partner's tower.
- Draw objects that are longer (or taller) or shorter than a given drawn object.
- Describe how to make sure objects are lined up before comparing length or height.

Prerequisite Skills

- Understand comparing numbers.

Lesson Vocabulary

- **length** how long something is.
- **height** how tall something is.
- **long, longer** having a length that is greater than that of another object.
- **tall, taller** having a height that is greater than that of another object.
- **short, shorter** having a length or height that is less than that of another object.
- **compare length or height** to decide if an object is longer/taller than, shorter than, or the same length/height as another object.

Learning Progression

In Kindergarten children begin to distinguish and compare measurable attributes of objects.

In this lesson children compare objects using different attributes, with a particular focus on length and height. They may describe several measurable attributes of a single object. The teacher guides conversations about things that are bigger or smaller, longer or shorter, and taller or shorter. While the focus is on length in one dimension, discussions may also extend to area (two dimensions) or even volume (three dimensions), and could include weight or capacity.

In Grade 1 children compare the lengths of two objects using a third object as a measurement tool. Children will also order objects by their lengths, and use numbers of units to describe lengths.

Lesson Pacing Guide

Whole Class Instruction

Day 1 *45–60 minutes*	**Introduction** **Use What You Know** • Activity *35 min* • Building Fluency *10 min*	
Day 2 *45–60 minutes*	**Modeled Instruction** **Explore Together** • Problem *15 min* • Talk About It *5 min* • Hands-On Activity *10 min* • Problem Solving Connection *15 min*	**Practice and Problem Solving** Assign pages 223–224.
Day 3 *45–60 minutes*	**Guided Practice** **Practice Together** • Problems *15 min* • Talk About It *5 min* • Hands-On Activity *15 min* • Fluency Practice *10 min*	**Practice and Problem Solving** Assign pages 225–226.
Day 4 *45–60 minutes*	**Guided Practice** **Practice Together** • Problems *20 min* • Talk About It *10 min* • Hands-On Activity *15 min*	**Practice and Problem Solving** Assign pages 227–228.
Day 5 *45–60 minutes*	**Independent Practice** **Practice by Myself** • Problems *10 min* • Talk About It *5 min* • Hands-On Activity *10 min* • Quick Check and Remediation *10 min* • Hands-On or Challenge Activity *10 min* **Teacher-Toolbox: Lesson Quiz** Lesson 26 Quiz	

Materials for Lesson Activities

Per child: 6–10 connecting cubes, 2 erasers of different lengths, 3 objects of different lengths

Per pair: 2 pencils of different lengths, 2 paintbrushes of different lengths, 2 markers of different lengths
Activity Sheet 15

For display: 2 noticeably different shoes of different lengths, 2 paint jars or cups of different heights

Small Group Differentiation

Teacher-Toolbox.com

Teacher-led Activities
Tools for Instruction *15–20 min*

Grade K *(Lesson 26)*
• Describing Length
• Measuring Height and Length

Student-led Activities
Math Center Activities *30–40 min*

Grade K *(Lesson 26)*
• K.34 Length Vocabulary
• K.35 Compare Lengths

Lesson 26 Compare Length
� Introduction

Activity Describe Measurable Attributes

Objective
Identify and describe measurable attributes of objects and compare lengths of objects.

Materials per pair
• 2 pencils of different lengths

Materials for display
• 2 noticeably different shoes of different lengths

Overview
Children identify attributes of shoes and make comparison statements based on length. Children then compare lengths of pencils and make comparisons statements.

Name _____

Compare Length
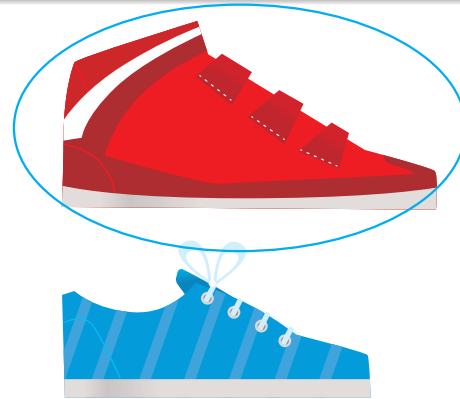
Children identify attributes of shoes and make comparison statements based on length. Display two shoes of different sizes. Invite children to describe the two shoes. Model a comparison statement, such as: *The blue shoe is longer than the white shoe.* Have children make comparison statements using *shorter, heavier,* and *lighter.* Have children make comparison statements about the shoes shown and circle the one that is longer.

Introduction • Lesson 26 **151**

Step By Step

• **Identify attributes of objects.** Display two different shoes and invite children to tell about each one. Identify the attributes they describe, such as color, size, and kind.

• Direct children's attention to the shoes on the Student Book page. Invite children to talk about the different attributes of the shoes shown.

• **Describe measurable attributes.** Explain that some things they described, like *how big, how long*, or *how heavy,* can be measured. And that if you can measure it, you can compare it.

• Model a comparison statement about the two shoes you are displaying, such as: *The blue shoe is longer than the white shoe.* Then invite a volunteer to make a comparison statement using the word *shorter.* Do the same with the words *heavier* and *lighter.*

• **Compare lengths of shoes.** Invite several children to the front of the classroom to compare the lengths of his or her own shoe to your display shoes. Demonstrate how to line up two shoes to make a direct comparison.

• Hold up the two shoes. Hold the shorter shoe above the longer shoe so that it looks longer, hiding the other end of the shoes. Indicate the shorter shoe and ask: *If I say this shoe is longer, would you agree with me?*

• Guide children to refute your statement and ask them to explain their reasoning. Lead them to describe that the correct way to compare the lengths of the shoes is to make sure that one end is lined up.

• Invite volunteers to make comparison statements about the shoes shown on the Student Book page. Listen for comparison statements based on length.

• Have children circle the shoe that is longer. Ask volunteers to share how they decided which shoe was longer.

Use What You Know
Compare Length

Check that children line up an end of the pencil with the dashed line to compare lengths.
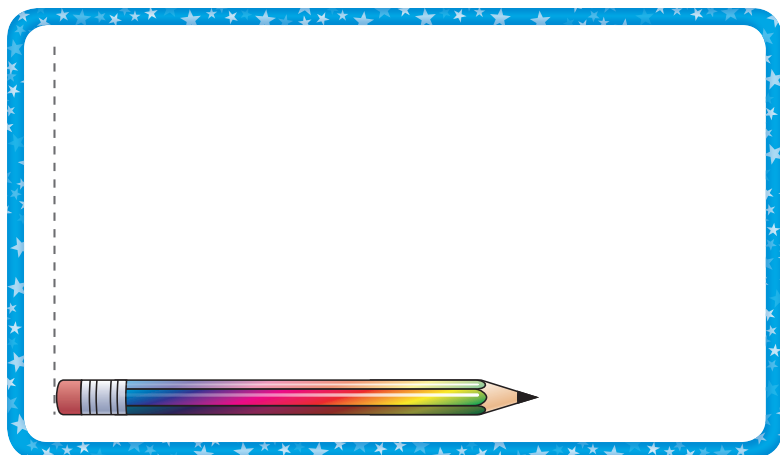
Children compare lengths of pencils and make comparison statements. Give pairs 2 pencils of different lengths. Have children compare the length of each pencil to the pencil shown. Guide them to describe each pencil in relation to the picture of the pencil using *shorter* or *longer*.

152 Lesson 26 • Introduction   ©Curriculum Associates, LLC   Copying is not permitted.

Step By Step

- **Compare lengths of pencils.** Direct children's attention to the pencil shown on the Student Book page. Distribute 2 pencils of different lengths to each pair of children. (Pencils should not be the same length as the one shown on the Student Book page.) Have children compare the length of each pencil to the length of the pencil shown on the Student Book page.

- Have children make comparison statements using both *shorter* and *longer*.

- Watch for children who do not make sure that the ends of the pencils are lined up before making the comparison.

- Children who have difficulty making direct comparisons or who do not use the appropriate comparison vocabulary may benefit from the Hands-On Activities in the lesson.

▶ **Building Fluency**

▶ **Building Fluency**

Practice writing numbers to 20.
Look for opportunities throughout the day for writing numbers. Examples may be writing the date on papers, writing numbers in the air together as a class, or writing numbers on white boards.

Play "What's My Shape?"
Engage children in identifying shapes. Say the name of an object in the classroom and have children respond with its shape. For example, if you say the clock, children might respond that it is a circle.

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Lesson 26 Compare Length

👥 Modeled Instruction

Step By Step

- **Encourage children to compare objects based on their heights or lengths.**

▶ **Hands-On Activity**

Error Alert In the Hands-On Activity, children may not line up objects before they compare the lengths. Remind them to line up one end. It may help to have children line up objects along the edge of a straight table or to use a book to align objects.

- **Model statements, such as:** *The yellow bat is longer than the red bat.* Encourage children to make statements about like objects, such as the boats, the benches, the trees, and the flowers. Children may also compare, for example, the height of the children to the height of the trees.

▶ **Mathematical Discourse 1**

- **Have children circle the taller or longer object for each comparison.** Have them compare the boats, flowers, bats, benches, and trees. Make sure children understand that *taller* refers to height and *longer* refers to length. Guide children to see that the purple boat is taller, but the red boat behind it is longer.

▶ **Mathematical Discourse 2**

📦 **Ready** Mathematics
PRACTICE AND PROBLEM SOLVING

Assign *Practice and Problem Solving* **pages 223–224** after students have completed this section.

Explore Together
Compare Length

Children circle the taller tree, the tallest boat, the taller flowers, the longer bench, the longest boat, and the longer bat.

Encourage children to compare objects based on their heights or lengths. Model statements, such as: *The yellow bat is longer than the red bat.* Have children circle the taller or longer object for each comparison.

Talk About It How can you tell which of the 3 boats is the longest?

Modeled Instruction • Lesson 26 **153**

▶ **Mathematical Discourse**

1 *Where do you see objects that are the same height?*

Responses might include the two children, the two red flowers, the two yellow flowers, the two purple flowers, the two balloons, and the two benches.

2 **Talk About It** When children have completed the page, ask: *How can you tell which of the 3 boats is the longest?*

The back end of the red boat starts before the back end of the sailboat and you can see a lot of the front end of the red boat sticking out after the sailboat ends. So the red boat is longer than the sailboat. The yellow boat is about the same size as the sailboat, so the red boat is the longest.

▶ **Hands-On Activity**

Compare heights of children and lengths of pencils.

Materials For each child: pencil or crayon

- Invite two children of different heights to the front of the classroom. Have them stand back to back so that the class can compare their heights. Ask: *Who is taller? Who is shorter?* Discuss with children how they determine who is taller and who is shorter.

- Pair children and have them compare the lengths of their pencils or crayons. Show children how to align one end of each object and then tell which pencil or crayon is longer and which is shorter.

Problem Solving Connection

👥 **Modeled Instruction**

Teacher-Toolbox.com

Compare Length **Problem Solving Connection** Problem 1

There are 4 trees on one side of the pond.

There are 4 trees on the other side of the pond.

How many trees are there in all?

Read the problem as a class. Have children work independently to solve the problem, allowing sufficient time for them to work through the problem on their own. Invite children to share their answers and discuss as a class.
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Compare Length **Problem Solving Connection** Problem 2

There are 6 flowers.

Some are tall.

The rest are short.

How many can be tall and how many can be short?

Read the problem as a class. Have children work independently to solve the problem, allowing sufficient time for them to work through the problem on their own. Invite children to share their answers and discuss as a class.
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Compare Length **Problem Solving Connection** Problem 3

There were 8 children in the park.

Some children went home.

Now there are 2 children in the park.

How many children went home?

Read the problem as a class. Have children work independently to solve the problem, allowing sufficient time for them to work through the problem on their own. Invite children to share their answers and discuss as a class.
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At A Glance

Children solve and discuss problem-solving situations. The problems are located on the online Teacher-Toolbox as individual PDFs for use as whole class instruction.

These provide problem-solving opportunities beyond the Student Book. They may be used along with the *Explore Together* scene in the Student Book. They may also be used with the corresponding black-and-white scene in *Practice and Problem Solving* for a more open-ended approach.

Step By Step

- **Read the problem as a class.** Display a problem and read it aloud. Discuss the problem with children to make sure they understand what it is asking before having them think about ways to solve it.

- **Have children work independently to solve the problem, allowing sufficient time for them to work through the problem on their own.**

> **SMP TIP** Persevere in Problem Solving
> Allowing children sufficient time to think through the problem on their own encourages them to try different approaches if their first or second attempt does not work. This builds confidence in finding ways to use what they learned from those attempts to revise their thinking on subsequent attempts. *(SMP 1)*

- **Invite children to share their answers and discuss as a class.** Encourage children to explain how their answers are alike and how they are different. Ask if anyone got a different answer to assess understanding and help children avoid common errors.

Solutions

Problem 1
Put Together, result unknown
$4 + 4 = \boxed{8}$

Problem 2
Put Together, both addends unknown
Answers may vary. Possible answer:
$6 = \boxed{4} + \boxed{2}$; accept any answers that sum to 6.

Problem 3
Take From, change unknown (Challenge)
$8 - \boxed{6} = 2$

Lesson 26 Compare Length

👥 **Guided Practice**

Step By Step

- **Guide children to identify which objects are taller or longer, and which objects are shorter.** Before beginning this page, provide opportunities for children to identify which object in a pair is shorter with activities such as Hands-On Activity 1.

▶ **Hands-On Activity 1**

- **Have children circle the shorter object in each pair.** Review each problem with children, asking them to point to the ends that are lined up. Encourage children to use hand gestures as they tell you which of the two objects is shorter.

- **Ask children to explain why the object is shorter than the other object.** Listen to see if children are able to use the correct terms to describe length and height.

▶ **Mathematical Discourse 1 and 2**

▶ **Fluency Practice**

📗 **Ready**® **Mathematics** PRACTICE AND PROBLEM SOLVING

Assign *Practice and Problem Solving* **pages 225–226** after students have completed this section.
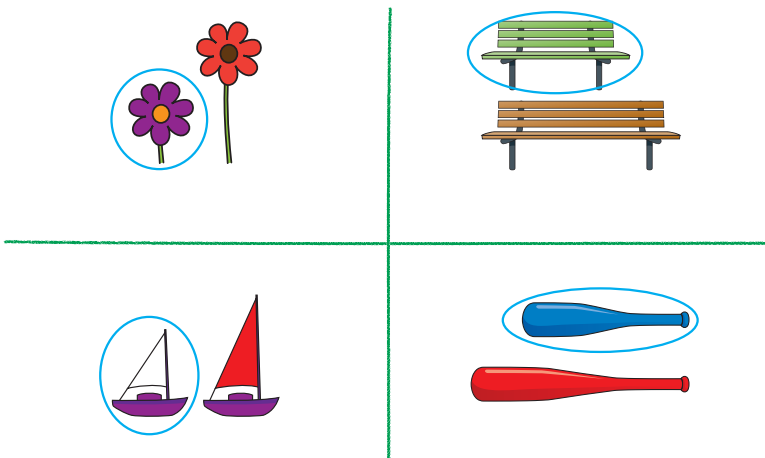
Practice Together
Compare Length

Guide children to identify which objects are taller or longer, and which objects are shorter. Have children circle the shorter object in each pair. Ask children to explain why the object is shorter than the other object.

Talk About It How did you decide which bat is shorter?

154 Lesson 26 • Guided Practice   ©Curriculum Associates, LLC   Copying is not permitted.

▶ **Mathematical Discourse**

1 *How is finding the shorter height the same as finding the shorter length? How is it different?*

They are alike because you need to make sure the objects line up before you find the shorter one. And the shorter one will stop before the other object. They are different because when you find the shorter height, you look up to see which is shorter. When you find the shorter length, you look left or right to see which is shorter.

2 **Talk About It** When children have completed the page, ask: *How did you decide which bat is shorter?*

I saw that the handles of the bats were lined up, so I looked for the bat that was not as long as the other. That was the blue bat.

▶ **Fluency Practice**

Identify numbers with 10-frames.

Materials For each pair: 10-Frame Cards (Activity Sheet 15)

Have one child in each pair mix up the 10-frame cards and flash them one at a time as the partner quickly names the number shown. Then have partners switch roles and repeat.

▶ **Hands-On Activity 1**

Compare heights and lengths of art materials.

Materials For each pair: 2 paintbrushes of different lengths, 2 crayons of different lengths; for display: two paint jars or cups of different heights

- Display the two paint jars. Ask: *Which paint jar is taller?* Use hand gestures from the table or floor to illustrate what it means to be taller. Place your hand on the taller jar. Invite a child to put a hand on top of the shorter jar to illustrate its height. Then ask: *Which paint jar is shorter?* Gesture with your hands to reinforce that the top of the shorter jar is closer to the table or floor than the taller jar.

- Invite pairs to directly compare the lengths of two paintbrushes. Encourage them to align one end of the brushes and to see which one extends past the other. Have children identify the longer brush. Use hand gestures and ask: *Which brush is shorter?*

- Have children repeat the process with the crayons.

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Practice Together
Compare Length

Name _____
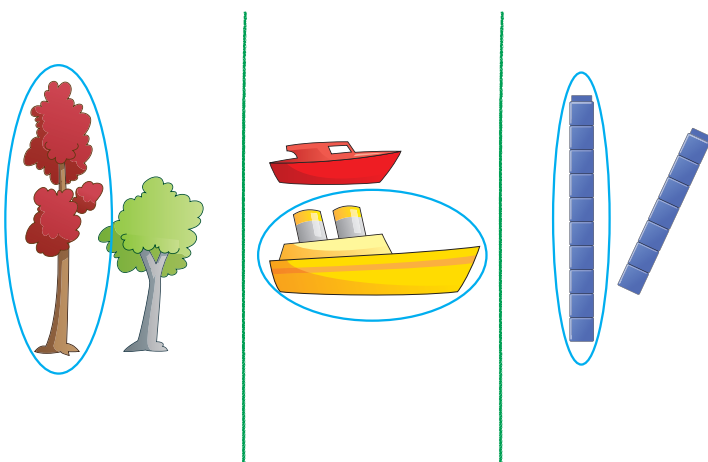
Guide children to identify which objects are taller or longer, and which objects are shorter. Have children circle the taller or longer object in each pair. Ask children to explain how they decided which object is taller or longer.

Talk About It How could you be sure which group of cubes is longer?

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Guided Practice • Lesson 26   **155**

Step By Step

- **Guide children to identify which objects are taller or longer, and which objects are shorter.** Before beginning this page, provide opportunities for children to identify which object in a pair is taller or longer using activities like Hands-On Activity 2.

▶ Hands-On Activity 2

- **Have children circle the taller or longer object in each pair.** Talk about each pair of pictures with children, asking them to point to the ends that are lined up.
- Discuss the fact that the connecting cubes are not lined up at one end. Encourage children to tell which train appears to be shorter or longer than the other.
- **Ask children to explain how they decided which object is taller or longer.** Listen to make sure that they use appropriate comparison language.

▶ Mathematical Discourse 3 and 4

SMP TIP Look for and Use Structure
When children relate the greater number of cubes to the longer length, they are making use of structure. This visualization of the greater number of equal segments being longer will help children as they move into more formal measurements. *(SMP 7)*

Ready Mathematics
PRACTICE AND PROBLEM SOLVING

Assign *Practice and Problem Solving* **pages 227–228** after students have completed this section.

▶ Hands-On Activity 2
Compare lengths of cube trains.

Materials For each child: 6–10 loose connecting cubes

- Pair children and give each partner a different number of cubes. Tell each child to link his or her cubes. Have children hold their linked cubes upright so that they form a tower.
- Ask pairs to compare the heights of their towers. Ask: *Which tower is taller? How do you know?*
- Then have children lie their linked cubes down on the table so they look like a train. Ask: *Which train is longer?*
- Watch as pairs compare their cube trains. Guide children to line up one end of each train to see which one extends farther than the other.
- Have children count the number of cubes in their train. Ask: *Does the longer train or the shorter train have more cubes?* [the longer train]

▶ Mathematical Discourse

3 *Is it easier to see a taller object or a shorter object? Is it easier to see a longer object or a shorter object? Why?*

   Children might say that it is easier to see the taller or longer object because it stands out on the page.

4 **Talk About It** When children have completed the page, ask: *How could you be sure which group of cubes is longer?*

   You can count the number of cubes in each tower and compare the numbers. Since 10 is greater than 7, the tower on the left (with 10 cubes) is longer than the tower on the right (with 7 cubes).

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Lesson 26 Compare Length
👤 Independent Practice

Step By Step

- **Have children draw pictures to show *taller* and *shorter*.** Before beginning this page, provide opportunities for children to identify objects that are longer and shorter than a given item with activities like the one in the Hands-On Activity.

▶ **Hands-On Activity**

- **Have children draw a flower that is taller and a bat that is shorter than those shown.** To make sure that children understand the directions, ask: *What are you going to draw next to the flower?* [a taller flower] *next to the bat?* [a shorter bat] Encourage children to have one end of their drawing lined up with the pictured item.

> **SMP TIP   Attend to Precision**
> When children make sure that their drawing lines up evenly with the pictured items, they are attending to precision. As children explain how they drew their objects, they continue to attend to precision. *(SMP 6)*

- **After completing the page, have children describe how they decided how to draw the items.**

▶ **Mathematical Discourse 1 and 2**

Practice by Myself
Compare Length

Pictures will vary. Check that children draw objects that are taller than the flower and shorter than the bat.
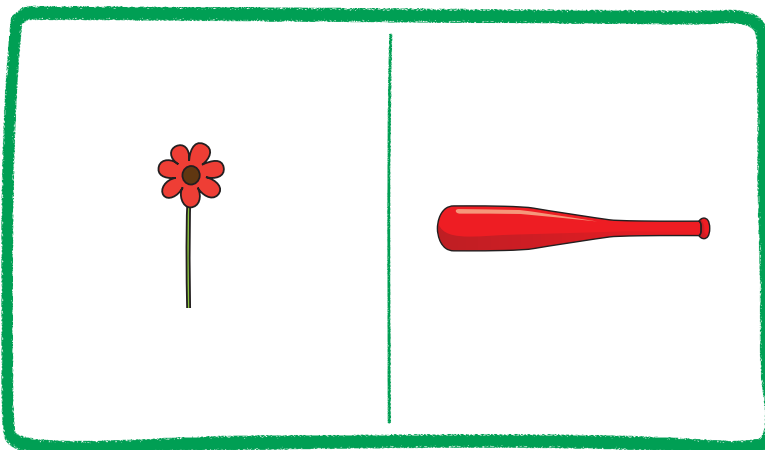
Have children draw pictures to show *taller* and *shorter*. Have children draw a flower that is taller and a bat that is shorter than those shown. After completing the page, have children describe how they decided how to draw the items.

Talk About It How would you draw a flower that is not shorter than and not taller than the flower shown?

156   Lesson 26 • Independent Practice

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▶ **Mathematical Discourse**

1 *How do you know that the bat you drew is shorter?*
   Responses might indicate that if you line up the ends of the two bats, the child's drawing stops before the end of the pictured bat.

2 **Talk About It**   When children have completed the page, ask: *How would you draw a flower that is not shorter than and not taller than the flower shown?*
   Responses should indicate drawing a flower that is the same height or starts and ends at the same places as the pictured flower. Some children may even say they could draw a flower on top of the one shown.

▶ **Hands-On Activity**

   Compare pencil lengths to objects in the classroom.

Materials   For each child: 1 pencil

- Invite children to find an object in the classroom that is longer (or taller) than their pencil. Encourage them to move around the classroom to make direct comparisons to check that the objects are longer.

- When children have found an object, ask them to "freeze" and stand near the object. Allow children to share their findings.

- Repeat the process, but have children find objects that are shorter than their pencil. If time permits, invite children to find objects that are about the same length as their pencil.

Differentiated Instruction

▶ Quick Check and Remediation

Materials: For each child: 2 pencils of different lengths, 2 objects of different lengths (such as erasers)

• Give children two pencils of different lengths and ask them which is shorter and which is longer.

• For children who are still struggling, use the chart below to guide remediation.

• After providing remediation, check children's understanding by giving them two objects of different lengths and asking them which is shorter and which is longer.

If the error is . . .	Children may . . .	To remediate . . .
saying that the longer pencil is shorter or the shorter pencil is longer	not understand the vocabulary.	Provide more practice in directly comparing the lengths of two objects, using the vocabulary with hand gestures. After children compare the objects, point to one and ask children if the object is shorter or longer and encourage the child to answer with words and hand gestures.
	may not have aligned the objects at one end.	Show children how to line up one end of each object so that they are even. Suggest that children use straight edges to help them line up objects, such as using the edge of a straight table, a piece of paper, or a ruler. Provide children with more practice in directly comparing the lengths of two objects and reminding them to line up the ends.

▶ Hands-On Activity

Identify attributes of objects and compare them to other objects.

Materials For each child: one classroom object that has length or height, such as a feather, straw, craft stick, pencil, crayon, marker, paintbrush, ribbon, jar, or can

• Distribute an item to each child. Invite children to describe at least two attributes of their item, such as it being long and green. Have children pair up to compare the lengths or heights of their items. Encourage children to make direct comparisons, using the terms *shorter, longer,* and *taller.*

• Ask children to make a comparison statement about their object's length compared to their partner's object. For example, one child might say: *This feather is longer than a crayon*. Then the partner with the crayon would say: *This crayon is shorter than the feather.*

▶ Challenge Activity

Compare the lengths of three objects.

Materials For each child: 3 objects of different lengths, such as a pencil, a crayon, and a marker

• Invite children to compare the lengths of two of the objects, such as the pencil and the crayon. Ask: *Which one is longer?* Ask children to make a statement comparing the objects.

• Then invite children to compare the length of the longer object to the third object. Again ask which object is longer. Guide children to make a statement about which of the three objects is the longest.

• Invite children to make comparison statements about all the objects including which is the longest object and which is the shortest object.

LESSON QUIZ

Lesson 26
Compare Length

Teacher-Toolbox.com

Overview

Assign the Lesson 26 Quiz and have children work independently to complete it.

Use the results of the quiz to assess children's understanding of the content of the lesson and to identify areas for reteaching. See the Lesson Pacing Guide at the beginning of the lesson and the Differentiated Instruction activities for suggested instructional resources.

Tested Skills

Assesses K.MD.A.1, K.MD.A.2

Problems on this quiz require children to be able to compare the length or height of two objects to identify which is longer (taller) and which is shorter and to draw an object that is longer or shorter than a given object. Children will also need to be familiar with comparing attributes of objects.

Ready® **Mathematics**

Lesson 26   Quiz Answer Key

Name _____

Have children circle the taller child. Then have children circle the longer spoon and circle the shorter bat.

Common Misconceptions and Errors

Errors may result if children:

- do not align the objects on one end before comparing.
- confuse *longer* or *taller* with *shorter*.

Lesson 26 Quiz Answer Key continued

Name _____

Pictures will vary. Check that children draw a pencil that is longer than the pencil shown.

Pictures will vary. Check that children draw a cup that is shorter than the cup shown.

Have children draw a pencil that is longer than the pencil shown. Then have children draw a cup that is shorter than the cup shown.

LESSON OVERVIEW

Lesson 25
Add and Regroup

CCSS Focus

Domain
Number and Operations in Base Ten

Cluster
C. Use place value understanding and properties of operations to add and subtract.

Standard
1.NBT.C.4 Add within 100, including adding a two-digit number and a one-digit number, and adding a two-digit number and a multiple of 10, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used. Understand that in adding two-digit numbers, one adds tens and tens, ones and ones; and sometimes it is necessary to compose a ten.

Standards for Mathematical Practice (SMP)
1 Make sense of problems and persevere in solving them.
2 Reason abstractly and quantitatively.
3 Construct viable arguments and critique the reasoning of others.
4 Model with mathematics.
6 Attend to precision.
7 Look for and make use of structure.
8 Look for and express regularity in repeated reasoning.

Lesson Objectives

Content Objectives
- Add two-digit numbers with regrouping.
- Compose a ten when adding ones.
- Relate two-digit addition with regrouping to two-digit addition without regrouping and to the make-a-ten strategy.

Language Objectives
- Draw quick-draw diagrams to show how to add two-digit numbers with regrouping.
- Rewrite two 2-digit numbers as tens and ones to add with regrouping.
- Tell how adding two-digit numbers with regrouping is like and how it is different from adding two-digit numbers without regrouping.
- Listen to the ideas of others and compare their strategies.

Prerequisite Skills
- Add two-digit numbers without regrouping.
- Utilize the make-a-ten strategy.

Lesson Vocabulary
- **make a ten** a strategy that uses combinations of numbers that add to ten when finding totals greater than 10.

Learning Progression

In Kindergarten children find number partners to make a ten and decompose teen numbers into ten ones and some more ones.

In Grade 1 children develop concepts related to the base ten system as they make a ten when adding two numbers whose sum is greater than ten and as they add tens to tens and ones to ones in double-digit addition.

In this lesson children expand on prior work with two-digit addition by recognizing that when adding ones to ones the sum may be greater than ten. Children apply models and strategies explored in previous lessons to addition with regrouping, developing an understanding of the process of making a ten from the sum of the ones digits to add to the existing tens.

In Grade 2 children continue work with two-digit addition and subtraction and extend base-ten computations to three-digit numbers.

Lesson Pacing Guide

Whole Class Instruction

Day 1
45–60 minutes

Introduction
Use What You Know
• Explore It *25 min*
• Try It *20 min*

Day 2
45–60 minutes

Modeled Instruction
Explore Together
• Example Problem *5 min*
• Model It *15 min*
• Hands-On Activity *15 min*
• Visual Model *10 min*

Practice and Problem Solving
Assign pages 227–228.

Day 3
45–60 minutes

Guided Instruction
Learn Together
• Example Problem *5 min*
• Model It *10 min*
• Talk About It *10 min*
• Hands-On Activity *15 min*
• Visual Model *5 min*

Practice and Problem Solving
Assign pages 229–230.

Day 4
45–60 minutes

Guided Practice
Practice Together
• Example Problem *5 min*
• Problems 1–2 *20 min*
• Fluency Practice *20 min*

Practice and Problem Solving
Assign pages 231–232.

Day 5
45–60 minutes

Independent Practice
Practice by Myself
• Problems 3–5 *15 min*
• Quick Check and Remediation *15 min*
• Hands-On or Challenge Activity *15 min*

Teacher-Toolbox: Lesson Quiz
Lesson 25 Quiz

Materials for Lesson Activities

Per child: base-ten blocks, 25 counters (7 red and 18 blue)
Activity Sheet 11, Activity Sheet 19*, Activity Sheet 30

Per pair: 2 number cubes, base-ten blocks

For display: 25 counters (7 red, 18 blue)

*Used for more than one activity.

Small Group Differentiation

Teacher-Toolbox.com

Reteach
Ready Prerequisite Lessons *45–90 min*

Grade K
• Lesson 24 Count to 100 by Tens
• Lesson 25 Count to 100 by Ones

Teacher-led Activities
Tools for Instruction *15–20 min*

Grade 1 *(Lesson 25)*
• Two-Digit Addition Without Regrouping

Student-led Activities
Math Center Activities *30–40 min*

Grade K *(Lessons 24 and 25)*
• K.30 Count by Tens
• K.31 Tens Bingo
• K.32 Count by Ones Vocabulary
• K.33 Keep Counting

Grade 1 *(Lesson 25)*
• 1.38 Add and Regroup

Personalized Learning

i-Ready.com

Independent
i-Ready Lessons* *10–20 min*

Grade 1 *(Lesson 25)*
• Adding a Two-Digit Number and a
  One-Digit Number
• Joining Sets to Add

** i-Ready lessons may be updated during the
2016–2017 school year. Updated references
will be on the Teacher-Toolbox.*

Lesson 25 Add and Regroup

👥 Introduction

Activity Explore Addition Strategies

Objective
Build the concept of regrouping with addition.

Materials for each child
- Hundreds Chart (Activity Sheet 19)
- base-ten blocks
- counters

Overview
Children explore, justify, and apply strategies for addition involving composing a ten in the ones place.

Step By Step

Explore It

Pose the problem.
- Tell children that Buzz and Boom both solved the problem "16 + 8" in different ways.
- Read each strategy one at a time, allowing children time to think about the first strategy before reading the next one.
- *Buzz said he added 16 + 4 to make 20 and then added 4 more.*
- *Boom said he broke 16 into 10 and 6. He added 6 + 4 to make ten, added 4 more, and then added the other 10.*

Model strategies.
- Have children work with a partner to model each strategy using blocks, hundreds charts, or other tools of their choice on the workmat on the Student Book page. Ask children if both strategies led to the same answer. [Yes, 24.]
- Ask each pair to decide which strategy they think was easier to use or which they like better. Ask several groups to explain their decisions.

Use What You Know
Add and Regroup

◌ Explore It

Buzz and Boom each find 16 + 8.

Buzz said he added 16 + 4 to make 20 and then added 4 more.

Boom said he broke 16 into 10 and 6. He added 6 + 4 to make ten, added 4 more, and then added the other ten. Show each strategy. Find each sum.

Buzz's sum: 24   **Boom's sum:** 24

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Justify strategies.
- Invite volunteers to justify each strategy by demonstrating it with a model. Ask children to explain why each strategy works.
- Compare the two strategies, asking children to tell how they are different and how they are alike.

Apply strategies.
- Discuss with children how adding these numbers is like or different from the addition problems they have done in previous lessons. Focus on the fact that in this problem, the total of the digits in the ones place is greater than 10.
- Encourage children to work with a partner to find a different way to solve the problem and share it with the class.

Use What You Know
Add and Regroup

>> **Try It**

Draw a picture to show how to find 17 + 5.
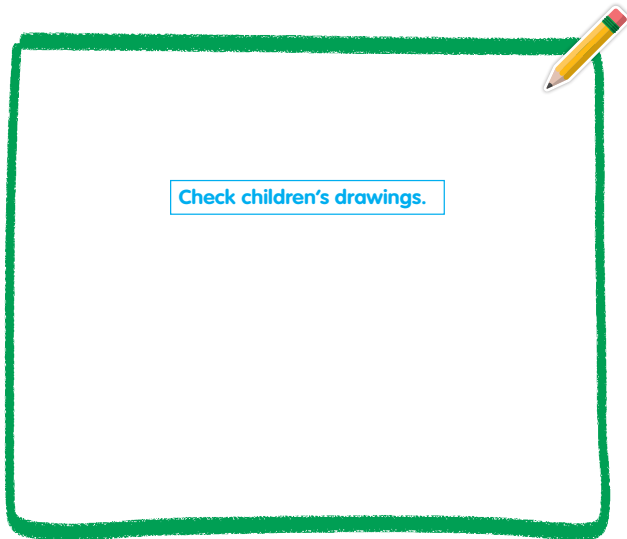
Check children's drawings.

17 + 5 = __22__

163

Step By Step

Try It

Pose the problem.

• Provide the children with the following problem: *Draw a picture to show how to find 17 + 5.*

Model and apply strategies.

• Encourage children to think about how they can model the situation with blocks, hundreds charts, or other tools.

• Some children might be able to make quick drawings that represent taking 3 ones from 5 ones and adding it to the 7 ones in 17 to make 2 tens. Others may make a drawing and count all. Support the latter group by allowing them to work with connecting cubes to physically create a 10 with the ones from both numbers.

Share drawings.

• Have pairs of children show and describe their drawings to each other.

• Invite volunteers to share their drawings with the class. Discuss how the drawings are similar and different, and how they each represent the problem.

Lesson 25 Add and Regroup

👥 **Modeled Instruction**

Step By Step

- Read the problem aloud. Ask children to relate this situation to the Activity in the Introduction by discussing ways to organize the erasers in a way that makes it easier to find the total.
- Use Hands-On Activity 1 to prepare children for the diagram shown in Model It.

▶ **Hands-On Activity 1**

> **SMP TIP Look for Structure**
> Display 18 blue counters and 7 red counters. Move two of the red counters into the blue group to demonstrate the viability of reorganizing addends to make a ten and to reinforce the application of the associative property of addition. *(SMP 7)*

Model It

- Draw attention to the diagram shown in Model It. Relate the diagram to Hands-On Activity 1 with questions such as: *How are the pictures shown like the 10-frames you filled? What is the arrow telling you to do? Why is it helpful to move 2 of the 7 ones over to the group of 18?*

▶ **Visual Model 1**

- Connect the process shown here to the making a ten strategy by asking Mathematical Discourse question 1.

▶ **Mathematical Discourse 1**

Ready **Mathematics**
PRACTICE AND PROBLEM SOLVING

Assign *Practice and Problem Solving* **pages 227–228** after students have completed this section.

Explore Together
Add and Regroup

Lou has some erasers.
18 are blue. 7 are red.
How many erasers in all?
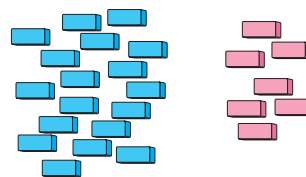
Model It Find 18 + 7.

Make the next ten.

$18 \quad + \quad 7$
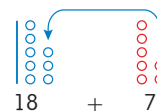
Then add the tens and ones.

$18 + 2 \quad + \quad 5$
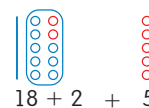
$20 + 5 = \underline{25}$

$\mathbf{18 + 7} = \underline{25}$

$20 + 5$

164

▶ **Mathematical Discourse**

1 *How is adding 18 + 7 like using the "make a ten" strategy?*

Children should notice that in adding 8 ones and 7 ones, the total is greater than 10, so composing a ten helps find the sum. In this problem, there is another ten to add so the sum has 2 tens, not one.

▶ **Visual Model 1**

Use quick number bonds to make the next ten.

Demonstrate the use of a quick number bond to help children see the numbers involved in making a ten.

$$18 + 7 =$$
$$\overset{\displaystyle 2 \quad 5}{\diagdown\diagup}$$
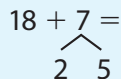
▶ **Hands-On Activity 1**

Model addition with counters.

Materials For each child: two copies of 10-Frame (Activity Sheet 11), 25 counters (7 red and 18 blue)

Have children model 18 with blue counters on two 10-frames and 7 using red counters on a third 10-frame. Ask them to reorganize the counters to make it easier to count the total. Guide children to take 2 counters from 7 and place them with 8 to complete another frame of 10. Remind children that the total in addition is not affected by moving the parts being added.

Learn Together
Add and Regroup

How many marbles?

35 marbles   27 marbles
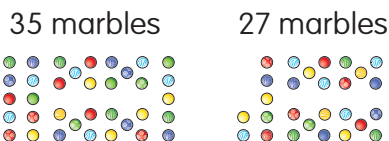
🔲 **Model It** Find 35 + 27.

Add the tens and ones.

$$\left|\left|\left|{}^{\circ\circ\circ}_{\circ\circ} + \right|\right|{}^{\circ\circ\circ}_{\circ\circ\circ} = \left|\left|\left|\left|\right| + {}^{\circ\circ\circ}_{\circ\circ\circ}\right.\right.\right.\right.$$

5 tens   12 ones

50   +   12

50   +   10 + 2 = __62__
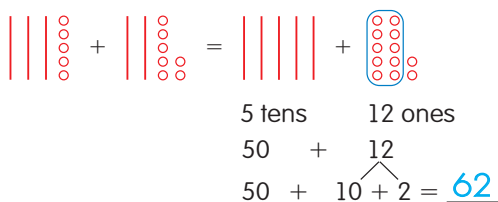
35 + 27 = __62__

💬 **Talk About It** Who is right? How do you know?

Buzz: 25 + 16 = 41   Boom: 25 + 16 = 31

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Step By Step

- Read the problem aloud and compare it to the problem from Model It on the previous page. Guide children to recognize that this addition problem involves 2 two-digit numbers.
- Use Hands-On Activity 2 to allow children to explore different strategies. Justify all reasonable methods, emphasizing that there are many ways to find the sum.

▶ **Hands-On Activity 2**

Model It

- Explore the model shown in Model It, helping children relate it to other models and strategies they have used. Point out that the sum of the ones digits is decomposed into a ten and some ones, so you can add all tens, then add ones.

▶ **Visual Model 2**

▶ **Mathematical Discourse 2**

Talk About It

- Read Talk About It. Have children work with a partner to find 25 + 16. Allow some pairs to present their work and tell who is right. After children understand that Buzz did the problem correctly, ask children to describe what they think Boom did wrong.

📗 **Ready** **Mathematics**
PRACTICE AND PROBLEM SOLVING

Assign *Practice and Problem Solving* **pages 229–230** after students have completed this section.

▶ **Hands-On Activity 2**

Add two-digit numbers using a hundreds chart.

Materials For each child: Hundreds Chart (Activity Sheet 19), 12 counters

- Have children model 35 in the hundreds chart by shading in 3 rows of ten and then adding 5 more counters. Ask them to add 27 to the chart in whatever way makes it easiest for them to count the total.
- Observe the strategies children use to find the total. Look for strategies such as: coloring 2 more rows and adding 7 counters; coloring 2 rows, filling the row of 5 counters with 5 more and adding the other 2 at the end; counting on 2 tens from 35 and then adding 7 ones, etc.
- Encourage children to share their strategies with the class. Pose questions such as: *How is your strategy like . . . ? Why can you put 5 of the 7 counters next to the other 5?*

▶ **Mathematical Discourse**

2 *How is adding 35 + 27 like adding 35 + 23? How is it different?*

In both problems, you add tens to tens and ones to ones. When you add 35 and 27, the total of the ones is greater than 10. When you add 35 and 23, the total of the ones is less than 10.

▶ **Visual Model 2**

Use number bonds to see tens and ones.

Reinforce the addition of tens to tens and ones to ones by showing 35 and 27 in number bonds:

```
   35            27
  /  \          /  \
30    5       20    7
```
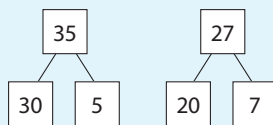
30 + 20 = 50; 5 + 7 = 12; 50 + 12 = 62

Lesson 25 Add and Regroup

👥 **Guided Practice**

Step By Step

- Read the example problem aloud. Ask children to describe the strategy that is used to add 27 and 64.
- Encourage children to describe or demonstrate other strategies that might be used to solve the example problem.
- Some children may suggest counting on by tens and then adding the ones. Reinforce the concept of the commutative property by asking: *Is it easier to start with 27 or 64 when counting on? Why? Why doesn't it matter which number you start with?*
- Have children use the model shown for Problem 1 as a guide, but encourage them to use whatever strategies or models they prefer to show the addition. Allow pairs to compare strategies they used.

> **SMP TIP Use Structure**
> Draw attention to the tens and ones shown in Problem 2. Ask children if it would make sense to write the answer for 3 tens and 15 ones as 315 and why or why not. This allows children to apply the structure they have learned with the base-ten system. *(SMP 7)*

- Use Mathematical Discourse question 1 to engage children in describing strategies and models. Stress the importance of each child utilizing a strategy that is comfortable and effective for that individual. Make sure children understand that for any problem, the strategy they find most effective may be different from what other people choose, and that's okay. Remind children that in the Activity in the Introduction, Buzz and Boom used different strategies to get the same answer.

▶ **Mathematical Discourse 1**

▶ **Fluency Practice**

🟦 **Ready** **Mathematics**
PRACTICE AND PROBLEM SOLVING

Assign *Practice and Problem Solving* **pages 231–232** after students have completed this section.

Practice Together
Add and Regroup

> 27 flower stickers. 64 star stickers.
> How many stickers?
>
> $\quad$ 2 tens 7 ones
> $+$ 6 tens 4 ones
> $\quad$ 8 tens 11 ones $= 80 \;+\; 11$
> $\qquad\qquad\qquad\quad 80 \;+ 10 + 1$
>
> **$27 + 64 =$** $\underline{91}$
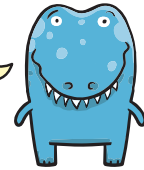
① 38 soccer balls and 46 kickballs.
How many balls?

$\underline{84} = \mathbf{38 + 46}$

② 17 yellow flowers and 28 white flowers.
How many flowers altogether?

$\quad\quad\quad$ 1 ten $\quad$ 7 ones
$\quad\quad + $ 2 tens 8 ones

$17 + 28 =$ $\underline{45}$

$\underline{3}$ tens $\underline{15}$ ones

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▶ **Mathematical Discourse**

1 *What strategy or model makes it easiest for you to add with regrouping? Why?*

Listen to children's responses, encouraging them to justify specifically rather than saying, "It's easier." Responses should refer to combining tens and ones and accounting for composing and regrouping a ten.

▶ **Fluency Practice**

Choose strategies to add with regrouping.

Materials For each child: Practice Regrouping to Add (Activity Sheet 30)

Distribute Activity Sheet 30 (Practice Regrouping to Add). Instruct children to find the total for each addition problem. Tell them to show their work using drawings, number bonds, or numbers and words.

Practice by Myself
Add and Regroup

3 33 math books and 27 reading books.
What is the total number of books?

33 + 27 = <u>60</u>

4 48 circles and 35 squares.
How many shapes?

<u>83</u> **= 48 + 35**

4 tens 8 ones
+ 3 tens 5 ones

<u>7</u> tens <u>13</u> ones

5 17 gold stars and 29 silver stars.
How many stars in all?

17 + 29 = <u>46</u>

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Step By Step

- Before children work on this page, review the models used in this lesson. Emphasize that children are free to use whatever way helps them solve the problems. Tell them that they may use a different strategy for each problem if they choose.
- Read each problem aloud, then have children work independently to solve.
- Observe children as they complete Problem 3, paying attention to the methods children use to find the sum. Do they combine the ones, compose a ten, and count all the tens? Do they count all the blocks individually? Do they count all the tens and then count on all the ones? Do they ignore the model and mentally find the sum? Use these observations to provide each child the appropriate tools or support he or she needs to be successful.
- Watch for children who fail to interpret 7 tens as 70 in Problem 4. Encourage them to use base-ten blocks to model the problem and check their answer.

▶ **English Language Learners**

▶ **Mathematical Discourse 2**

- Remind children to show the strategy they used in Problem 5 with a drawing or other type of model, or by describing the strategy.
- Use Mathematical Discourse question 3 to start a discussion about the different strategies children used to solve the problems on this page.

▶ **Mathematical Discourse 3**

▶ **English Language Learners**

Some English language learners may need support with the vocabulary in Problem 4. Write the word *Shapes* on the board and invite children to draw or write the names of shapes that they know. Reinforce the idea that circles and squares (and others) are all kinds of shapes.

▶ **Mathematical Discourse**

2 *How are the models shown in Problems 3 and 4 alike? How are they different?*
Both models show breaking up the addends into tens and ones. Problem 3 does this with drawings of tens and ones. Problem 4 does this with numbers and words.

3 *How did you choose a strategy for each problem? Did you use the same strategy for all the problems?*
Allow children to describe and justify the strategies they used. Discuss why some strategies might make more sense for certain problems (for example, making a ten in Problem 3 leaves no leftover ones to add). Encourage children to find a balance between choosing a strategy they are comfortable with and a strategy that "works well" for a specific problem.

Lesson 25
Add and Regroup

Differentiated Instruction

▶ Quick Check and Remediation

Materials For each child: base-ten blocks

- Ask children to find the sum of 27 and 58 and show their work. [85]
- For children who are still struggling, use the chart below to guide remediation.
- After providing remediation, check children's understanding using the following problem: *Find the sum of 15 and 49.* [64]

If the error is . . .	Children may . . .	To remediate . . .
715	have recorded 7 tens and 15 ones as 715.	Have children model the problem with base-ten blocks. Write 7 tens as 70 and 15 as 10 + 5. Ask children how they would add 70 + 10 + 5 and compare it to their answer. Discuss which answer is correct and why. Encourage them to recognize the error they made by having them tell what is wrong with the original answer.
75	have failed to add the composed ten to the 7 tens.	Isolate the ones digits and have children calculate. Ask them to write 15 as tens and ones. Lead children to see that the 10 from 15 needs to be combined with the other tens to find the sum.
any other sum	have miscalculated.	Tell children to check their answers using a physical model.

▶ Hands-On Activity

Build and solve problems involving regrouping.

Materials For each pair: 2 number cubes (1–6 and 4–9), base-ten blocks

- Place children in pairs. One partner rolls the number cubes and forms a two-digit number using the numbers rolled as digits. The number is recorded on a whiteboard or paper. The other partner rolls the number cubes and forms a two-digit number to add to the first number.
- Partners work together to find the sum, then check using base-ten blocks. If their sum is not correct, they must find their error before rolling again.
- If the addition requires regrouping, the partners earn a point. The activity ends when the partners have earned 5 points or when time expires.

▶ Challenge Activity

Explore strategies involving subtraction.

Materials For each child: Hundreds Chart (Activity Sheet 19), base-ten blocks

- Remind children of the strategies they used during this lesson. Tell them that you thought of another strategy for adding 18 + 7: Add 10 to 18 and then subtract 3.
- Challenge children to:
  - try the strategy with at least 10 different addition problems involving a two-digit and a one-digit number.
  - justify why this strategy works.
  - determine if it will work for adding other numbers.
- Allow children to share their work.

Teacher Notes

LESSON QUIZ

Lesson 25
Add and Regroup

Teacher-Toolbox.com

Overview

Assign the Lesson 25 Quiz and have children work independently to complete it.

Use the results of the quiz to assess children's understanding of the content of the lesson and to identify areas for reteaching. See the Lesson Pacing Guide at the beginning of the lesson and the Differentiated Instruction activities for suggested instructional resources.

Tested Skills

Assesses 1.NBT.C.4

Problems on this quiz require children to be able to add tens and add ones and to add two two-digit numbers with regrouping. Children will also need to be familiar with adding two two-digit numbers without regrouping and the make a ten strategy.

Ready® **Mathematics**

Lesson 25 Quiz Answer Key

Name _____

Solve.

1 36 white eggs and 25 brown eggs.
How many eggs?

_61_ = **36 + 25**

2 35 black bugs and 47 red bugs.
How many bugs in all?

35 + 47 = _82_

3 tens 5 ones
+ 4 tens 7 ones
_7_ tens _12_ ones

3 56 small dogs and 17 big dogs.
What is the total number of dogs?

_73_ = **56 + 17**

Grade 1 **Lesson 25** Add and Regroup

1

Want to learn more?
Go to ReadyCentral.com.

Common Misconceptions and Errors

Errors may result if children:

- do not add the composed ten from the ones place in the tens place.
- ignore or confuse place value when writing the sum.
- incorrectly decompose a two-digit number into tens and ones.

Name _____

Solve.

4 38 white socks and 48 black socks.
How many socks?

$\underline{86} = 38 + 48$

5 There are 63 apple trees on the farm.
There are 29 pear trees.
How many trees are on the farm?

$63 + 29 = \underline{92}$

There are $\underline{92}$ trees on the farm.

Lesson 23
Make Line Plots and Interpret Data

CCSS Focus

Domain
Measurement and Data

Cluster
B. Represent and interpret data.

Standards
5.MD.B.2 Make a line plot to display a data set of measurements in fractions of a unit $\left(\frac{1}{2}, \frac{1}{4}, \frac{1}{8}\right)$. Use operations on fractions for this grade to solve problems involving information presented in line plots. *For example, given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally.*

Standards for Mathematical Practice (SMP)

1 Make sense of problems and persevere in solving them.

2 Reason abstractly and quantitatively.

4 Model with mathematics.

5 Use appropriate tools strategically.

6 Attend to precision.

7 Look for and make use of structure.

Lesson Objectives

Content Objectives
- Create a line plot that displays measurement data that has fractional units.
- Use a line plot to solve word problems about measurement data given in fractional units.
- Analyze data shown on a line plot.

Language Objectives
- Create a line plot to present measurement data.
- Analyze measurement data shown on a line plot.
- Communicate precisely with others about conclusions drawn from data shown in line plots.

Prerequisite Skills

- Interpret data on line plots, including data displayed in fractional units.
- Use line plots to solve word problems involving addition and subtraction of fractional units.
- Add, subtract, and multiply fractions.
- Divide with unit fractions.

Lesson Vocabulary

- **distribution** how spread out or how clustered pieces of data are

Review the following key terms.

- **line plot** a data display that shows the frequencies of the data as marks above a number line
- **scale** the increment by which the numbers along the axes of a graph change

Learning Progression

Since Grade 2 students have been making line plots for measurement data and analyzing the data shown in line plots.

In Grade 4 students solved word problems involving addition and subtraction of fractional measurement units, including measurements expressed as mixed numbers, by interpreting data shown in line plots.

In this lesson students examine the distribution of data in line plots and identify clusters of data values. They use their understanding of fraction multiplication and division to compare one fractional data value to another. They create line plots, inspect the data, and draw conclusions about the data based on their observations.

In later grades students will use their data analysis skills when they do more in-depth statistical reasoning.

Lesson Pacing Guide

Whole Class Instruction

Day 1 *45–60 minutes*	**Toolbox: Interactive Tutorial** *Line Plots with Fractions* **Introduction** • Use What You Know *10 min* • Find Out More *20 min* • Reflect *5 min*	**Practice and Problem Solving** Assign pages 249–250.
Day 2 *45–60 minutes*	**Modeled and Guided Instruction** **Learn About Making a Line Plot** • Model It/Model It *15 min* • Connect It *20 min* • Try It *10 min*	**Practice and Problem Solving** Assign pages 251–252.
Day 3 *45–60 minutes*	**Modeled and Guided Instruction** **Learn About Solving Problems Using Data in a Line Plot** • Picture It/Model It *15 min* • Connect It *20 min* • Try It *10 min*	**Practice and Problem Solving** Assign pages 253–254.
Day 4 *45–60 minutes*	**Guided Practice** **Practice Making Line Plots and Interpreting Data** • Example *5 min* • Problems 16–18 *15 min* • Pair/Share *15 min* • Solutions *10 min*	**Practice and Problem Solving** Assign pages 255–256.
Day 5 *45–60 minutes*	**Independent Practice** **Practice Making Line Plots and Interpreting Data** • Problems 1–4 *20 min* • Quick Check and Remediation *10 min* • Hands-On or Challenge Activity *15 min* **Toolbox: Lesson Quiz** Lesson 23 Quiz	

Small Group Differentiation

Teacher-Toolbox.com

Reteach
Ready Prerequisite Lessons *45–90 min*

Grade 4
• Lesson 27 Line Plots

Teacher-led Activities
Tools for Instruction *15–20 min*

Grade 4 *(Lesson 27)*
• Using Line Plots

Grade 5 *(Lesson 23)*
• Solve Problems with Fractional Data

Student-led Activities
Math Center Activities *30–40 min*

Grade 4 *(Lesson 27)*
• 4.47 Line Plots
• 4.48 Using Line Plots

Grade 5 *(Lesson 23)*
• 5.37 Line Plot Vocabulary Match
• 5.38 Fractions as Data

Personalized Learning

i-Ready.com

Independent
i-Ready Lessons *10–20 min*

Grade 4 *(Lesson 27)*
• Interpreting Line Plots

Lesson 23 Make Line Plots and Interpret Data

👥 **Introduction**

At A Glance

Students read a word problem and answer a series of questions that guide them to interpret the information presented in a line plot. Students use analytic skills and mathematical operations to answer the questions. Then students learn that a line plot gives you a picture of the data. They also learn that mathematical operations can be used to more specifically describe the data.

Step By Step

- Work through **Use What You Know** as a class.
- Tell students that this page models solving a problem using information presented in a line plot. Remind students that a line plot uses a number line to display data.
- Ask students to read the problem at the top of the page.
- Have students explain how they found the difference between the heaviest and the lightest tomato. $\left[\text{Subtract } \frac{7}{8} - \frac{1}{8}.\right]$
- Ask students to explain how they answered question f. $\left[\text{Think: } \frac{1}{8} \times \text{ what number } = \frac{7}{8}?\right]$

▶ **Mathematical Discourse 1 and 2**

Lesson 23 👥 **Introduction**   5.MD.B.2

Make Line Plots and Interpret Data

🅖 **Use What You Know**

You have created and used line plots before. Now you will create line plots and use them to answer more complex questions about data. Take a look at this problem.

Tomatoes come in different sizes and types. Mrs. May's class weighed several different tomatoes to the nearest $\frac{1}{8}$ pound. The results are shown in the line plot below. Use the line plot to describe how the weights varied.

Tomato Weight (pounds)
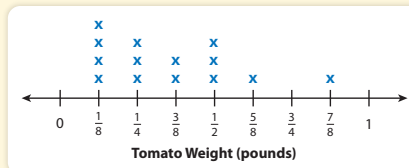
a. The greatest number of tomatoes weigh _____ $\frac{1}{8}$ **pound** _____ .

b. Which best describes how the weights are spread out? Circle the best description.

| clustered between 0 lb and $\frac{1}{2}$ lb | clustered between $\frac{1}{2}$ lb and 1 lb | spread out between 0 lb and 1 lb |

c. Are most of the tomatoes on the heavier or lighter end of the scale? **lighter**

d. Are there any tomatoes whose weight is very different from the rest? If so, what does it weigh? **yes; 1 tomato weighs $\frac{7}{8}$ pound.**

e. What is the difference between the weights of the heaviest and lightest tomato? **$\frac{6}{8}$ pound**

f. How many times the weight of the lightest tomato is the heaviest tomato? **7 times**

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▶ **Mathematical Discourse**

1 *What other questions could be answered using this line plot?*

Answers may include "How many tomatoes were weighed?" [14] or "Do more tomatoes weigh more than $\frac{5}{8}$ pound or less than $\frac{5}{8}$ pound?" [less]

2 *Would the line plot change if you weighed the tomatoes in ounces?*

The numbers on the number line would change, and the labels would change from pounds to ounces, but the line plot would look the same. The weights of the tomatoes would be the same, just expressed in a different unit of measure.

▶▶ Find Out More

Plotting data on a line plot helps you get a "picture" of what the data look like and how the data are spread out. Each X represents one piece of data. So the taller stacks of Xs mean more data with the same value.

You can use the *Tomato Weight* line plot to talk about the distribution of tomato weights. **Distribution** is how spread out or how clustered the data are.

Most of the data are clustered between $\frac{1}{8}$ and $\frac{1}{2}$.

Tomato Weight (pounds)
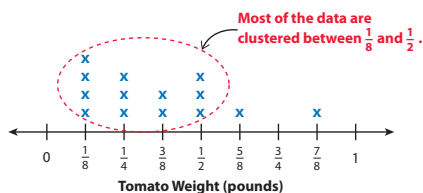
You can also use operations with data values to come up with ways to describe the data. For example:

● Subtract $\frac{7}{8} - \frac{1}{8}$ to find the difference between the weights of the heaviest and lightest tomato. The difference tells how much the weights vary.

● Divide $\frac{7}{8} \div \frac{1}{8}$ to find that the heaviest tomato is 7 times heavier than the lightest tomato. This gives a comparison between the least and greatest data value.

▶ Reflect

1 Suppose you have one more tomato with a weight of $\frac{3}{4}$ pound. Would that change how much the weights vary? Explain.

No; Possible explanation: $\frac{3}{4}$ is not the heaviest or the lightest tomato. So the variation will not change.

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Step By Step

- Read **Find Out More** as a class.
- Point out that to describe the distribution of data means to describe the way the data are grouped or how clustered together or spread out the data are.

▶ English Language Learners

- Ask students to describe what a line plot would look like for data that are evenly distributed. [The number of Xs above the data values would be the same, and there would be the same number of data values above the left half of the number line as above the right half.]

▶ Real-World Connection

▶ Hands-On Activity

Ready Mathematics
PRACTICE AND PROBLEM SOLVING

Assign *Practice and Problem Solving* **pages 249–250** after students have completed this section.

▶ Hands-On Activity

Make a human line plot.

Materials: index cards, each displaying one measurement (repeat some measurements); masking tape

- Find a space where students can form a human line plot, preferably along a wall. Make a large number line using masking tape along the floor in that space.
- Distribute one index card (with a pre-labeled measurement) to each student.
- Have students look at their measurement cards and line up one at a time in the proper place along the number line.
- When all the students are in the proper place, ask students questions about the line plot.

▶ English Language Learners

Students may not be familiar with the term *clustered*. Point out that *clustered* and *spread out* have opposite meanings. *Clustered* means bunched up. Data values can all be bunched up around one or two values, or they can be spread far apart. Provide examples of line plots with clustered data and examples of line plots with data spread far apart to help students understand the terms.

▶ Real-World Connection

Encourage students to think about everyday places or situations in which people might find it useful to present data on a line plot. Have volunteers share their ideas.

Examples: heights of each student in a class, age of each athlete in a race, distance each employee of a company commutes to work

Lesson 23 Make Line Plots and Interpret Data
Modeled and Guided Instruction

At A Glance

Students use a table to organize information given in a word problem and describe how to transfer the data from the table to a line plot. Then students revisit this problem to make a line plot of the data. Then, students answer questions about the line plot.

Step By Step

- Read the problem at the top of the page as a class.

Model It

- Read **Model It**. Ask students to explain how they would order $\frac{1}{4}$, $\frac{1}{2}$, and $\frac{1}{8}$. [Possible responses: Rewrite the fractions with a common denominator, 8, and then compare the numerators. The fraction with the greatest numerator is the greatest fraction. Students could also compare the fractions as given. When fractions have the same numerators, the greatest fraction has the least denominator.]

Model It

- Read **Model It**. Ask students to explain why it makes sense to label the number line from 0 to $\frac{1}{2}$. [The number line should always include the least value and the greatest value.]
- Ask students how many columns of Xs there will be on the line plot and which sticker width will have the tallest column of Xs. [There are data for 3 different widths of stickers, so there will be 3 columns of Xs to show the data on the line plot. The column for the $\frac{1}{4}$-inch width sticker will have the tallest column of Xs.]

▶ **Mathematical Discourse 1 and 2**

Lesson 23 Modeled and Guided Instruction

Learn About **Making a Line Plot**

Read the problem below. Then explore different ways to understand how to make a line plot.

Kiera bought a bag of stickers to decorate her scrapbook pages. She sorted the stickers by width. She counted the stickers and found 18 stickers that are $\frac{1}{4}$ inch wide, 11 stickers that are $\frac{1}{2}$ inch wide, and 14 stickers that are $\frac{1}{8}$ inch wide. Kiera wants to see the distribution of the widths so she can plan how to use the stickers. Make a line plot of the data.

▶ **Model It** **You can use a table to understand the data given in the problem.**

List the number of stickers in a table from least width to greatest width.

Sticker Width (in inches)	Number of Stickers
$\frac{1}{8}$	14
$\frac{1}{4}$	18
$\frac{1}{2}$	11

▶ **Model It** **Use the table to list what you know and to plan how to make the line plot.**

- The fractions are in eighths, fourths, and halves.
- The least fraction is $\frac{1}{8}$. The greatest fraction is $\frac{1}{2}$.
- Label the line plot in eighths: $0, \frac{1}{8}, \frac{1}{4}, \frac{3}{8}, \frac{1}{2}$.
- The least number of stickers is 11.
- The greatest number of stickers is 18.

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▶ **Mathematical Discourse**

1 *What advantages are there in presenting data in a line plot instead of a table?*

Responses may include that it is easier to see the relative amounts of data for each given value, or that you can quickly see how the data are distributed.

2 *What question that involves subtraction could be answered using the line plot described on this page?*

Responses may include finding the difference between the number of $\frac{1}{4}$-inch stickers and $\frac{1}{2}$-inch stickers.

Connect It Now you will make the line plot for the problem on the previous page.

2 What scale is used for the line plot? Explain.
Eighths of an inch because the sticker widths
are $\frac{1}{8}$, $\frac{1}{4}$ (which is $\frac{2}{8}$), and $\frac{1}{2}$ (which is $\frac{4}{8}$).

3 How many Xs will you draw above each width?
$\frac{1}{8}$ in. **14** $\frac{1}{4}$ in. **18** $\frac{3}{8}$ in. **0** $\frac{1}{2}$ in. **11**

4 Use the number line at the right to make a line plot of the sticker widths.

5 Based on how the data are distributed, what is one conclusion you can make about Kiera's stickers?
Possible answer: Most of Kiera's stickers are
at least $\frac{1}{4}$ inch wide.

6 How do you use a line plot to show the distribution of measurement data? **Possible answer:**
You group data from least to greatest value.
The Xs show how the data are distributed
among the different measures.

Sticker Width (inches)
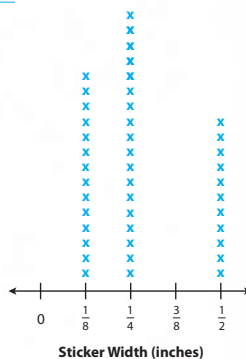
Try It Use what you just learned about creating line plots to solve this problem. Show your work on a separate sheet of paper.

7 At a health fair, Shawn recorded the number of cups of sugar per gallon for several different sports drinks and sodas. Make a line plot of the data.
$1\frac{5}{8}, 3\frac{1}{4}, 1\frac{3}{4}, 2\frac{7}{8}, 1\frac{3}{4}, 3\frac{1}{4}, 1\frac{5}{8}, 2\frac{3}{8}, 1, 1\frac{3}{4}$

Sugar (cups)
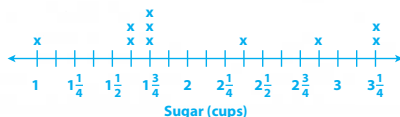
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Step By Step

Connect It
- Read **Connect It** as a class. Be sure to point out that the questions refer to the problem on the previous page.
- Remind students that "scale" is the increment by which the numbers change on the number line. Discuss that it makes sense to use $\frac{1}{8}$ as the scale because each width can be expressed as eighths.
- Ask students which column of Xs would be the tallest if Kiera had 20 stickers that have a width of $\frac{1}{2}$ inch. $\left[\frac{1}{2}\text{-inch column of Xs}\right]$
- Guide students to understand that the line plot shows measurement data from least to greatest, resulting in a visual model that shows how the data are grouped.

SMP TIP Model with Mathematics
Students represent the data using a line plot and discuss the types of questions that can best be answered using this model. *(SMP 4)*

Try It
7 **Solution**
See line plot on the Student Book page; Students may make a table listing the different numbers of cups in order from least to greatest $\left(1, 1\frac{5}{8}, 1\frac{3}{4}, 2\frac{3}{8}, 2\frac{7}{8}, 3\frac{1}{4}\right)$, and then transfer the data to a line plot.

Error Alert Students who wrote $1\frac{3}{4}$ before $1\frac{5}{8}$ compared numerators without finding a common denominator of 8.

Ready **Mathematics**
PRACTICE AND PROBLEM SOLVING

Assign *Practice and Problem Solving* **pages 251–252** after students have completed this section.

Lesson 23 Make Line Plots and Interpret Data
👥 Modeled and Guided Instruction

At A Glance

Students use pictures and a model to understand the data described in a word problem. Then students revisit this problem and use the data shown in the picture and model to solve the problem.

Step By Step

- Read the problem at the top of the page as a class.

Picture It

- Read **Picture It**. Point out that eight $\frac{1}{8}$-inch stickers in a row have a length of 1 inch, four $\frac{1}{4}$-inch stickers in a row have a length of 1 inch, and two $\frac{1}{2}$-inch stickers in a row have a length of 1 inch.

Model It

- Read **Model It**. Ask students what the length of each row is. $\left[\frac{1}{8}\text{-inch stickers: }1\frac{3}{4}\text{ inches or }1\frac{6}{8}\text{ inches, }\frac{1}{4}\text{-inch stickers: }4\frac{1}{2}\text{ inches or }4\frac{2}{4}\text{ inches, }\frac{1}{2}\text{-inch stickers: }5\frac{1}{2}\text{ inches}\right]$

▶ **Mathematical Discourse 1 and 2**

▶ **Concept Extension 1**

Lesson 23 👥 Modeled and Guided Instruction

Learn About Solving Problems Using Data in a Line Plot

Read the problem below. Then explore different ways to understand how to solve the problem using the data from a line plot.

Look at the line plot of sticker widths that you made on the previous page. Kiera wants to make a 5-inch wide row of stickers under a photo. She wants to use the same stickers for the whole row. How many of which sticker width can she use?

▶ **Picture It** You can use a picture to help understand the data in the problem.

Kiera has 14 stickers that are $\frac{1}{8}$-inch wide:

1 in. $1\frac{6}{8}$ in.

Kiera has 18 stickers that are $\frac{1}{4}$-inch wide:

1 in. 2 in. 3 in. 4 in. $4\frac{2}{4}$ in.
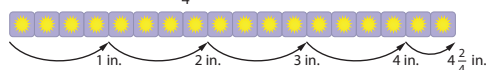
Kiera has 11 stickers that are $\frac{1}{2}$-inch wide:

1 in. 2 in. 3 in. 4 in. 5 in. $5\frac{1}{2}$ in.
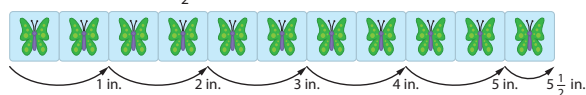
▶ **Model It** You can use a model to help understand the data in the problem.

Line up all the stickers of each width above a ruler.

$\frac{1}{8}$ inch

$\frac{1}{4}$ inch

$\frac{1}{2}$ inch

0 1 2 3 4 5
inches

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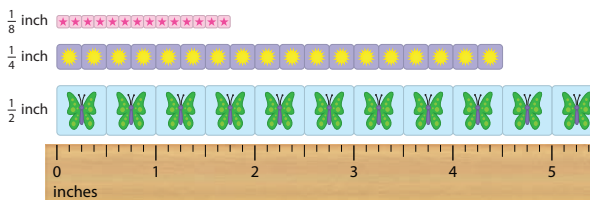
▶ Mathematical Discourse

1 *What questions can you answer using the pictures on the page?*

Responses may include which row of stickers has the longest or shortest length when all the stickers of the same width are placed in a row. Responses may also include how long each row is if the stickers are arranged in rows according to the width of each sticker.

2 *How does the picture and the model help you solve the problem?*

Responses should include the fact that both make it easy to see that there is only one kind of sticker that Kiera can use to make a 5-inch row.

▶ Concept Extension 1

Relate addition and multiplication.

- Ask students what operation the pictures on the page illustrate. [Students may respond either addition or multiplication.] Point out that the pictures illustrate both addition and multiplication.

- Have students explain how an addition expression can be used to describe each picture on the page. $\left[\frac{1}{8}\text{ added to itself 14 times; }\frac{1}{4}\text{ added to itself 18 times; }\frac{1}{2}\text{ added to itself 11 times.}\right]$

- Have students write a multiplication expression for each picture on the page. $\left[14 \times \frac{1}{8}; 18 \times \frac{1}{4}; 11 \times \frac{1}{2}\right]$

- Discuss with students which operation they would use to find the length of each row of stickers and why.

Connect It Now you will solve the problem from the previous page using the line plot.

8 How wide is the row Kiera can make with the $\frac{1}{8}$-inch stickers? _____ $1\frac{6}{8}$ inches

9 Can she make a 5-inch row with the $\frac{1}{4}$-inch stickers? Explain. _____ no; $18 \times \frac{1}{4} = 4\frac{2}{4}$

10 Can she make a 5-inch row with the $\frac{1}{2}$-inch stickers? Explain. _____ yes; $11 \times \frac{1}{2} = 5\frac{1}{2}$

11 Which sticker width does Kiera need to use to make a 5-inch row? _____ $\frac{1}{2}$-inch
How many of these stickers does she need? Explain.
Divide 5 inches by $\frac{1}{2}$ to find the number of stickers: $5 \div \frac{1}{2} = 10$ stickers.

12 How did the line plot help you to answer problem 11? **Possible answer: It was easy to see how many of each width of sticker she had, so I multiplied the number by the width to find each possible row and compared the width of each row to 5 inches to see whether it would work.**

13 Give an example of another question that can be answered using the line plot. Include the answer. **Answers will vary. What two widths of stickers and how many of each could she use to make a 5-inch row? fourteen $\frac{1}{8}$-inch and thirteen $\frac{1}{4}$-inch stickers**

Try It Use what you just learned about using data in line plots to solve these problems. Show your work on a separate sheet of paper.

Look at the line plot you made about the amount of sugar in different drinks in problem 7.

14 How many times the amount of sugar in one gallon of the least sugary drink is in one gallon of the most sugary drink? _____ $3\frac{1}{4}$

15 Suppose you take all of the sugar in one gallon of each of the three most sugary drinks and split it equally among them. How many cups of sugar will be in each gallon? _____ $3\frac{1}{8}$

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Step By Step

Connect It

- Discuss students' responses to problem 8. Ask students to explain how they could find how many $\frac{1}{8}$-inch stickers Kiera would need to make a 5-inch row. [Possible answers: Divide 5 by $\frac{1}{8}$; Use **Picture It** or **Model It** to draw more $\frac{1}{8}$-inch stickers and count the number of stickers that make a 5-inch row.]
- Discuss students' responses to problems 9–13.

> **SMP TIP Reason Quantitatively**
> Students use quantitative reasoning skills to provide examples of questions that could be answered using the line plot. Have students share their questions with a partner and answer their partner's questions. *(SMP 2)*

- Emphasize that line plots make it easy to see how many of each data value are in the data.

▶ **Concept Extension 2**

Try It

14 **Solution**
$3\frac{1}{4}$; Students may use the line plot or table to identify the most and least sugary drinks, $3\frac{1}{4}$ and 1, and then divide $3\frac{1}{4}$ by 1.

15 **Solution**
$3\frac{1}{8}$; Students may add all the amounts of sugar and then divide the sum, $9\frac{3}{8}$, by the number of drinks, 3.

Error Alert Students who wrote $9\frac{3}{8}$ found the total amount of sugar in the three most sugary drinks, but did not divide by 3 to find how much sugar would be in each drink if it were redistributed equally.

Ready· Mathematics PRACTICE AND PROBLEM SOLVING

Assign *Practice and Problem Solving* **pages 253–254** after students have completed this section.

▶ **Concept Extension 2**

Solve using an alternate method.

- Explain that you can also find how many of which width sticker Kiera can use to make a 5-inch long row using division.
- Guide students to understand that the quotient of 5 and the width of a sticker is the number of stickers of that width that Kiera would need in order to make a 5-inch long row.
- Have students find how many of each width sticker Kiera would need to make a 5-inch long row. [$5 \div \frac{1}{8} = 40$, forty $\frac{1}{8}$-inch stickers; $5 \div \frac{1}{4} = 20$, twenty $\frac{1}{4}$-inch stickers; $5 \div \frac{1}{2} = 10$, ten $\frac{1}{2}$-inch stickers.]
- Ask: *Does Kiera have enough $\frac{1}{4}$-inch stickers to make a 5-inch row?* [no] $\frac{1}{8}$-inch stickers? [no] $\frac{1}{2}$-inch stickers? [yes]
- Point out that this is the same solution they reached answering the questions on the page.

Lesson 23 Make Line Plots and Interpret Data

👥 Guided Practice

At A Glance

Students make and use line plots to interpret data.

Step By Step

- Ask students to solve the problems individually and label the scale on their line plots.
- **Pair/Share** When students have completed each problem, have them Pair/Share to discuss their solutions with a partner or in a group.

Solutions

Example Multiplying the number of burgers of each weight by the weight and then adding the results is shown as one way to solve the problem.

16 **Solution**

$\frac{3}{4}$ pound; See possible work on the Student Book page. Students could solve the problem by multiplying $\frac{1}{4}$ by 3.

DOK 1

Lesson 23 👥 Guided Practice

Practice **Making Line Plots and Interpreting Data**

Study the example below. Then solve problems 16–18.

Example

For a cookout, Mel made burgers of different weights. She recorded how many burgers of each weight she made. The line plot shows her data. How many pounds of meat did she use to make all the burgers?

Burger Weights (pounds)

The student multiplied the number of burgers of each weight by the weight, then added the amounts to get the total.

Look at how you could use the data in the line plot.

One $\frac{1}{8}$-lb burger: $\frac{1}{8}$ Five $\frac{1}{4}$-lb burgers: $5 \times \frac{1}{4} = 1\frac{1}{4}$

Four $\frac{1}{2}$-lb burgers: $4 \times \frac{1}{2} = 2$ Two $\frac{3}{4}$-lb burgers: $2 \times \frac{3}{4} = 1\frac{1}{2}$

Total: $\frac{1}{8} + 1\frac{1}{4} + 2 + 1\frac{1}{2} = 4\frac{7}{8}$

Solution $\underline{\quad 4\frac{7}{8} \text{ pounds} \quad}$

Pair/Share
Check the student's answer using addition instead of multiplication.

---

16 Look at the *Burger Weight* line plot above.

One friend at the cookout asked for a triple quarter-pound burger. Where on the number line could that burger be represented?

Show your work.

Possible student work using an equation:
$\frac{1}{4}$ **pound** $\times 3 = \frac{3}{4}$ **pound**

Solution $\underline{\quad \frac{3}{4} \text{ pound} \quad}$

What would two $\frac{1}{4}$-pound burgers put together be?

Pair/Share
Draw a picture to show a triple quarter-pound burger.
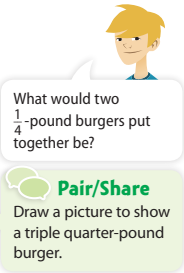
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Teacher Notes

17 A veterinarian's scale weighs animals to the nearest one eighth pound. The list below shows the weights, in pounds, of the last 14 dogs that the veterinarian saw.

$15\frac{1}{8}$, 19, $17\frac{1}{2}$, $15\frac{1}{8}$, $16\frac{1}{4}$, $17\frac{1}{2}$, $17\frac{1}{2}$, $18\frac{1}{4}$, $16\frac{5}{8}$, $14\frac{1}{4}$, 19, $17\frac{3}{8}$, $17\frac{1}{8}$, 18

Create a line plot to show the data.

> How should the line plot's scale be labeled to show these data?

Possible line plot:

Dog Weight (pounds)

> **Pair/Share**
> How is your line plot the same as your partner's? How is it different?

18 Look at your line plot for problem 17. Which statement about the data is true? Circle the letter of the correct answer.

A The heaviest dog weighed about 5 times as much as the lightest dog.

B Most of the dogs weighed more than 17 pounds.

C All of the dogs weighed between 15 and 19 pounds.

D At most, only 2 dogs weighed the same amount.

> Read each statement carefully and check it against the data to see if it is true.

Michelle chose **A** as the correct answer. How did she get that answer?

Possible answer: Michelle found the difference of 5 pounds and thought it meant 5 times as much weight.

> **Pair/Share**
> Does Michelle's answer make sense?

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Lesson 23

Solutions

17 Solution

See student work on the Student Book page. Students may make a line plot using a scale of $\frac{1}{8}$, drawing Xs above a weight for each time the weight is listed.
DOK 2

18 Solution

B; Possible answer: The greatest number of Xs are clustered above the 17 mark on the line plot.

Explain to students why the other two answer choices are not correct:

C is not correct because 1 dog weighs less than 15 pounds.

D is not correct because 3 dogs weigh $17\frac{1}{2}$ pounds.
DOK 3

Ready Mathematics
PRACTICE AND PROBLEM SOLVING

Assign *Practice and Problem Solving* **pages 255–256** after students have completed this section.

Teacher Notes

Lesson 23 Make Line Plots and Interpret Data

Independent Practice

At A Glance

Students make and use line plots to interpret data to solve problems that might appear on a mathematics test.

Solutions

1 Solution
D; Identify which line plot lists the lengths in order from least to greatest and has the correct number of Xs above each length.
DOK 2

2 Solution
a. **False**;
b. **False**;
c. **True**;
d. **True**
DOK 2

Quick Check and Remediation

- Draw a line plot from 0–1 with intervals of $\frac{1}{8}$. Place 0 Xs at 0, 0 Xs at $\frac{1}{8}$, 1 X at $\frac{1}{4}$, 4 Xs at $\frac{3}{8}$, 6 Xs at $\frac{1}{2}$, 4 Xs at $\frac{5}{8}$, 3 Xs at $\frac{3}{4}$, 2 Xs at $\frac{7}{8}$, 1 X at 1. Ask students to solve the following problem: Ian recorded the number of strawberries and their weights in ounces that filled a carton of strawberries. The line plot shows his data. How many ounces of strawberries are in the carton? $\left[12\frac{1}{4} \text{ ounces} \right]$

- For students who are struggling, use the chart to guide remediation.

- After providing remediation, check students' understanding. Use the same line plot. Tell students that Ian added two more strawberries to the carton, one that weighed $\frac{1}{8}$ ounce and one that weighed $\frac{1}{4}$ ounce. Have students adjust the line plot and find how many ounces of strawberries are now in the pint. $\left[12\frac{5}{8} \text{ ounces} \right]$

- If a student is still having difficulty, use *Ready Instruction,* Grade 4, Lesson 27.

Lesson 23 Independent Practice

Practice **Making Line Plots and Interpreting Data**

Solve the problems.

1 Juan drives a race car. The race tracks vary in length. To prepare for the racing season, he recorded the lengths, in miles, of the tracks in the list shown below. Juan would like to see the distribution of the track lengths. Which line plot correctly shows the track data?

$$\frac{1}{4}, \frac{1}{2}, \frac{3}{8}, \frac{1}{2}, \frac{1}{4}, \frac{1}{2}, 1, 1\frac{1}{4}, \frac{3}{4}, \frac{1}{2}, \frac{7}{8}, \frac{1}{2}, \frac{3}{4}$$

A

Track Length (miles)

C

Track Length (miles)

B

Track Length (miles)

D
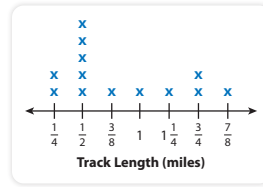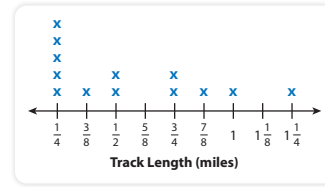
Track Length (miles)

2 Look at the data in problem 1. Choose *True* or *False* for each statement.

a. Most of the tracks are more than 1 mile long. ☐ True ☒ False

b. The most common track length is $\frac{1}{4}$ mile. ☐ True ☒ False

c. None of the tracks are $\frac{5}{8}$ mile long. ☒ True ☐ False

d. The longest track is 5 times as long as the shortest track. ☒ True ☐ False

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If the error is . . .	Students may . . .	To remediate . . .
$4\frac{3}{8}$ ounces	not have multiplied each weight by the number of strawberries.	Ask students how many strawberries were weighed. [21] Ask them if their answer represents the weight of all 21 strawberries. Explain that they need to multiply each weight by the number of strawberries at that weight.
$11\frac{1}{4}$ ounces	not have included the strawberry that weighs 1 ounce in the total.	Ask students how many strawberries were weighed. [21] Have them check to be sure that they included the weights of all 21 strawberries weighed.

3 Look at the data in problem 1. What is the total length of all the tracks that are longer than $\frac{5}{8}$ mile? _____ $4\frac{5}{8}$ _____ miles

4 Sara owns Sara's Hardware. She made the line plot below to compare the fuel capacity of several types of yard trimmers.

Tank Capacity of Yard Trimmers

```
        x
        x                    x
        x                    x                        x
  x     x          x         x                        x
  |_____|_____|_____|_____|_____|_____|_____|_____|_____|_____>
 1½   1⅝   1¾   1⅞    2   2⅛   2¼   2⅜   2½
```
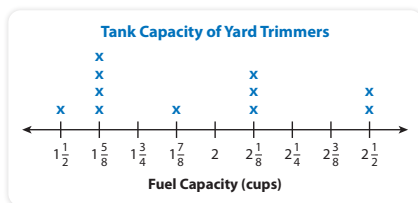
Fuel Capacity (cups)

Part A What is the most common fuel capacity of the trimmers Sara sells?

Answer _____ $1\frac{5}{8}$ _____ cups

Part B The tanks of all of Sara's yard trimmers are empty. How much fuel does Sara need to fill the tanks of all the trimmers?

Show your work.

Possible student work:

$$1\frac{1}{2} + \left(4 \times 1\frac{5}{8}\right) + 1\frac{7}{8} + \left(3 \times 2\frac{1}{8}\right) + \left(2 \times 2\frac{1}{2}\right) = \frac{12}{8} + \frac{52}{8} + \frac{15}{8} + \frac{51}{8} + \frac{40}{8} = \frac{170}{8} = 21\frac{2}{8}$$

Answer _____ $21\frac{2}{8}$ _____ cups

✓ **Self Check** Go back and see what you can check off on the Self Check on page 211.

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Solutions

3 **Solution**
$4\frac{5}{8}$; Find all the tracks that are longer than $\frac{5}{8}$ mile. Then, add the lengths of all those tracks.
DOK 2

4 **Part A Solution**
$1\frac{5}{8}$; Use the line plot to identify which column of Xs is the tallest.
Part B Solution
$21\frac{2}{8}$; Add the number of cups represented by each X on the line plot. See possible student work on the Student Book page.
DOK 2

▶ **Hands-On Activity**

Gather, plot, and interpret data.

Materials: bean bag, yardstick

Form groups of at least 8 students. Have each student in a group toss a bean bag at a marked target on the floor about 5 feet away. After each toss, have students measure the distance from where the bean bag lands to the target. Students should measure to the nearest $\frac{1}{4}$ inch.

Tell students to list the data for their group in a table and then transfer the data to a line plot. Ask each group to use the line plot to describe their data. Have the groups answer questions such as *What is the difference in length between the toss closest to the target and the one farthest from the target?*

▶ **Challenge Activity**

Interpret data from two related line plots.

Write this problem on the board: The heights of the players on opposing basketball teams are listed below to the nearest one eighth of a foot.

Team A:
$5\frac{3}{4}$, $6\frac{1}{4}$, $5\frac{7}{8}$, $6\frac{1}{2}$, 6, $6\frac{1}{4}$, $6\frac{1}{8}$, $5\frac{3}{4}$, $6\frac{1}{4}$, $6\frac{1}{8}$, $5\frac{5}{8}$, $6\frac{1}{2}$

Team B:
$5\frac{5}{8}$, $6\frac{1}{2}$, $5\frac{3}{4}$, $6\frac{1}{8}$, $5\frac{7}{8}$, $6\frac{1}{2}$, $5\frac{5}{8}$, $6\frac{1}{4}$, $5\frac{7}{8}$, $6\frac{1}{2}$, $5\frac{5}{8}$, $6\frac{3}{8}$

Tell students to make a line plot for the heights of Team A players and another line plot for Team B.

Ask questions such as: *How many times the number of players under 6 feet tall are on Team B than are on Team A?* $\left[1\frac{1}{2}\right.$; Team B: 6 players; Team A: 4 players; $6 \div 4 = \frac{6}{4} = 1\frac{1}{2}\right]$

Lesson 23
Make Line Plots and Interpret Data

Teacher-Toolbox.com

Overview

Assign the Lesson 23 Quiz and have students work independently to complete it.

Use the results of the quiz to assess students' understanding of the content of the lesson and to identify areas for reteaching. See the Lesson Pacing Guide at the beginning of the lesson for suggested instructional resources.

Tested Skills

Assesses 5.MD.B.2

Problems on this assessment form require students to be able to examine and describe the distribution of data values shown on a line plot, to solve multi-step word problems about measurement data that has fractional units, and to create line plots to display measurement data that has fractional units. Students will also need to be familiar with computing with fractions, and the meaning of each operation, in order to find answers to questions about the data.

Ready® Mathematics

Lesson 23 Quiz

Solve the problems.

1 Al recorded the heights, in feet, of his adult relatives. $5\frac{7}{8}, 5\frac{1}{2}, 5\frac{3}{4}, 6\frac{1}{8}, 5\frac{7}{8}, 5\frac{1}{4}, 6\frac{1}{8}, 5\frac{7}{8}$

Which line plot correctly shows the data?

A

Height (feet)

B

Height (feet)

C

Height (feet)

D

Height (feet)
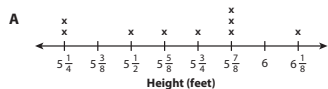
2 Choose True or False for each statement about the data in problem 1.

a. Most of the relatives are greater than $5\frac{3}{4}$ feet tall.   ☐ True   ☐ False

b. The tallest relative is $1\frac{1}{8}$ foot taller than the shortest relative.   ☐ True   ☐ False

c. The most common height of the relatives is $6\frac{1}{8}$ feet.   ☐ True   ☐ False

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Lesson 23 Quiz continued

3 Sam and Amelia make bean bags for a tossing game. Amelia makes a line plot to show the weight, in pounds, of the bean bags.

Bean Bag Weight (pounds)
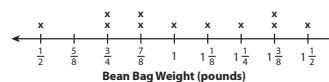
Sam says the heaviest bean bag is twice as heavy as the lightest bean bag. Amelia says the heaviest bean bag is three times as heavy as the lightest bean bag.

Who is correct? Explain how you know.

_____

_____

_____

4 Claire and her family cook meals on a camping stove on their camping trips. Claire recorded the number of canisters of cooking fuel they used on different camping trips. The list of the data Claire recorded is shown below.

$2\frac{1}{8}, 1\frac{1}{2}, 1\frac{3}{4}, 2\frac{3}{4}, 2\frac{7}{8}, 1\frac{1}{4}, 1\frac{3}{4}, 2\frac{3}{8}, 2\frac{3}{4}, 1\frac{3}{4}$

Make a line plot of the data.

Common Misconceptions and Errors

Errors may result if students:

• check only a few of the given distributions to see if they match the data.

• miscalculate the difference between mixed numbers on a line plot.

• use a number on the scale instead of a data value (Xs).
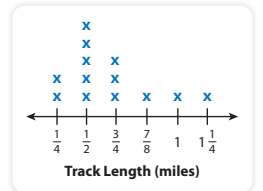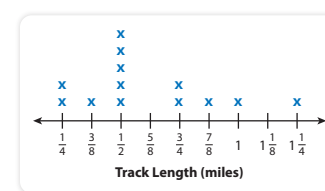
• use an inappropriate or uneven scale when creating a line plot.

***Ready*® Mathematics**

Lesson 23   Quiz Answer Key

1. C
DOK 2

2. a. True
   b. False
   c. False
   DOK 2

3. Amelia is correct. Possible explanation: The heaviest bean bag weighs $1\frac{1}{2}$ pounds. The lightest bean bag weighs $\frac{1}{2}$ pound. Divide $1\frac{1}{2}$, or $\frac{3}{2}$, by $\frac{1}{2}$ to compare the weights of the heaviest and lightest bean bags. $\frac{3}{2} \div \frac{1}{2} = \frac{3}{2} \times \frac{2}{1} = \frac{6}{2} = 3$. The heaviest bean bag is 3 times as heavy as the lightest bean bag.
DOK 3

4. Possible student line plot:

Canisters of Cooking Fuel Used

Cooking Fuel Used (canisters)
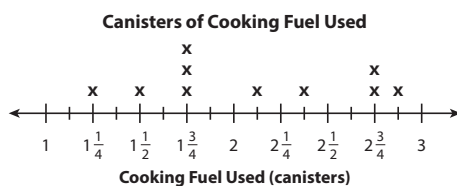
DOK 2

LESSON OVERVIEW

Lesson 16
Algebraic Expressions

CCSS Focus

Domain
Expressions & Equations

Cluster
A. Apply and extend previous understandings of arithmetic to algebraic expressions.

Standard
6.EE.A.2 Write, read, and evaluate expressions in which letters stand for numbers.

a. Write expressions that record operations with numbers and with letters standing for numbers. *For example, express the calculation "Subtract y from 5" as $5 - y$.*

b. Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity. *For example, describe the expression $2(8 + 7)$ as a product of two factors; view $(8 + 7)$ as both a single entity and a sum of two terms.*

c. Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). *For example, use the formulas $V = s^3$ and $A = 6s^2$ to find the volume and surface area of a cube with sides of length $s = \frac{1}{2}$.*

Additional Standard
6.EE.B.6 (See page B3 for full text.)

Standards for Mathematical Practice (SMP)
1 Make sense of problems and persevere in solving them.

2 Reason abstractly and quantitatively.

3 Construct viable arguments and critique the reasoning of others.

4 Model with mathematics.

6 Attend to precision.

Lesson Objectives

- Write, read, and evaluate variable expressions.
- Apply the order of operations on expressions with variables, including those with exponents.
- Translate an expression from its word form to an algebraic expression and vice versa.
- Identify parts of expressions using appropriate mathematical vocabulary.

Prerequisite Skills

- Write, interpret, and evaluate numerical expressions, including those involving exponents.
- Interpret a fraction as division.
- Know that expressions do not include equals, greater than, or less than signs.
- Know that variables represent unknown quantities.
- Apply order of operations.

Lesson Vocabulary

- **variable** a letter that stands for an unknown number.
- **term** a known number, a variable, or the product of a known number and variable(s).
- **variable term** a term that includes variables.

Learning Progression

In Grade 5 students learned how to evaluate and write expressions. **Earlier in Grade 6** students evaluated expressions with exponents.

In this lesson students write, read, and evaluate expressions in which letters stand for numbers. Students will write expressions to record operations with letters standing for numbers. Students will identify parts of expressions using mathematical terms to include the viewing of one or more parts of an expression as a single entity. Students will also evaluate expressions at specific values of their variables, including expressions which arise from formulas used in the real world.

In Grade 7 students will evaluate and write linear expressions.

Want to learn more?
Go to ReadyCentral.com.

Lesson Pacing Guide

Whole Class Instruction

Day 1
45–60 minutes

Toolbox: Interactive Tutorial
Algebraic Expressions

Introduction
- Use What You Know *15 min*
- Find Out More *20 min*
- Reflect *10 min*

Practice and Problem Solving
Assign pages 171–172.

Day 2
45–60 minutes

Modeled and Guided Instruction

Learn About Writing Expressions with Variables
- Model It/Model It *15 min*
- Connect It *20 min*
- Try It *10 min*

Practice and Problem Solving
Assign pages 173–174.

Day 3
45–60 minutes

Modeled and Guided Instruction

Learn About Writing and Evaluating Expressions
- Picture It/Model It *5 min*
- Connect It *10 min*
- Try It *5 min*

Modeled and Guided Instruction

Learn About Writing and Evaluating Expressions
- Picture It/Model It *5 min*
- Connect It *15 min*
- Try It *5 min*

Practice and Problem Solving
Assign pages 175–178.

Day 4
45–60 minutes

Guided Practice

Practice Writing and Evaluating Expressions
- Example *5 min*
- Problems 25–27 *20 min*
- Pair/Share *10 min*
- Solutions *10 min*

Practice and Problem Solving
Assign pages 179–180.

Day 5
45–60 minutes

Independent Practice

Practice Writing and Evaluating Expressions
- Problems 1–6 *25 min*
- Quick Check and Remediation *10 min*
- Hands-On or Challenge Activity *10 min*

Toolbox: Lesson Quiz
Lesson 16 Quiz

Small Group Differentiation

Teacher-Toolbox.com

Reteach
Ready Prerequisite Lessons *45–90 min*

Grade 5
- Lesson 19 Evaluate and Write Expressions
- Lesson 20 Analyze Patterns and Relationships

Teacher-led Activities
Tools for Instruction *15–20 min*

Grade 6
- Evaluate Variable Expressions

Personalized Learning

i-Ready.com

Independent
i-Ready Lessons *15–20 min*

Grade 6
- Algebraic Expressions

Lesson 16 Algebraic Expressions
👥 Introduction

ⓖ Use What You Know

In Lesson 15, you learned to write and evaluate expressions with numbers and operations. Now, take a look at this problem.

> Describe the expression $2x + 5$ in words.

Use the math you know to solve the problem.

a. What does the letter x stand for?

an unknown number

b. Which operation is represented by $2x$?

multiplication

c. What do you call the result of this operation?

product

d. What operation does the $+$ sign show?

addition

e. What do you call the result of this operation?

sum

f. Explain what the whole expression represents.

The expression represents the sum of two amounts. The first amount is the product of 2 and an unknown number. The second amount is 5.

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At A Glance

Students view an expression and are guided to describe it using mathematical terms such as product and sum. Then they will identify parts of an expression using mathematical terms and view one or more parts of an expression as a single entity.

Step By Step

- Work through **Use What You Know** as a class.
- Tell students that this page guides them in understanding and describing an expression that includes variables and mathematical operations.
- Have students read the problem at the top of the page. Explain that we can tell a lot about an expression without evaluating it, or performing the calculation, or knowing the values of all the terms.
- Emphasize the variable, x, in the expression. Ask students if they know what this represents. [It could be any number; an unknown number.]
- Point out the term $2x$ and the lack of an operational sign. Tell students that representing multiplication this way avoids any confusion of the variable x with a multiplication symbol. The expression $2x$ means "two times x."
- Ask student pairs or groups to explain what the whole expression $2x + 5$ represents.

> **SMP TIP Look for Structure**
> When students describe an expression without evaluating it, they come to understand that an expression is a single object that can also be seen as a combination of objects. *(SMP 7)*

▶ **Concept Extension**

▶ **Mathematical Discourse 1–3**

▶ Mathematical Discourse

1 *Kristen says that if x is positive, then $2x + 5$ is greater than 5. Do you agree?*

Listen for reasoning that the expression has to be greater than 5 because some positive number is added to 5.

2 *Is $2x + 5$ a sum or a product? Why?*

Students may recognize that it is a sum. They may say that $2x$ is the product of 2 and x. Others may be unsure or insist that you can't know without knowing the value of x.

3 *What else can you say about this expression?*

Allow plenty of wait time. Have students respond rather than commenting yourself. Responses may include that it has two parts, that its value is positive, or that it can be rewritten as $x + x + 5$.

▶ Concept Extension

Create verbal translations of expressions.

Materials: index cards with $9 - 3$, $3 + 8$, 5×6, $x - 3$, $x + 3$, $\frac{x}{3}$, $\frac{10}{2}$, and $6x$

- Assign pairs or groups expressions to read aloud.
- Create as many different verbal translations of the expression as possible.
- Write story problems to represent each expression.
- Share verbal translations with the class.

▶▶ Find Out More

You have evaluated expressions with known numbers and operation signs. An example of this would be $6 - 7 \times 4$. Now you will evaluate expressions that include variables. Remember, a **variable** is a letter that stands for an unknown number.

Look at this expression.
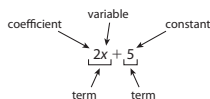
Every expression is made up of terms. A **term** is a known number, a variable, or the product of a known number and variable(s). The expression $2x + 5$ has two terms: $2x$ and 5.

A term that is a known number without variables is called a **constant**. The expression $2x + 5$ has one constant: 5.

A term that includes variables is called a **variable term**. The expression $2x + 5$ has one variable term: $2x$.

If one factor of a variable term is a known number, that number is called the **coefficient**. The coefficient of the term $2x$ is 2.

Look again at the term $2x$. It means "multiply a number by 2." You have used the symbol $\times$ for multiplication. However, now that you are using the variable x, you will need other ways to show multiplication. The expression $2 \times x$ would look confusing. Instead, you can write $2 \cdot x$ or $2x$.

▶ Reflect

1 Claire says the expression $8x^3$ has three terms: 8, x, and 3. Is she correct? Explain.

Claire is incorrect. A term is a known number, a variable, or the product of a known number and variable(s). $8x^3$ is the product $8 \cdot x \cdot x \cdot x$, therefore it is one term.

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Step By Step

- Read **Find Out More** as a class.
- Write the expression $2x + 5$ on the board. Circle and label the variable term, the coefficient, and the constant.

▶ Real-World Connection

- Point out to students another way to show multiplication is using "·" such as $2 \cdot x$.

▶ Visual Model

- Read **Reflect** as a class. Clarify the operations being used. [multiplication and evaluating a power]
- Ask student pairs or groups to share their explanations as to why Claire was correct or incorrect.

📗 **Ready** Mathematics
PRACTICE AND PROBLEM SOLVING

Assign *Practice and Problem Solving* **pages 171–172** after students have completed this section.

▶ Visual Model

Study expressions with algebra tiles.

Materials: algebra tiles

- Present students with algebra tiles. Introduce the small square as one unit, the rectangular tile as x, and the large square as x^2. The red side represents a negative, and the green side represents a positive.
- Use tiles to model the following expressions: $2x + 5$, $3x$, 4, $x^2 + 1$, $2x^2 - 3x$, $-2x^2 - 3$, and -5.
- Write expressions for the following:
  2 red rectangles and 3 small green squares ($-2x + 3$)
  4 green rectangles ($4x$)
  3 large red squares ($-3x^2$)

- Explain to students that each grouping of tiles represents a term in the expression.
- Identify addition as the operation which describes the combining of the groups.

▶ Real-World Connection

Discuss situations that are modeled by a given expression.

Encourage students to create real-world applications of the expression $2x + 5$. Have students share expressions that could be used in the real world.

Examples: Bob earns 2 dollars for each pile of leaves he bags, x, and 5 dollars for helping.

Lesson 16 Algebraic Expressions

Modeled and Guided Instruction

At A Glance

Students will explore ways to write expressions using numbers, variables, and operational symbols from verbal descriptions. They identify parts of an expression and then write an expression from words.

Step By Step

- Read the problem at the top of the page as a class.

- Write the verbal expression for students to see. Ask students to determine the operations to be used in this expression. [multiplication and subtraction]

Model It

- Have students read the first **Model It**. Call attention to the model. Lead a discussion relating the model to the verbal expression. Ask: *Why are there two boxes?* [You need two terms to perform subtraction.]

Model It

- Review the remaining problems and highlight the vocabulary which determines the operation.

- Ask students to show alternative ways of writing "a number times four." [Possible answers: $4x$, $x \cdot 4$, $x(4)$.] Explain to students the common practice of writing the coefficient (number) before the variable when writing a variable term ($4x$ and not $x4$).

▶ **Concept Extension**

Lesson 16 Modeled and Guided Instruction

Learn About ▶ **Writing Expressions with Variables**

Read the problem below. Then explore ways to write expressions from words.

> Write an expression with the same meaning as "subtract a number times 4 from 10."

▶ **Model It** You can look for operation words to help you write the expression.

"Subtract a number times 4 from 10."
The expression will be a difference between terms.

$$\boxed{\text{First term}} - \boxed{\text{Second term}}$$

This is the overall "shape" of the expression.

▶ **Model It**

You can think of similar expressions to help you write this expression.

Write an expression for "subtract 6 from 10."	$10 - 6$
Write an expression for "subtract a number from 10."	$10 - x$
Write an expression for "a number times 4."	$4x$

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▶ **Concept Extension**

Identify parts of a term and like terms.

Materials: cards (x, x^2, x^3, m, m^2, m^3, $2m$, $2x$, $3x$, $3m$, $4x^2$, $4x^3$, $4m^2$, $4m^3$); Cards may be duplicated.

- Give each student one card.

- Ask students who have a term without a coefficient to add one.

- List all terms for students to see.

- Ask students to find others who have a term that is "like" the one they are holding. Clarify for students that *like terms* are terms that have the same variable or variable with the same exponent.

- Once students are in groups of like terms, have students write an expression that would combine their terms and include a simplified expression of the like terms.

- Ask groups to combine their simplified expressions to write a class expression.

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▶ **Connect It** Now, you will solve the problem from the previous page using the models.

2 Look at the first *Model It* on the previous page. When you subtract a number "from 10," will 10 be the first term or the second term? Explain.

first term

3 Erica says that the expression 4*x* has one term. Is she correct? Explain.

Yes; 4x is the product of a known number (4) and a variable (x).

4 Look at the second *Model It*. Write an expression for "subtract a number times 4 from 10." **10 − 4x**

5 List each term in your answer to problem 4. **10, 4x**

6 Does your answer to problem 4 have any constants? Explain. **Yes; 10. This is a known number without variables.**

7 What are the coefficients, if any, in your answer to problem 4? Explain.

4 is a factor next to x.

8 Explain the difference between a constant and a coefficient. **A constant is a known number. There are no variables in a constant. A coefficient is one factor in a variable term.**

▶ **Try It** Use what you just learned about writing expressions to solve these problems. Show your work on a separate sheet of paper.

9 Write an expression with the same meaning as "the result of multiplying $\frac{1}{2}$ by a number, then subtracting 9."

$\frac{1}{2}x - 9$

10 Write an expression with the same meaning as "7 less than the square of a number."

$x^2 - 7$

11 Write an expression to represent "the sum of 3 and the quotient of a number divided by 6."

$3 + \frac{x}{6}$

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Step By Step

Connect It

- Read **Connect It** as a class. Be sure to point out that the questions refer to the problem on the previous page.

- Read the **Try It** problems as a class.

▶ **English Language Learners**

> **SMP TIP** **Attend to Precision**
> Ask students to state the meaning of the symbols they choose. This provides an opportunity for students to communicate their reasoning precisely and appropriately with clear definitions. *(SMP 6)*

Try It

9 **Solution**
$\frac{1}{2}x - 9$; Students may use the decimal representation of one half as 0.5.

10 **Solution**
$x^2 - 7$; Students may write $x \cdot x - 7$.

Error Alert Students who wrote "$2x - 7$" did not use their knowledge of exponents to represent a number being multiplied by itself.

11 **Solution**
$3 + \frac{x}{6}$; Students may write "$3 + x \div 6$" instead of writing the fraction bar or a model to determine the terms.

Ready **Mathematics**
PRACTICE AND PROBLEM SOLVING

Assign *Practice and Problem Solving* **pages 173–174** after students have completed this section.

▶ **English Language Learners**

Ask students to use a different color to highlight the different operations. Use the same color for similar operations.

Lesson 16 Algebraic Expressions
Modeled and Guided Instruction

At A Glance

Students will explore ways to write and evaluate expressions with variables. Then they solve problems by writing and evaluating expressions.

Step By Step

- Read the problem at the top of the page as a class.

Picture It

- Read **Picture It**. What does the variable p represent in the model? [the number of pieces of gum in each mint pack]
- Guide students to connect the facts to the model (1 pack of orange gum, 3 packs of mint gum, orange gum has 8 pieces, unknown number of mint pieces in each pack).

Model It

- Ask a volunteer to read the second sentence in **Model It** ("The total number...."). Draw attention to the operating word "sum," which generally means two items are being combined. Ask: *What two items will be added?* [number of pieces in orange packs and number of pieces in mint packs] *What will the sum of these two terms determine?* [the total number of pieces purchased by Jennifer]

▶ **Mathematical Discourse 1 and 2**

> **SMP TIP Model with Mathematics**
> Writing expressions to represent real-world situations and interpreting expressions in terms of the situation are examples of modeling with mathematics. *(SMP 4)*

▶ **Concept Extension**

Lesson 16 Modeled and Guided Instruction
Learn About Writing and Evaluating Expressions

Read the problem below. Then explore ways to write and evaluate expressions with variables.

> Jennifer buys 1 pack of orange sugarless gum and 3 packs of mint sugarless gum. The pack of orange gum has 8 pieces. The packs of mint gum each have the same number of pieces.
>
> - Write an expression to show the total number of pieces of gum that Jennifer buys.
> - If 1 pack of mint gum has 6 pieces, what is the total number of pieces of gum that Jennifer buys?

▶ **Picture It** You can draw a picture to help you understand this problem.

You can draw the packs of gum and label the number of pieces in each pack.

ORANGE	MINT	MINT	MINT
SUGARLESS GUM	SUGARLESS GUM	SUGARLESS GUM	SUGARLESS GUM
8 pieces	p pieces	p pieces	p pieces

▶ **Model It** You can use words to help you solve this problem.

You can write a sentence describing the total number of gum pieces.

The total number of pieces of gum is the sum of the number of pieces in one pack of orange gum and the number of pieces in three packs of mint gum.

The word *sum* in the sentence above tells you that the expression will have this overall "shape."

$$\boxed{\text{First amount}} + \boxed{\text{Second amount}}$$

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▶ Mathematical Discourse

1 *Is there another box model that would work here? Explain.*

Yes; this is an addition problem, and the order in which addition occurs does not matter. The second and first terms could change position.

2 *How would you change the problem to increase the number of pieces of gum Jennifer buys? Can you write an expression for this? Is there another way to rewrite the problem?*

Possible answers: change the number of orange pieces in a pack to a number greater than 8, increase the number of mint packs she purchases.

▶ Concept Extension

Evaluate expressions by substitution.

Materials: index cards with the digits 0–9; symbols $+$, $-$, $\cdot$, $\div$; exponents 2, 3, a variable card (such as x)

- Explain to students that they will be asked to evaluate expressions by substitution.
- Provide students with these expressions:

  $(2 + 4) \cdot x^2$, $\frac{x^3}{(14 - 5)}$, $(-9 + 3) + x^2$,
  $2x + 3$, $\frac{4x}{2}$, $5(x + 3)^2$

- Have students work in groups. Direct students to show an expression with the cards.
- Ask students to replace the variable with any digit or with a digit directed by the teacher.
- Students should show the steps for evaluating the expression by using the order of operations.

Connect It Now you will solve the problem from the previous page using the picture and model.

12 Write an expression for "the number of pieces in one pack of orange gum."

8

13 Write an expression for "the number of pieces in three packs of mint gum."

3*p*

14 Write an expression for "the sum of the number of pieces in one pack of orange gum and the number of pieces in three packs of mint gum."

8 + 3*p*

15 Explain how you could use the expression from problem 14 to find the total number of pieces Jennifer buys if each pack of mint gum has 6 pieces.

Evaluate the expression 8 + 3*p* for *p* = 6. 8 + 3(6) = 8 + 18 = 26; Jennifer

buys 26 pieces of gum.

Try It Use what you just learned about solving expressions with variables to solve these problems. Show your work on a separate sheet of paper.

16 Martina is 3 inches less than twice as tall as her little brother. Write an expression for Martina's height. How tall is Martina if her little brother is 28 inches tall?

2*b* − 3; 53 in.

17 Tracy has 5 cans of vegetable juice in her refrigerator. Four of the cans each have 6 ounces of juice. Write an expression for the total ounces of juice Tracy has in her refrigerator. If the fifth can has 12 ounces, what is the total ounces of juice Tracy has?

24 + *j*; 36 oz.

18 Brian says that the expression 8*n* + 2 is equal to 83 when *n* = 1. Explain why Brian's answer is incorrect. **Brian evaluated 8(1) as 81, then added 2 to get 83. The answer**

should be 8*n* + 2 = 8(1) + 2 = 8 + 2 = 10

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Step By Step

Connect It

- Read **Connect It** as a class. Be sure to point out that the questions refer to the problem on the previous page.

- Refer students to the number of terms in the expression (2) and how they are separated (by an addition sign).

- Remind students to highlight operating words and to create a box model.

▶ **Visual Model**

Try It

16 Solution

2*b* − 3; 53 in.; Students write and evaluate an expression for twice the brother's height minus 3 inches.

Error Alert Students who wrote 3 − 2*b* did not take into account the order of "3 less than twice as tall" meaning "3 removed from twice as tall."

17 Solution

24 + *j*; 36 oz; Students write and evaluate an expression for the cans and ounces of juice.

18 Solution

Brian evaluated 8(1) as 81, then added 2 to get 83. The answer is 8*n* + 2 = 8(1) + 2 = 8 + 2 = 10.

Ready Mathematics
PRACTICE AND PROBLEM SOLVING

Assign *Practice and Problem Solving* **pages 175–176** after students have completed this section.

▶ **Visual Model**

Model expressions with algebra tiles.

Materials: algebra tiles

- As a class, review the value of each of the algebra tiles. [The small square is one unit, the rectangular tile is *x,* and the large square is x^2. The red side represents a negative value, and the green side represents a positive value.]

- Ask students to use algebra tiles to model the gum problem. [8 small squares and 3 rectangles]

- Ask students: *How many terms are represented?* [2; two different groupings of shapes] *What operation would describe the combining of the groups of tiles?* [addition]

- Model for students some changes to the number of orange and mint packs Jennifer bought. Ask: *How does this change the expression?* [The constant or coefficient may change, but the number of terms remains the same.]

- Ask volunteers to change the problem and model the changed expression. [Models will vary.]

Lesson 16 Algebraic Expressions
👥 Modeled and Guided Instruction

At A Glance

Students will continue exploring ways to write and evaluate expressions. Then they solve problems by writing and evaluating expressions.

Step By Step

- Read the problem at the top of the page as a class.
- Prompt students to state the facts. [This year's prize is $20 less than 3 times last year's prize; two people win a prize; two people split the prize evenly.]

Picture It

- Refer students to **Picture It**. Connect the facts described by the class to the model. Lead a discussion on the differences between this model and the previous gum model. What do students notice to be different?

Model It

- Guide students to **Model It**. Ask students to identify the phrase that describes the operation [less than] and the operation it signifies [subtraction]. Refer students to the model with two terms for subtraction. Point out the importance of the order of the terms.
- Refer students to Evan's prize money: "Evan gets half of the prize." Ask: *What operation does this ask us to use?* [Divide by 2 or multiply by $\frac{1}{2}$ or multiply by 0.5.]

▶ Mathematical Discourse

> **SMP TIP** **Make Sense of Problems**
> Identifying facts lets students make sense of problems by using simpler forms of the original problem to gain insight into its solution. *(SMP 1)*

▶ Concept Extension

Lesson 16 👥 Modeled and Guided Instruction

Learn About **Writing and Evaluating Expressions**

Read the problem below. Then continue exploring ways to write and evaluate expressions with variables.

Last year, the Speedster Bicycle Company held a bicycle design contest and awarded a cash prize. This year, the contest prize is $20 less than three times last year's prize. Evan and Gina win this year's contest and split the prize money evenly between them.

- Write an expression to show how much prize money Evan wins.
- If last year's prize was $50, how much prize money does Evan win?

▶ **Picture It** You can draw a picture to help you understand the problem.

You can represent the prize money as envelopes and draw a line to show Evan's half.
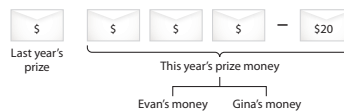
▶ **Model It** You can use words to help you solve the problem.

The contest prize is $20 less than three times last year's prize.

The phrase *less than* tells you the expression representing this year's prize money will have this overall "shape."

| First amount | − | Second amount |

Evan gets half of this year's prize.

The phrase *half of* tells you this year's prize money is divided by 2. The expression representing Evan's share of this year's prize money will have this overall "shape."

$$\frac{\text{First amount} - \text{Second amount}}{2}$$

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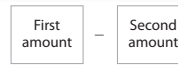
▶ Mathematical Discourse

A student wrote "$\frac{1}{2}$(first amount − second amount)" to represent Evan's share of this year's prize money. Do you agree or disagree? Can you explain why this makes sense? Can you write another expression to represent Evan's share of this year's prize money?

Possible answers: Agree, multiplying by $\frac{1}{2}$ or 0.5 or dividing by 2 are equivalent. Students may also take $\frac{1}{2}$ of the second amount and subtract it from $\frac{1}{2}$ of the first amount.

▶ Concept Extension

Use a table to evaluate expressions.

- Provide students with the following situation: *You work at a store that rents video games for $4.*
- Ask a volunteer to share the expression that represents the amount the store earns when it rents *g* games. [4*g*]
- Complete the table by substituting the given number of games into the expression to determine the amount earned.

Number of Games	Expressions	Amount Earned
g	$4 \cdot g$	4*g*
15		
40		
45		

Connect It Now you will solve the problem from the previous page using the picture and model.

19 Look at *Model It* on the previous page. This year's prize is "$20 less than" another amount. Will 20 be the first amount or the second amount? Explain.

second amount; 20 is subtracted from an amount.

20 Explain how to write an expression for "three times last year's prize."

x is last year's prize so $3x$ is 3 times last year's prize.

21 Write an expression for "$20 less than three times last year's prize." _____ **$3x - 20$**

22 Chandler writes the expression $\frac{1}{2}(3x - 20)$ to represent Evan's winnings. Is she correct? Explain.

Yes; multiplying by one-half is the same as dividing by 2.

23 Explain how you can find how much money Evan wins if last year's prize was $50.

Evaluate the expression $\frac{3x - 20}{2}$ for $x = 50$; $\frac{3(50) - 20}{2} = \frac{150 - 20}{2} = \frac{130}{2} = 65$;

Evan wins $65.

Try It Use what you just learned to solve this problem. Show your work on a separate sheet of paper.

24 The price of one share of XYZ Inc.'s stock drops by $0.02 on Monday. On Tuesday, the price goes back up by $0.05.

Write an expression with three terms to show the change in price of XYZ stock.

$s - 0.02 + 0.05$

If one share of XYZ stock cost $34.18 at the start of business on Monday morning, what is the price of one share of XYZ stock at the close of business on Tuesday evening?

$34.21

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Step By Step

Connect It

- Read **Connect It** as a class. Be sure to point out that the questions refer to the problem on the previous page.

▶ **English Language Learners**

- Clarify different ways to represent "3 times last year's prize." [$3x$, $3 \cdot x$, $3(x)$, and noting that $3xx$ is incorrect]
- Regarding problem 22, ask the class to share alternate ways which Chandler could write the expression $\frac{1}{2}(3x - 20)$.
  [Examples: $\frac{(3x - 20)}{2}$, $0.5(3x - 20)$]
- Remind students to follow the order of operations when evaluating expressions.

Try It

24 **Solution**

$s - 0.02 + 0.05$; $34.21; Students find an expression with three terms to show the change in the price of XYZ stock, then evaluate it.

Error Alert Students who wrote $s - 0.2 + 0.5$ did not transfer the numeric values accurately.

Ready **Mathematics**
PRACTICE AND PROBLEM SOLVING

Assign *Practice and Problem Solving* **pages 177–178** after students have completed this section.

▶ **English Language Learners**

Emphasize that the word "than" in "is less than" means the operation is written in a different order. Refer students to alternative phrases to aid in clarification. For example: "20 less than a number" can be phrased as "20 removed from a number" or "20 subtracted from a number."

Lesson 16 Algebraic Expressions
👥 Guided Practice

At A Glance

Students will solve problems by writing and evaluating expressions.

Step By Step

- Ask students to solve the problems individually by writing and evaluating expressions.

- **Pair/Share** When students have completed each problem, have them Pair/Share to discuss their solutions with a partner or in a group.

Solutions

Example $65h + 40$; 235 miles; when $h = 3$, $65(3) + 40 = 235$.

25 Solution
$\frac{m}{3} - 2$, Georgia is 7 years old;
Students could solve the problem by writing $\frac{m}{3} - 2 = \frac{27}{3} - 2 = 9 - 2 = 7$.

DOK 2

Lesson 16 👥 Guided Practice

Practice ▶ **Writing and Evaluating Expressions**

Study the example below. Then solve problems 25–27.

Example

During a car trip, LaTasha drives 65 miles per hour for several hours. She stops for gasoline, and then drives 40 miles more.

Write an expression to show how many miles LaTasha drives in all. Use your expression to find how many miles she drives in all if she drives for 3 hours before stopping for gasoline.

Look at how you could show your work using a model.

Miles before stop	+	Miles after stop

Miles before stop is "65 miles per hour for several hours": $65h$
Miles after stop is "40 miles more": 40
Total miles is $65h + 40$; evaluate for $h = 3$.
$65(3) + 40 = 195 + 40 = 235$

Solution $65h + 40$; LaTasha drives a total of 235 miles.

This student used a model to think about the terms and operations Then, the student wrote an expression and evaluated it for $h = 3$.

💬 **Pair/Share**
Are there any other expressions that would also be correct?

---

25 Georgia is 2 years younger than $\frac{1}{3}$ of her Aunt Mika's age. Write an expression that describes Georgia's age. How old is Georgia if her Aunt Mika is 27?

Show your work.
$\frac{m}{3} - 2$
$\frac{27}{3} - 2 = 9 - 2 = 7$

Finding $\frac{1}{3}$ of an amount is the same as dividing that amount by 3.

💬 **Pair/Share**
Would the expression $m - 20$ always give Georgia's age correctly?

Solution $\frac{m}{3} - 2$; Georgia is 7 years old.

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Teacher Notes

26 Shane buys 3 books. Each book is the same price. He also must pay $0.35 tax on each book. Write an expression to show the total cost of the books. If the price of each book is $5.15, how much does Shane spend in all?

The total cost of each book is its price plus tax.

Show your work.

$3(b + 0.35)$

$3(5.15 + 0.35) = 3(5.5) = 16.50$

Solution $3(b + 0.35)$; Shane spends a total of $16.50.

Pair/Share
How many terms are in the expression you wrote? Explain how you know.

27 Christi alters a skirt. She cuts 7 inches off the bottom of the skirt and then adds a 5-inch ruffle to the skirt's remaining bottom edge. Which expression best represents the final length of the skirt?

A $2 - s$

B $2 + s$

C $s - 2$

D $s - 12$

I can draw a picture to help myself understand this problem.

Evan chose **D** as the correct answer. How did he get that answer?

He wrote the expression $s - 7 + 5$ and then simplified it working right to left instead of left to right. He did not follow the order of operations.

Pair/Share
Talk about the problem and then write your answer together.

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Solutions

26 **Solution**

$3(b + 0.35)$; Shane spends a total of $16.50; Students could solve the problem by writing $3(b + 0.35) = 3(5.15 + 0.35) = 3(5.5) = 16.50$.

DOK 2

27 **Solution**

C; Evan wrote the expression $s - 7 + 5$, then simplified it working right to left instead of left to right. He did not follow the order of operations.

Explain to students why the other two answer choices are not correct.

A is not correct because 2 inches are being removed from the skirt ($s - 2$).

B is not correct because 2 inches is the amount being removed from the skirt, not added.

DOK 3

Ready **Mathematics**
PRACTICE AND PROBLEM SOLVING

Assign *Practice and Problem Solving* **pages 179–180** after students have completed this section.

Teacher Notes

Lesson 16 Algebraic Expressions

👤 Independent Practice

At A Glance

Students write, read, and evaluate expressions that contain variables that might appear on a mathematics test.

Solutions

1 **Solution**

C; $5x^3$, $-2x^3$ and $6x$ are variable terms, each with a coefficient. -4 is the constant term.
DOK 1

2 **Solution**

A; Mila's dog weighs $8 \cdot k$ or $8k$ and an additional 4 more pounds. So, Mila's dog weighs $8k + 4$ pounds.
DOK 2

3 **Solution**

See student book page for solution. Find the mathematical expression that matches the verbal description.
DOK 1

Quick Check and Remediation

- Present this situation to students: *Tom's cucumber garden is 4 square feet less than twice the size of the tomato garden. Tom divides the cucumber garden into thirds to share with his brothers. Write an expression to represent the total area of the cucumber garden given to each brother. If the tomato garden is 123.5 square feet, how many square feet did each brother receive?* [$\frac{2g - 4}{3}$; 81 square feet]

- For students who are struggling, use the chart to guide remediation.

- After providing remediation, check students' understanding. Present this situation: *Sue's farm is 4 square miles more than three times the size of Joe's. Sue shares half her farm with her sister. Write an expression to represent the size of Sue's farm. If Joe's farm is 2 square miles, how many square miles does Sue share with her sister?* [$\frac{3j + 4}{2}$; 5 square miles]

Lesson 16 👤 Independent Practice

Practice **Writing and Evaluating Expressions**

Solve the problems.

1 How many coefficients are in the expression $5x^3 - 2x^2 + 6x - 4$?

A 1
B 2
(C) 3
D 4

2 Mila's dog weighs 4 pounds more than 8 times the weight of Keiko's dog. Which expression could be used to find the weight of Mila's dog?

(A) $8k + 4$
B $4k + 8$
C $4(8k)$
D $4 + 8 + k$

3 Match the algebraic expression with its English meaning by writing the expression in the appropriate box. *Not all expressions will have a match.*

| $5 - 2x$ | $5x + y$ | $x^2 - 5$ | $5x - 2$ | $(25x)^2$ | $(5 - x)^2$ | $2x - 5$ | $5(x + y)$ |

"Five less than twice a number"	"Five times the sum of two numbers"	"The difference of 5 and a number, squared"
$2x - 5$	**$5(x + y)$**	**$(5 - x)^2$**

4 Which of these expressions equal 15 when $x = \frac{1}{2}$ and $y = 3$? Circle all that apply.

(A) $4(2y - 4x) - 1$
B $4x^2 + 2y^3 - 10$
(C) $4(x^2 + 1) + 2x + 3y$
(D) $xy + 3\frac{1}{2} + 20x$
E $\frac{9}{y} + 14x^2$

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If the error is . . .	Students may . . .	To remediate . . .
incorrect operations	have vocabulary confused.	Connect the meaning of sum, product, quotient, and difference with operational symbols.
$\frac{4 - 2g}{3}$	have confused the two terms.	Focus on the importance of order when writing expressions.
$245\frac{2}{3}$	have forgotten the order of operations.	Review the order of operations.
any other answers	have trouble translating to an algebraic expression from a verbal expression.	Remediations will vary. Depending on the student, highlight the operating terms; write phrases to summarize the operations; create a box model from the phrases; use algebra tiles to model the box model; write an expression from the models; or apply the order of operations to evaluate the expression.

5 Keenan gives Tisha half of his strawberries. Tisha keeps 4 of the strawberries she got from Keenan and gives the rest to Suvi.

Part A Write an expression for the number of strawberries Tisha gives to Suvi. Use k for the number of strawberries Keenan started with.

Answer ___Possible answer: $\frac{1}{2}k - 4$___

Part B Could Keenan have started with 6 strawberries? Use your expression to explain why or why not.

Show your work. $\quad \frac{1}{2}k - 4 = \frac{1}{2}(6) - 4 = 3 - 4$

Answer ___No. Tisha gets only 3 strawberries from Keenan, so she can't keep 4.___

6 Jason paints $\frac{1}{4}$ of the area of his living room walls, w, on Monday. On Tuesday, he paints twice as much as he painted on Monday.

Part A Write an expression to find the remaining unpainted area.

Show your work.
$$w - \frac{1}{4}w - 2\left(\frac{1}{4}w\right)$$
$$= w - \frac{1}{4}w - \frac{2}{4}w$$
$$= \frac{1}{4}w$$

Answer ___$\frac{1}{4}w$___

Part B Jason's living room has 210 square feet of wall. How much wall is left to paint?

Show your work. $\quad \frac{1}{4}(210) = 52.5$

Answer ___52.5 square feet___

✔ **Self Check** Go back and see what you can check off on the Self Check on page 143.

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Solutions

4 **Solution**
A; Substitute $\frac{1}{2}$ for x and 3 for y into the expression. Then evaluate.
C; Substitute $\frac{1}{2}$ for x and 3 for y into the expression. Then evaluate.
D; Substitute $\frac{1}{2}$ for x and 3 for y into the expression. Then evaluate.
DOK 1

5 **Part A Solution**
$\frac{1}{2}k - 4$

Part B Solution
No; $\frac{1}{2}(6) = 3$. Tisha cannot keep 4 strawberries if she gets only 3. See student book page for possible student work.
DOK 3

6 **Part A Solution**
$w - \frac{1}{4}w - 2(\frac{1}{4}w) = \frac{1}{4}w$; See student book page for possible student work.

Part B Solution
52.5 square feet; See student book page for possible student work.
DOK 3

▶ **Hands-On Activity**

Use a box model to solve problems.

Present students with the following: *A store has CDs on sale for $12 each and DVDs on sale for $15 each.*

1. Create a box model to translate the expression.

2. Write an expression that gives the total cost for CDs and DVDs.

3. Provide a table to evaluate the expression for different values of CDs and DVDs.

▶ **Challenge Activity**

Use a table to evaluate different values.

Present students with the following: *A store has CDs on sale for $8 each and DVDs on sale for $15 each.*

1. Create a box model to translate the expression.

2. Write an expression that gives the total cost for CDs and DVDs.

3. Provide a table to evaluate the expression for different values of CDs and DVDs.

4. If Shannon has $150 dollars to spend, what are the possible combinations of CDs and DVDs she can purchase? Explain your possibilities.

LESSON QUIZ

Lesson 16
Algebraic Expressions

Teacher-Toolbox.com

Overview

Assign the Lesson 16 Quiz and have students work independently to complete it.

Use the results of the quiz to assess students' understanding of the content of the lesson and to identify areas for reteaching. See the Lesson Pacing Guide at the beginning of the lesson for suggested instructional resources.

Tested Skills

Assesses 6.EE.A.2a, 6.EE.A.2b, 6.EE.A.2c

Problems on this assessment form require students to be able to write, read, and evaluate expressions, translate an expression from words to an algebraic expression and vice versa, and identify parts of expressions using mathematical vocabulary. Students will also need to be familiar with the order of operations and properties of operations and exponents.

Ready® **Mathematics**

Lesson 16 Quiz

Solve the problems.

1 Match the algebraic expression with its English meaning by writing the expression in the appropriate column. Not all expressions will be used.

| $3 - 6x$ | $3(6 - x)$ | $6 - x^3$ | $6x - 3$ | $3(x - 6)$ | $x^3 - 6$ | $(6 - x)^3$ |

"Three less than six times a number"	"Triple the difference of six less than a number"	"Subtract six from a number cubed"

2 Tell whether each statement about the expression $5y + 9$ is *True* or *False*.

a. The number 5 in the expression is a constant. ☐ True ☐ False

b. The expression has one variable term. ☐ True ☐ False

c. The variable in the expression is y. ☐ True ☐ False

d. The number 5 is not a coefficient in the expression. ☐ True ☐ False

e. The expression has three terms. ☐ True ☐ False

3 Oliver makes blueberry jam every year. The number of pints of jam he makes this year can be represented by the expression $4p - 9$, where p is the number of pints of jam he made last year.

Oliver made 8 pints of jam last year. How many pints does he make this year?

Show your work.

Answer: _____ pints

Lesson 16 Quiz continued

4 Eliza reads $\frac{1}{7}$ of her book on Monday. On Tuesday and Wednesday combined, she reads three times as much as she reads on Monday. The expression $\frac{1}{7}r + 3\left(\frac{1}{7}r\right)$ can be used to determine the number of pages Eliza reads on Monday, Tuesday, and Wednesday combined. The variable r represents the total number of pages in the book.

Part A

Eliza's book has a total of 357 pages. How many pages does Eliza read on Monday, Tuesday, and Wednesday combined?

A   306

B   204

C   153

D   51

Part B

Renee reads the same fraction of a different book over the same period of time as Eliza. Renee's book has a total of 406 pages. How many more pages does Renee read than Eliza?

Fill in the blanks to complete the statements.

Renee reads a total of _____ pages.

She reads _____ more pages than Eliza.

5 Humberto evaluates the expression $4t^2$ for $t = 3$. He correctly substitutes 3 for t in the expression, but then says that the value is 144.

Fill in the blanks to explain Humberto's error.

Humberto first multiplied _____ by _____ to get _____.

Then he multiplied _____ by itself to get a value of 144. He should have

first multiplied _____ by itself. Then he should have multiplied the

result, _____, by _____.

The correct value of the expression is _____.

Common Misconceptions and Errors

Errors may result if students:

• confuse vocabulary for coefficient, constant, term, variable term, and variable.

• ignore parentheses.

• confuse the operation or the order of operations when translating the verbal expression to the algebraic expression or vice versa.

• evaulate exponents incorrectly by adding or multiplying by the exponent instead of multiplying the value by itself.

***Ready*® Mathematics**

Lesson 16   Quiz Answer Key

1.

"Three less than six times a number"	"Triple the difference of six less than a number"	"Subtract six from a number cubed"
$6x - 3$	$3(x - 6)$	$x^3 - 6$

DOK 1

2. a. False
   b. True
   c. True
   d. False
   e. False
   DOK 1

3. 23
   DOK 2

4. *Part A:*
   B
   DOK 2

   Part B:
   232
   28
   DOK 2

5. 4
   3
   12
   12
   3
   9
   4
   36
   DOK 3

Steps for Identifying Daily Mathematical Learning Goals

Step 1: Use *Ready Mathematics* **to identify what students should know/understand, be able to do, and what models/representations they might use in the multi-day lesson. This step will give you the overall learning progression of the multi-day lesson.**

- Read the first page of the Lesson front matter (CCSS Focus, Lesson Objectives, Prerequisite Skills, Lesson Vocabulary, Learning Progression) to get an overview of the lesson.

- Read the progression chart at the front of the unit to see how this lesson fits into the learning progression.

- Complete the Lesson Quiz.

- Read through the Tested Skills section and the Common Misconceptions and Errors section on the Lesson Quiz pages of the Teacher Resource Book.

Step 2: Use the sections you read and the Lesson Quiz problems you completed to identify mathematical learning goals, prerequisite understanding, and common errors/misconceptions for the overall multi-day lesson.

Students will know and be able to...	Students might use (models/representations/tools)...

Prerequisite Understanding:	Common Errors and Misconceptions:

Step 3: This step provides a way to think through preparing for a day of the multi-day lesson.

As you prepare for a day of the lesson, read the At a Glance section, work through the problem and questions, and read the notes in the Teacher Resource Book, paying particular attention to the Mathematical Discourse questions. Use this work to identify the mathematics that students are learning in each day of the lesson.

A "Thinking through Teaching…" Lesson Preparation guide is available for each day to provide support in preparing for instruction. Space is provided on each "Thinking through Teaching…" Lesson Preparation guide for identifying the mathematical learning goals for that particular day. "Thinking through Teaching…" guides are available for each part of a *Ready* lesson.

- Introduction Day

- Modeled and Guided Instruction Days (Grades 2–8)/Modeled Instruction Day (Grades K–1)

- Modeled and Guided Instruction Days, if applicable (Grades 2–8)/Guided Instruction Day (Grades K–1)

- Guided Practice Day

- Independent Practice Day

▶ **Notes**

Introduction Days of Developing Skills and Strategies Lessons

This is a tool for selecting *Ready Mathematics* components and considering key questions regarding teaching the day. It is not intended that every question be answered, but rather as a best-practice guide for thinking through preparation for the day.

Lesson: **Day:**

Mathematical Learning Goals for the Day:

Consider the Planning Backwards process to identify the mathematical goals for this day.

Students will know and be able to...	Students might use (models/representations/tools)...

Thinking through Your Teaching Plan:

LESSON FLOW	*Ready* Components *The teacher or students use...*	Questions to Consider When Preparing for This Day	Preparation Notes
START OF DAY	From a prerequisite lesson: • Quick Check and Remediation problem as a formative assessment, and/or • Problems/tutorials for activating prior knowledge/reteaching.	• How will you assess understanding of prerequisite knowledge? • If needed, what will you use to activate prior knowledge/reteach concepts?	
TRANSITION TO NEW CONTENT	• The Teacher Resource Book Lesson Front Matter (Lesson Objectives, Prerequisite Skills, Learning Progression).	• What statement will you make to transition students from prior knowledge and/or previous day's learning to new topics/learning?	
STEP 1: MAKE SENSE OF THE PROBLEM	With students' books closed: • Step 1 of the Think-Share-Compare (TSC) slides (Gr. 2–8).	• How will you support students in understanding the context of the problem and what they are asked to do without taking away the challenge?	
STEP 2: SOLVE AND SUPPORT YOUR THINKING	With students' books closed: • Step 2 of the TSC slides (Gr. 2–8).	• What manipulatives/tools from the students' toolkits will they likely use?	

Start — spans START OF DAY and TRANSITION TO NEW CONTENT

Teach — spans STEP 1 and STEP 2

LESSON FLOW	*Ready* Components *The teacher or students use...*	Questions to Consider When Preparing for This Day	Preparation Notes
Teach — STEP 3: DISCUSS	With students' books closed: • Step 3 of the TSC slides (Gr. 2–8).	• What solution strategies do you anticipate students will use? • What misconceptions or errors are students likely to have/make? • What questioning strategies can you use to encourage student-to-student conversations about their thinking, reasoning, and solution strategies? • What resources will you use to prompt mathematical discourse?	
STEP 4: COMPARE	With students' books closed: • Step 4 of TSC slides (Gr. 2–8).	• What strategies are the most important to include in the whole class discussion to advance to goals of the lesson? • How will you select and sequence the student-generated strategies to be shared and discussed in order to support all students to engage in the discussions? • What questions will you ask to prompt students to make connections among their own models and representations? • What resources will you use to prompt mathematical discourse?	
STEP 5: CONNECT AND REFLECT	With students' books closed: • Step 5 of TSC slides (Gr. 2–8). • Teacher-developed questions based on the Find Out More.	What questions will you ask to prompt students to: • Analyze the representations, pictures, strategies, and/or definitions from Find Out More? • Make connections to the new concepts from Find Out More?	
Close — STEP 6: APPLY	• Reflect questions.	• Will you discuss the Reflect question as a class or collect it to inform instruction for the next day?	
PRACTICE / HOMEWORK	• Practice and Problem Solving (PPS) corresponding to this day of the lesson or Fluency Practice pages.	• What will you assign to have students apply the day's learning? How will students complete the assignment? • How will you use the assignment to formatively assesses understanding and inform planning?	
Differentiate — ADDITIONAL INSTRUCTION	• Activities in the Teacher Resource Book (Hands-On Activities, Visual Models, Challenge Activities, Concept Extensions). • Resources on the Online Teacher Toolbox (Tools for Instruction, Center Activities, parts of prerequisite lessons).	• Will you provide additional instruction using *Ready Mathematics* resources? If so, what will you use? • When and how will you incorporate the additional instruction?	

Modeled and Guided Instruction Days of Developing Skills and Strategies Lessons

This is a tool for selecting *Ready Mathematics* components and considering key questions regarding teaching the day. It is not intended that every question be answered, but rather as a best-practice guide for thinking through preparation for the day.

Lesson: | **Day:**

Mathematical Learning Goals for the Day:

Consider the Planning Backwards process to identify the mathematical goals for this day.

Students will know and be able to...	Students might use (models/representations/tools)...

Thinking through Your Teaching Plan:

LESSON FLOW	*Ready* Components *The teacher or students use...*	Questions to Consider When Preparing for This Day	Preparation Notes
START OF DAY	• A problem from a previous day or a prerequisite lesson: Practice and Problem Solving question, Try It (Gr. 2–8), or Talk About It (Gr. 1).	• What problem/activity will you use for students to connect to the previous day or prior learning? • How will students engage in the problem/activity?	
TRANSITION TO NEW CONTENT	• The Teacher Resource Book Lesson Front Matter (Lesson Objectives, Prerequisite Skills, Learning Progression).	• What statement will you make to transition students from prior knowledge and/or previous day's learning to new topics/learning?	
STEP 1: MAKE SENSE OF THE PROBLEM	With students' books closed: • Step 1 of TSC slides (Gr. 2–8). • Display the problem (Gr. K–1).	• How will you support students in understanding the context of the problem and what they are asked to do without taking away the challenge?	
STEP 2: SOLVE AND SUPPORT YOUR THINKING	With students' books closed: • Step 2 of TSC slides (Gr. 2–8). • Display the problem (Gr. K–1).	• What manipulatives/tools from the students' toolkits will they likely use?	

Start — **Teach**

LESSON FLOW	*Ready* Components *The teacher or students use...*	Questions to Consider When Preparing for This Day	Preparation Notes
Teach — STEP 3: DISCUSS	With students' books closed: • Step 3 of TSC slides (Gr. 2–8). • Display the problem (Gr. K–1).	• What solution strategies do you anticipate students will use? • What misconceptions or errors are students likely to have/make? • What questioning strategies can you use to encourage student-to-student conversations about their thinking, reasoning, and solution strategies? • What resources will you use to prompt mathematical discourse?	
STEP 4: COMPARE	With students' books closed: • Step 1 of TSC slides (Gr. 2–8). • Display the problem (Gr. K–1). With students' books open: • Step 4 of TSC slides (Gr. 2–8). • Display the problem (Gr. K–1).	• What strategies are the most important to include in the whole class discussion to advance to goals of the lesson? • How will you select and sequence the student-generated strategies to be shared and discussed in order to support all students to engage in the discussions? • What questions will you ask to prompt students to make connections among their own models/representations and to the Picture It/Model It representations in *Ready*? • What resources will you use to prompt mathematical discourse?	
STEP 5: CONNECT AND REFLECT	• Step 5 of TSC slides (Gr. 2–8). • Teacher Resource Book questions in Mathematical Discourse and/or the Step By Step (Gr. K–1).	• How will students work on Connect It questions (independently/small groups) as a means to formalize and record the learning of the day? • Which Connect It questions are the most important to discuss together as a class?	
Close — STEP 6: APPLY	• Try It questions (Gr. 2–8). • Talk About It questions or questions from the Practice and Problem Solving book (Gr. K–1).	• Will you discuss any of these question as a class or collect them to inform the next day of instruction?	
PRACTICE / HOMEWORK	• Practice and Problem Solving (PPS) corresponding to this day of the lesson or Fluency Practice pages.	• What will you assign to have students apply the day's learning? How will students complete the assignment? • How will you use the assignment to formatively assesses understanding and inform planning?	
Differentiate — ADDITIONAL INSTRUCTION	• Activities in the Teacher Resource Book (Hands-On Activities, Visual Models, Challenge Activities, Concept Extensions). • Resources on the Online Teacher Toolbox (Tools for Instruction, Center Activities, parts of prerequisite lessons).	• Will you provide additional instruction using *Ready Mathematics* resources? If so, what will you use? • When and how will you incorporate the additional instruction?	

Guided Practice Days of Skills and Strategies Lessons

This is a tool for selecting *Ready Mathematics* components and considering key questions regarding teaching the day. It is not intended that every question be answered, but rather as a best-practice guide for thinking through preparation for the day.

Lesson: _____   **Day:** _____

Mathematical Learning Goals for the Day:

Consider the Planning Backwards process to identify the mathematical goals for this day.

Students will know and be able to...	Students might use (models/representations/tools)...

Thinking through Your Teaching Plan:

LESSON FLOW	*Ready* Components *The teacher or students use...*	Questions to Consider When Preparing for This Day	Preparation Notes
START OF DAY	• On-Level Interactive Lesson Tutorial, and/or • An Example problem from Practice and Problem Solving (or a problem from a previous day).	• What problem/activity will you use for students to connect to the previous day or prior learning? • How will students engage in the problem/activity?	
TRANSITION TO NEW CONTENT	• Summary of concepts of the Lesson.	• How will you have students recall and summarize what they have learned so far? • How will you support students as they apply all of the learning of the lesson for the first time?	

Start

LESSON FLOW	*Ready* Components *The teacher or students use...*	Questions to Consider When Preparing for This Day	Preparation Notes

Teach / IMPLEMENTATION	• Guided Practice problems.
	• Pair/Share questions (in the student book for Gr. 2–8 or Teacher Resource Book for Gr. K–1).
		• How will you approach the Guided Practice day?
		  ○ Use Think-Share-Compare and/or other collaboration and discourse routines to have students solve, discuss, and analyze the problems one at a time, or
		  ○ Have students work collaboratively, in pairs or small groups, on the problems, only bringing the whole group together to discuss key problems, models/methods, and/or misconceptions as needed.
		• Will you support students in understanding the context of the problem and what they are asked to do, or will you remove this scaffolding at this time?
		• What manipulatives/tools from the students' toolkits will they likely use?
		• What strategies are the most important to include in the whole class discussion to advance to goals of the lesson?
		• How will you select and sequence the student-generated strategies to be shared and discussed in order to support all students to engage in the discussions?
		• What questions will you ask to prompt students to make connections among their own models and representations?
		• What resources will you use to prompt mathematical discourse?	

Close / FORMATIVE ASSESSMENT	• Quick Check and Remediation questions.	• How will you use the Quick Check and Remediation questions (or other *Ready Mathematics* questions) to formatively assess students' understanding? • How will these questions inform planning for the Independent Practice Day?	
PRACTICE / HOMEWORK	• Practice and Problem Solving (PPS) corresponding to this day of the lesson or Fluency Practice pages.	• What will you assign to have students apply the day's learning? How will students complete the assignment? • If you want to accelerate pacing, also assign the Independent Practice.	
Differentiate / ADDITIONAL INSTRUCTION	• Activities in the Teacher Resource Book (Hands-On Activities, Visual Models, Challenge Activities, Concept Extensions). • Resources on the Online Teacher Toolbox (Tools for Instruction, Center Activities, parts of prerequisite lessons).	• Will you provide additional instruction using *Ready Mathematics* resources? If so, what will you use? • When and how will you incorporate the additional instruction?	

Independent Practice Days of Skills and Strategies Lessons

This is a tool for selecting *Ready Mathematics* components and considering key questions regarding teaching the day. It is not intended that every question be answered, but rather as a best-practice guide for thinking through preparation for the day.

Lesson: [   ]   **Day:** [   ]

Mathematical Learning Goals for the Day:

Consider the Planning Backwards process to identify the mathematical goals for this day.

Students will know and be able to...	Students might use (models/representations/tools)...

Thinking through Your Teaching Plan:

LESSON FLOW	*Ready* Components *The teacher or students use...*	Questions to Consider When Preparing for This Day	Preparation Notes
Start — **START OF DAY**	• A problem from a previous day of the lesson, or • Interactive Tutorial for the current lesson.	• What will you use to reinforce concepts that students need to strengthen?	
Teach — **IMPLEMENTATION OPTION 1: DIFFERENTIATED STATIONS***	Stations (or station rotations) on: • The Independent Practice/ Practice by Myself problems, Practice and Problem Solving problems, or Fluency Practice, or • Teacher Resource Book activities for teacher-led, on-level or prerequisite remediation, • Toolbox resources for on-level reteaching or prerequisite review, and/or • *i-Ready Instruction* digital lessons.	• How will you use Quick Check questions and other formative assessments from the *Ready* lesson to divide students into groups? • How will you use *i-Ready* data to inform how to group students? (If available) • Which stations will you set up? Will all students visit all stations? • What *Ready Mathematics* and *i-Ready* resources will you have students complete at each station to effectively differentiate instruction? • Do any of the stations require that you show students what to do at the station ahead of time? • Will you pull the whole group back together at any point to discuss key problems, models/methods, and/or misconceptions?	

LESSON FLOW	*Ready* Components *The teacher or students use...*	Questions to Consider When Preparing for This Day	Preparation Notes
INDEPENDENT PRACTICE*	Independent work on: • The Independent Practice/Practice by Myself problems, and/or • Fluency Practice.	• How will you monitor and support students as they work independently through the problems? • Will you pull the whole group back together at any point for a discussion on key problems, models/methods, and/or misconceptions? • Will you conference with select students or groups of students during this independent practice time?	
OPTIONAL FORMATIVE ASSESSMENT	• An Independent Practice/Practice by Myself problem or a problem(s) from the Practice and Problem Solving book.	• Will you use one of the problems from this day or another question in *Ready Mathematics* to formatively assess students one last time before administering the Lesson Quiz? • Will you pull the whole group back together for a discussion on this problem/question?	
OPTIONAL PRACTICE / HOMEWORK	• Remaining Practice and Problem Solving problems and/or Fluency pages from the back of Practice and Problem Solving.	• Will you assign additional practice prior to administering the Lesson Quiz (classwork or homework)?	
LESSON QUIZ	• Lesson Quiz.	• How much time will students have to complete the Lesson Quiz? • When will you administer the Lesson Quiz (at the end of this day or at another time)? Will they have enough time to process what they learned on this day before taking the quiz? • What additional teaching and learning will be provided for students who do not perform well?	

* If pacing is an issue, consider using the problems from the Independent Practice/Practice By Yourself days as part of the homework (with Practice and Problem Solving) for the Guided Practice Day.

Skills and Strategies Lesson Introduction Days*

Purpose: Activates prior knowledge, connecting what students already know with the new skills and concepts they will be learning.

LESSON FLOW	*Ready* Components *The teacher or students use...*	Teacher Moves: *The teacher…*	Student Actions: *Students…*
Start — START OF DAY	• Quick Check, problems, and/or tutorials from a prerequisite lesson.	• Engages students in a problem that connects previous learning to new concepts (warm-up, fluency practice, number talks, etc.)	• Actively participate in completion and/or discussion of the problem/activity.
Start — TRANSITION TO NEW CONTENT	• Lesson Objectives or Progressions from the Teacher Resource Book.	• Makes a statement of transition from prior knowledge to the new topic/learning for this Day.	• Actively listen while the teacher transitions to the new topic/learning of the Day.
Teach — STEP 1: MAKE SENSE OF THE PROBLEM	With students' books closed: • Step 1 of the Think-Share-Compare (TSC) slides (Gr. 2–8).	• Ask multiple students to explain the context of the problem and what they are asked to do, guiding students to build upon one another until the class agrees their explanation is accurate.	• Can explain what the problem is about. • Can explain what they are being asked to do.
Teach — STEP 2: SOLVE AND SUPPORT YOUR THINKING	With students' books closed: • Step 2 of the TSC slides (Gr. 2–8).	• Provides time for independent thinking. • Makes a variety of manipulatives/tools available, without being prescriptive. • Circulates through the room to support students who struggle.	• Work independently. • Persevere in developing their own solution strategy. • Select and use appropriate manipulatives and tools.
Teach — STEP 3: DISCUSS	With students' books closed: • Step 3 of the TSC slides (Gr. 2–8).	• Provides time for pairs/small groups of students to discuss and compare their solution strategies. • Circulates, asking students to explain their thinking/solutions and posing questions based on students' reasoning and work. • Monitors students' solution strategies to inform selecting and sequencing in **Step 4: Compare.** • Prepares students for sharing and explaining solutions.	• Work collaboratively in pairs or small groups. • Remain actively engaged in solving the problem. • Explain and justify their strategies to each other and to the teacher and politely critique the reasoning of others. • Use manipulatives and tools correctly, as appropriate. • Prepare to share a solution strategy with the class during **Step 4: Compare.**

* For Gr. 1, use the Teacher Resource Book for implementation guidance.

LESSON STEP	*Ready* Components *The teacher or students use...*	Teacher Moves: *The teacher…*	Student Actions: *Students…*
STEP 4: COMPARE	With students' books closed: • Step 4 of TSC slides (Gr. 2–8).	• Selects 2-4 students to share their solutions in a sequence that supports all students in engaging in the discussion. • Uses questioning strategies to prompt student-to-student discourse and make connections among representations. • Guides students to discuss and resolve errors/misconceptions. • Allows sufficient time for discourse.	• Present and explain their own solution methods, referencing their models/representations. • Explain and/or critique the reasoning of others, referring to each other's models/representations.
STEP 5: CONNECT AND REFLECT	With students' books closed: • Step 5 of TSC slides (Gr. 2–8). • Teacher-developed questions based on the Find Out More.	• Uses questions to have students analyze the representations, pictures, strategies, and/or definitions from Find Out More. • Develops and uses questioning strategies to prompt students to make connections to the new concepts in the Find Out More.	• Complete and/or discuss the problems/ideas from the Find Out More section using the TSC slides. • Make connections between their work, the work of other students, and the concepts in the Find Out More.
STEP 6: APPLY	• Reflect questions.	• Has students work on an assignment (usually independently) to apply the learning of the day. • Assesses students' work and uses it to inform future instruction.	• Reflect on the learning of the day while demonstrating flexible use of strategies to solve new problems. • Begin to show some understanding of the lesson goal(s).
PRACTICE / HOMEWORK	• Practice and Problem Solving (PPS) corresponding to this day of the lesson or Fluency Practice pages.	• Assigns additional practice.	• Demonstrate understanding of practice assignment and complete assignment in class or at home.
ADDITIONAL INSTRUCTION (OPTIONAL)	• Activities in the Teacher Resource Book or on the Teacher Toolbox.	• Provides additional instruction, as needed, implemented through whole class instruction, small groups, and/or stations. • Continues to provide student think time and facilitate student discussions about the mathematics.	• Actively participate in completing and/or discussing the problems or activity.

Teach

Close

Differentiate

Skills and Strategies Lesson Modeled and Guided Days

Purpose: Explores ways to solve problems using multiple representations and prompts students to reason and explain their thinking.

LESSON FLOW	*Ready* Components *The teacher or students use...*	Teacher Moves: *The teacher…*	Student Actions: *Students…*
START OF DAY	• A problem from a previous day of the lesson or a prerequisite lesson.	• Engages students in a problem that connects previous learning to new concepts (warm-up, fluency practice, number talks, etc.)	• Actively participate in completion and/or discussion of the problem/activity.
TRANSITION TO NEW CONTENT	• Lesson Objectives or Progressions from the Teacher Resource Book.	• Makes a statement of transition from the previous day's learning to the new topic/learning for this day.	• Actively listen while the teacher transitions to the new topic/learning of the day.
STEP 1: MAKE SENSE OF THE PROBLEM	With students' books closed: • Step 1 of TSC slides (Gr. 2–8). • Display the problem (Gr. K–1).	• Asks multiple students to explain the context of the problem and what they are asked to do, guiding students to build upon one another until the class agrees their explanation is accurate.	• Explain what the problem is about. • Explain what they are being ask to do.
STEP 2: SOLVE AND SUPPORT YOUR THINKING	With students' books closed: • Step 2 of TSC slides (Gr. 2–8). • Display the problem (Gr. K–1).	• Provides time for independent thinking and makes a variety of manipulatives/tools available, without being prescriptive. • Circulates through the room to support students who struggle.	• Work independently. • Persevere in developing their own solution strategies. • Select and use appropriate manipulatives and tools.
STEP 3: DISCUSS	With students' books closed: • Step 3 of TSC slides (Gr. 2–8). • Display the problem (Gr. K–1).	• Provides time for pairs/small groups to discuss and compare their solution strategies. • Circulates, asking students to explain their thinking/solutions and posing questions based on students' reasoning and work. • Monitors students' solution strategies to inform selecting and sequencing in **Step 4: Compare.** • Prepares students for sharing and explaining solutions.	• Work collaboratively in pairs or small groups. • Remain actively engaged in solving the problem. • Explain and justify their strategies to each other and to the teacher and politely critique the reasoning of others. • Use manipulatives and tools correctly, as appropriate. • Prepare to share a solution strategy with the class during **Step 4: Compare.**

Start

Teach

LESSON STEP	*Ready* Components *The teacher or students use...*	Teacher Moves: *The teacher…*	Student Actions: *Students…*
STEP 4: COMPARE	With students' books closed: • Step 1 of TSC slides (Gr. 2–8). • Display the problem (Gr. K–1).	• Selects 2–4 students to share their solutions in a sequence that supports all students in engaging in the discussion. • Uses questioning strategies to prompt student-to-student discourse and make connections among representations. • Guides students to discuss and resolve errors/misconceptions. • Allows sufficient time for discourse.	• Present and explain their own solution methods, referencing their models/representations. • Explain and/or critique the reasoning of others, referring to each other's models/representations.
	With students' books open: • Step 4 of TSC slides (Gr. 2–8). • Display the problem (Gr. K–1).	• Has students open their books to analyze the Picture It/Model It solutions and make connections between the strategies in *Ready Mathematics* and the student-generated solutions. • Allows sufficient time for discourse.	• Make connections among student-generated solutions and the Picture/Model It solutions in *Ready Mathematics*. • Begin to show some understanding of the lesson goal(s).
STEP 5: CONNECT AND REFLECT	• Step 5 of TSC slides (Gr. 2–8). • Teacher Resource Book questions in Mathematical Discourse and/or the Step By Step (Gr. K–1).	• Has students work on questions, independently or in small groups, to formalize and record the learning of the day. • Orchestrates whole group discussion about select questions.	• Record answers to questions by reflecting on learning from their work and the classroom discussion. • Articulate their answers and critique the answers of others in small group and/or whole group discourse.
STEP 6: APPLY	• Step 6 of TSC slides (Gr. 2–8). • Talk About It questions or Practice & Problem Solving (Gr. K–1).	• Has students work on an assignment (usually independently) to apply the learning of the day. • Assesses students' work and uses it to inform future instruction.	• Reflect on the learning of the day while demonstrating flexible use of strategies to solve new problems. • Demonstrate some understanding of the lesson goal(s).
PRACTICE / HOMEWORK	• PPS corresponding to this day or Fluency Practice pages.	• Assigns additional practice for students to do in class or at home.	• Demonstrate understanding of practice assignment and persevere to complete assignment in class or at home.
ADDITIONAL INSTRUCTION (OPTIONAL)	• Teacher Resource Book (activities). • Online Teacher Toolbox (differentiation resources).	• Provides additional instruction, as needed, implemented through whole class instruction, small groups, and/or stations. • Continues to provide student think time and facilitate student discussions about the mathematics.	• Actively participate in completing and/or discussing the problems or activity.

Teach

Close

Differentiate

Skills and Strategies Lesson Guided Practice Days

Purpose: Models self-questioning and mathematical habits of mind as student solve problems and discuss their solution methods.

LESSON FLOW	*Ready* Components *The teacher or students use...*	Teacher Moves: *The teacher…*	Student Actions: *Students…*
START OF DAY *(Start)*	• Interactive Tutorial for the current lesson, • The Example problem (Gr. 2–8), or • A Practice and Problem Solving question from a previous day.	• Uses collaboration and discourse routines to promote student–student discourse. • Circulates through the room prompting students to explain and justify their reasoning.	• Explain and justify the thinking to each other and to the teacher. • Explain and/or critique the reasoning of others.
TRANSITIONING TO PRACTICING ALL CONCEPTS	• Summary of concepts of the Lesson.	• Makes a statement that outlines what students have learned so far. • Tells students they will now practice all of the concepts from the Lesson.	• Actively listen while the teacher outlines learning from the Lesson.
IMPLEMENTATION *(Teach)*	• Guided Practice problems, and • Pair/Share questions (in the student book for Gr. 2–8 or Teacher Resource Book for Gr. K–1).	• May use Think-Share-Compare and/or other collaboration and discourse routines to have students solve, discuss, and analyze the problems one at a time. • May have students work collaboratively, in pairs or small groups, on the problems, only bringing the whole group together to discuss key problems, models/methods, and/or misconceptions as needed. • Circulates through the room asking students to explain their thinking/solutions and posing questions and providing scaffolds based on students' reasoning and work.	• Actively participate in individual, small, and whole group work and discussions. • Make connections among different models/methods. • Demonstrate/verbalize understanding of how different models/methods can be used to solve problems.
FORMATIVE ASSESSMENT *(Close)*	• Quick Check and Remediation questions.	• Has students work independently on one or both of the Quick Check and Remediation questions. • Uses student work as a formative assessment to inform planning for differentiating instruction, perhaps on the Independent Practice day.	• Reflect on and apply what they have learned in the Lesson. • Demonstrate perseverance and flexible use of strategies when solving a new problem. • Demonstrate understanding of the lesson goal(s).
PRACTICE / HOMEWORK	• Practice and Problem Solving pages that correspond to this day of the lesson or Fluency Practice pages.	• Assigns additional practice for students to do in class or at home. • May also assign Independent Practice.	• Demonstrate understanding of practice/homework assignment and persevere in completing the assignment in class or at home.

Skills and Strategies Lesson Independent Practice Days

Purpose: Provides problems in a variety of assessment formats that integrate and extend concepts and skills.

LESSON FLOW	*Ready* Components *The teacher or students use…*	Teacher Moves: *The teacher…*	Student Actions: *Students…*
START OF DAY	• A problem from a previous day of the lesson, or • Interactive Tutorial for the current lesson.	• Engages students in a problem/activity that reviews a key concept from the lesson.	• Actively participate in completion or discussion of the problem/activity.
IMPLEMENTATION OPTION 1	Stations (or station rotations) on: • The Independent Practice/ Practice by Myself problems, • Teacher Resource Book activities for on-level remediation, • Toolbox resources for on-level reteaching or prerequisite review, and/or • *i-Ready Instruction* digital lessons.	• Divides students into groups based on formative assessment, students' understanding of the lesson, and/or *i-Ready* data. • Has students engage in one or more stations: ○ Independent Station: Students work independently on the Independent Practice/Practice by Myself problems. ○ Teacher-Led Station: The teacher works with small groups using on-level or prerequisite resources from the Teacher Resource Book and/or Online Toolbox. ○ Student-Led Station: Students do a Center Activity or a Practice and Problem Solving Unit Game. ○ *i-Ready* Station: Students work independently on their personalized *i-Ready* digital lessons.	• Actively participate in each assigned station.
IMPLEMENTATION OPTION 2	Independent work on: • The Independent Practice/ Practice by Myself problems, and/or • Fluency Practice.	• Has students work independently on the problems. • Circulates throughout the room to use questioning strategies and scaffold support as needed. • May pull small groups or the whole group back together to discuss key problems, models, strategies, and misconceptions.	• Actively participate in completion and/ or discussion of the problems.
FORMATIVE ASSESSMENT (OPTIONAL)	• An Independent Practice/ Practice by Myself problem or a problem(s) from the Practice and Problem Solving book.	• Has students work independently and/or collaboratively on the problem(s). • May pull the whole group back together to discuss the problem, models/methods, and/or misconceptions. • Uses student work as a formative assessment.	• Actively participate in completion and/ or discussion of the problem(s).
PRACTICE / HOMEWORK	• Remaining Practice and Problem Solving problems and/or Fluency Practice pages.	• Assigns additional practice if needed prior to administering the Lesson Quiz (classwork or homework).	• Demonstrates understanding of practice assignment.
LESSON QUIZ	• Lesson Quiz.	• Gives ample time to complete the problems. • Provides students with additional paper to draw models and show complete solutions.	• Persevere in solving problems.

Start

Teach

Close

Assessment

Tips for Planning Lessons with "*Understand*" in the Title

Review the following guidance. Read the Lesson Overview in the Teacher Resource Book just as you would for any other lesson.

For the Introduction:

- **Focus on internalizing the concept that is being introduced to students.** What is it that we want them to understand? Why?

- ***Understand* lessons mark points of significant transition as students prepare for new learning.** Given this:
  - Make connections to prerequisite knowledge. Are there opportunities to extend the Introduction with whole class or small group prerequisite review using Toolbox resources? How will you check for understanding?

- **The Introduction to *Understand* lessons often features more direct instruction than other parts of *Ready Mathematics*.** Given this:
  - **Consider having students leave their books closed.** What images from the Introduction might you display during your classroom conversation introducing the topic? What questions will you ask students? How will you integrate the questions featured in the section headings?
  - **How can you use features such as *Hands-On Activities*, the *Visual Models*, and questions from Mathematical Discourse** as opportunities to integrate all or part of *Ready Mathematics* instructional routines, continuing the classroom momentum you built using *Lesson 0*?

▶ **Notes**

For Guided Instruction:

- **Find the parallels to *Modeled and Guided Instruction* in the other lessons and use those as opportunities to integrate the *Ready Mathematics* instructional routines.** For example:
  - Can you use the Make Sense of the Problem step of the Think-Share-Compare Routine to make sure that students understand the concept in Let's Explore the Idea before opening their books?

- **The end of many of the *Let's Explore the Idea* sections have one or more problems related to the concept.** This could be an opportunity for Grades 2–8 students to use Steps 2–4 (*Solve and Support Your Thinking, Discuss, and Compare*) or for Grades K–1 students to use Steps 4–5 (*Do the Math and Compare*) of the Think-Share-Compare Routine.

- ***Let's Talk About It* sections have similarities to the *Connect It* sections in *Modeled and Guided Instruction*.** How could you use these questions to have students engage in partner and whole class conversations?

- **The *Let's Try It Another Way* sections sound similar in name to the *Try It* sections in *Modeled and Guided Instruction,* but actually introduce another way of looking at the concept.** Think about how you could have students Discuss and Compare these strategies to the others they've seen in this lesson, working in pairs or with the whole class.

For Guided & Independent Practice:

- **The *Guided Practice* provides three problems that often ask students to think critically about the concept, evaluate common misconceptions, explain their reasoning, or model what they have learned.** These are rich questions for conversation, so consider having students answer questions on their own, then Discuss and Compare their responses, first in pairs and then as part of a whole class discussion.

- **Use the *Put It Together* performance task similarly, being sure to include an opportunity for more mathematical discourse.** Simultaneously, you can use this as a formative assessment to form your groups for Differentiated Instruction.

Lesson Preparation Guide Graphic Organizer

Lesson: _____   **Day:** _____

Mathematical Learning Goals for the Day:

Consider the Planning Backwards process to identify the mathematical goals for this day.

Students will know and be able to...	Students might use (models/representations/tools)...

Thinking through Your Teaching Plan:

LESSON STEP	*Ready* Components *The teacher or students use...*	Preparation Notes
START OF DAY		
TRANSITION TO NEW CONTENT		

Start

LESSON STEP	*Ready* Components *The teacher or students use...*	Preparation Notes
Teach — STEP 1: MAKE SENSE OF THE PROBLEM		
STEP 2: SOLVE AND SUPPORT YOUR THINKING		
STEP 3: DISCUSS		
STEP 4: COMPARE		
STEP 5: CONNECT AND REFLECT		
Close — STEP 6: APPLY		
PRACTICE / HOMEWORK		
Differentiate — ADDITIONAL INSTRUCTION (OPTIONAL)		
Assessment — LESSON QUIZ		

Lesson Level Resources

Teacher Resource Book

- **Mathematical Discourse questions** engage students in mathematical reasoning and prompt conversation.
- **Hands-On Activities** support development of conceptual understanding.
- **Visual Models** support students with thinking about another strategy for making sense of a problem.
- **Concept Extensions** support building understanding around key mathematical ideas.
- **English Language Learner** feature supports the development of critical academic vocabulary.
- **Quick Check & Remediation** can be used to formatively assess student understanding and provide reteaching. A chart provides a list of incorrect answers based on common errors and gives specific remediation suggestions for each error.

Online Teacher Toolbox

- **Think-Share-Compare templates and slides** can be displayed during class to structure the Introduction and Modeled & Guided Instruction days of the lesson.
- **Practice & Problem Solving book** can be used to provide additional practice for each day of the lesson. Includes:
  - Family letters for each lesson
  - Fluency practice to promote number sense as well as computational fluency
- **Lesson Quiz** assesses student understanding after the lesson.
- **Small Group Activities** can be used to differentiate instruction.
  - Prerequisite lessons
  - Tools for Instruction
  - Math Centers (Grades K–5)

Unit Level Resources

Teacher Resource Book

- **Unit Self Check**
- **Unit Review** (Grade 1)
- **Interim Assessments** (Grades 2–8)

Online Teacher Toolbox

- **Practice & Problem Solving book** can be used to review key skills from the unit. Includes:
  - Unit Games
  - Unit Practice
  - Unit Performance Task (Grades 2–8)
- **Mid-Unit & End of Unit Assessments** can be used to assess student progress during and after the unit.

Notes

Think-Share-Compare Routine

What Is It?

The *Ready* Think-Share-Compare Routine helps children achieve greater mathematical proficiency and rigor within a collaborative structure. Children develop greater understanding of mathematical models and strategies using think time, partner talk, individual writing, and whole class discourse.

When to Use It

Use the Think-Share-Compare Routine during the Introduction, Modeled Instruction, and Guided Instruction sections of each *Ready* lesson.

Why It Matters

There are many ways to approach mathematical thinking and solutions to problems, but when only one way is presented, children may think they "didn't do it right," even when their solution process or thinking is accurate. Exposing children to a number of models and approaches helps them:

- Build mathematical confidence.
- Make connections between representations.
- Develop flexible thinking.
- Deepen and extend conceptual understanding.
- Construct viable arguments and politely critique the reasoning of others.
- Stay engaged, focused, and motivated.

Management Tips

Allow time for productive struggle.

- **Have children talk with a partner about their ideas** or try another strategy.
- **Avoid telling children** whether their approach or answers are incorrect. Instead, prompt children:
  - *Do you agree with [child's] answer? Why or why not?*

Create classroom discussion guidelines.

- **Have children listen carefully** to their partners.
- **Tell children to ask questions** if they don't understand, such as *I was confused when you said…*
- **Guide children to respect others' ideas** and add on to them.

Prepare for the classroom conversations.

- **Circulate** as children work.
- **Identify strategies and models** to highlight in the classroom discussion.
- **Sequence the strategies** you want to discuss. You may want to start with a child who has an incorrect answer or solution process to address common misconceptions and promote discussion.

Talking can help us better understand math.

Think-Share-Compare Routine

1. Make Sense of the Problem
Read and understand the problem or question. Think about the key information.

Read the problem together as a class. Make sure children understand what they are being asked to do. Ask a few children to describe what the problem is about. Have several children explain what the problem is asking them to do and what information they know.

2. Solve and Support Your Thinking
Include pictures, models, and/or explanations in your solutions. If you have time, show another way to solve it.

Allow enough time for children to persevere as they think through their solutions. Make sure children are showing the models and strategies they use.

3. Discuss
Explain your thinking to a partner. Discuss how your strategies are alike and different.

Have partners discuss their strategies. Circulate to hear conversations and select and sequence solutions to discuss with the whole class.

4. Compare
Compare your strategies with the class, including the strategies in the *Ready* book.

Call on children to share their answers and solution strategies with the class. Ask children if they agree or disagree with a child's strategy, rather than telling if the strategy is right or wrong. Show a *Ready* strategy for comparison.

5. Connect and Reflect
Complete and discuss the *Connect It* questions.

Choose key questions from the Teacher Resource Book to help children make connections and reflect on their learning.

6. Apply
Apply what you have learned to a new problem. Be sure to support your answer.

Use practice problems corresponding to the lesson in Practice and Problem Solving to give children an opportunity to apply learning in a new, similar problem.

Math Talk

What Is It?

Math Talk guidelines help all children participate in communicating about their reasoning and problem solving strategies. Standard practices for communicating verbally and non-verbally enable pairs, small groups, and whole classes to engage in productive math discussions.

When to Use It

Introduce Math Talk hand signals and conversation protocols at the beginning of the year to establish practices that can be used throughout the *Ready* lessons when children are engaging in whole class, small group, or partner conversations.

Why It Matters

Conducting effective mathematical discussions works well when children know what is expected. Consistent use of these cues reinforces positive behaviors.

These practices:

- Set the expectation that participation is valued and ensure that every child has a voice.
- Provide positive modeling for respectful, balanced interactions among children.
- Empower and enable children to talk with each other authentically and independently.
- Allow children to use silent signals to indicate their readiness to share without interfering with other children's thinking.
- Encourage risk-taking by demonstrating how learning results from mistakes.

Management Tips

To promote good discussion habits, you may wish to:

Create guidelines for talking.

- Have children **use hand signals and a louder voice** to communicate with the whole class.
- Guide children to **look** at others **and listen** carefully when they speak.
- Have **partners use "6-inch" voices**.
- Have children **ask questions** if they don't understand something.
- Encourage children to **respect others'** ideas and share their own ideas.
- Tell children **it's okay to make mistakes**— when they happen, they help us learn.

Post discussion starters for children.

- Display Discussion Starters found in Step 3 of Lesson 0. Add to the list by creating your own.
- Refer to discussion starters to help children begin talking.
- Discussion starters that fall into these general categories ensure that conversations have variety and balance:
    - **Share thinking.**
    - **Listen to the thinking of others.**
    - **Ask clarifying questions.**
    - **Disagree or agree respectfully.**

Partner Talk

Use a
6-inch voice.

Look at your
partner.

Listen to your
partner.

?

Ask
questions.

Mistakes
are OK.

**Tell children that today they will learn rules for talking with a partner
to solve math problems.**

Grade K and 1   **Math Talk**

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Whole-Class Talk

I'm thinking.

I have
an idea.

I have
another idea.

I agree.

Use a whole-
class voice.

?

Ask
questions.

Look at the
speaker.

Mistakes
are OK.

**Tell children that today they will learn rules for talking in
whole-class discussions to solve math problems.**

Grade K and 1   **Math Talk**

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Hands-On Learning

What Is It?

Hands-On Learning engages children through the use of both concrete objects (mathematical manipulatives and common objects that can represent ideas) and physical interactions (hands and fingers, kinesthetic experiences, use of space, and acting out mathematical situations).

When to Use It

Use Hands-On Learning to engage children in exploration during problem-solving. Make familiar tools available for children to choose strategies while they develop conceptual understanding and reinforce skills during practice. Use manipulatives often so that they are seen as a common element of mathematical learning.

Why It Matters

Using manipulatives and hands-on learning experiences helps children to relate concrete, visual, and abstract ideas in a developmentally appropriate sequence.
It helps children:

- Explore different ideas.
- Engage in productive struggle as they solve problems.
- Change their solutions or fix errors easily.
- Make their thinking visual more easily than in writing.
- Establish a model to refer to as they communicate their thinking verbally.

Management Tips

To promote good habits for hands-on learning, you may wish to:

Create guidelines for handling manipulatives.

- Guide children to treat objects as **math tools**.
- Discuss how the tools **connect to mathematical ideas**.
- Model and reinforce correct **usage** and **safety**.
- Prepare and provide **appropriate quantities** for the activity.
- Set expectations and routines for **storage**, **distribution**, and **sharing** of materials during use.

Post a list of common tools with their names and pictures.

- Show a **picture of the tool** along with its name.
- Encourage children to refer to manipulatives by **name** when sharing their thinking.
- Direct children's attention to the pictures of manipulatives for **ideas** when they struggle to begin solving a problem.
- Teach children to **draw simple representations** of the manipulatives to create their models.
- Refer to *SMP 5 (Use appropriate tools strategically)* to guide children in making decisions about which tools are appropriate for which problem-solving situations.

Notes

LESSON OVERVIEW

Lesson 0 *Access at Teacher-Toolbox.com*
Think-Share-Compare Routine

CCSS Focus

Domain
Geometry

Cluster
A. Identify and Describe Shapes

Standard
K.G.A.1. Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as *above, below, beside, in front of, behind,* and *next to.*
K.G.A.2. Correctly name shapes regardless of their orientations or overall size.

Standards for Mathematical Practice (SMP)

1 Make sense of problems and persevere in solving them.
3 Construct viable arguments and critique the reasoning of others.
4 Model with mathematics.
5 Use appropriate tools strategically.
6 Attend to precision.
7 Look for and make use of structure.

Lesson Objectives

Routine Objectives
- Use best practices during a *Ready* mathematics lesson.
- Identify and explain models or strategies used to solve problems.
- Critique and compare solution strategies of others and those provided in *Ready.*
- Use math talk practices to efficiently share and compare strategies for solving problems.
- Apply math knowledge and modeling techniques to new, similar problems.

Mathematical Objectives
- Use position words to place and draw objects accurately.
  (Previews Grade K Lesson 29)
- Describe, identify, and draw basic shapes.
  (Previews Grade K Lesson 29)
- Place specific shapes in places designated by position words.
  (Previews Grade K Lesson 29)

Prerequisite Skills

- Familiarity with words such as *over, under, next to, between.*
- Familiarity with basic shapes such as *square, rectangle, triangle, circle.*

Lesson Vocabulary

- **above, beside, below, on, under** words to describe the position of an object relative to another object
- **triangle** a flat shape with 3 straight sides and 3 corners
- **square** a flat shape with 4 straight sides of equal length and 4 square corners
- **rectangle** a flat shape with 4 straight sides and 4 square corners
- **circle** a perfectly round flat shape with no sides and no corners

Learning Progression

Pre Kindergarten experiences prepare children for Kindergarten by exposing them to everyday objects and situations that involve the language of basic shapes and position words. Across the five days of Lesson 0, children focus on reviewing and practicing these words. On Days 1 and 2, children use concrete manipulatives and drawings to show the position of objects relative to one another. On Days 3 and 4 they identify and name shapes in a picture. On Day 5,

children combine knowledge of shape and position words to solve problems involving both shapes and their locations. Children practice using math talk with their peers to understand how different solutions can be correct. They discuss how visuals match the meaning of words.

In Kindergarten Unit 7, children will build vocabulary for 2- and 3-dimensional shapes and more position words. They will apply strategies as they solve geometry problems that use these words.

Lesson Pacing Guide

Whole Class Instruction

Access materials at Teacher-Toolbox.com

Day 1
30 minutes

Routine Introduction
• Think-Share-Compare Routine Introduction *5 min*
  (on right)

Steps 1–3
• Make Sense of the Problem *5 min*
• Solve and Support Your Thinking *10 min*
• Discuss *10 min*

Day 2
30 minutes

Steps 4–6
• Compare *10 min*
• Connect and Reflect *10 min*
• Apply *10 min*

Day 3
25–30 minutes

Steps 1–3
• Make Sense of the Problem *5 min*
• Solve and Support Your Thinking *10 min*
• Discuss *10 min*

Day 4
30 minutes

Steps 4–6
• Compare *10 min*
• Connect and Reflect *10 min*
• Apply *10 min*

Day 5
45–55 minutes

Steps 1–6
• Make Sense of the Problem *5 min*
• Solve and Support Your
  Thinking *5–10 min*
• Discuss *10 min*
• Compare *10 min*
• Connect and Reflect *10 min*
• Apply *5–10 min*

Materials for Lesson Activities

Per child: • *Preview 1* pages (Days 1 and 2)
            • *Preview 2* pages (Days 3 and 4)
            • *Preview 3* pages (Day 5)
            • 1 orange and 1 green crayon
            • 1 orange square pattern block, 1 green triangle pattern block
            • 1 connecting cube

For display: Sample of square, rectangle, triangle, and circle shapes

Routine Introduction

Think-Share-Compare Routine

This routine offers a consistent six-step structure for in-depth collaborative problem solving.

• **Days 1–4** The routine is split into three steps per day to allow for shortened instructional times on the first few days of school. The slower pace also allows you extra time to evaluate children's work and their mathematical reasoning.

• **Day 5** The full routine is presented as it would be used during a *Ready Mathematics* lesson.

Introduce the routine.

• Display the Think-Share-Compare Routine shown below and found on Teacher-Toolbox.com.

• Briefly introduce the steps of the routine. Tell children that they will learn more about each step as they do the routine.

• Tell children they will use this routine during the math lessons throughout the year.

Start the routine.

Go to the Day 1–2 pages to start the lesson and practice the routine.

Ready | **Mathematics**

Think-Share-Compare Routine

❶ Make Sense of the Problem
❷ Solve and Support Your Thinking
❸ Discuss
❹ Compare
❺ Connect and Reflect
❻ Apply

Think-Share-Compare Routine
DAY 1 Steps 1–3

Teacher-Toolbox.com

To prepare for Grade K
Learn *Ready* Think-Share-Compare Routine
Preview *Position words* (Grade K, Lesson 29)

Step By Step

Step 1 Make Sense of the Problem

Use the items below to help children make sense of the problem.

- Put a chair at the front of the room and place a backpack **on** the seat. Ask: *Who can tell where the backpack is?*
- Call on children to describe the location of the backpack.
- Repeat by placing the backpack **under** the chair and holding it **above** the chair and asking children to describe where it is.
- Tell children they will practice another problem like this one.
- ***Display Step 1.*** Read the problem on Step 1. Ask the following questions:
  - *What is the problem about?*
  - *What are you trying to find out?*
  - *What information is important?*

Step 2 Solve and Support Your Thinking

Hand out *Preview 1* from the Teacher Toolbox. Give each child a cube to represent a backpack. ***Display Step 2*** and reread the Problem.

- Tell children to place the cube wherever they think it can go.
- When they have placed the cube, tell them to mark where it is with a pencil or crayon.
- As you monitor children's work, look for a role-play partner for Step 3.

Step 3 Discuss

Display Step 3. Have children work in pairs. Use the items below to help partners **share** their thinking.

- Tell children that the goal of the Discuss step is to share their thinking and to understand their partner's thinking.
- Model how to use the *Discussion Starters* from Step 3 with a child. For example, show your paper and say to your partner, *I did it this way because I know "beside" means "next to" and this is next to the bench.*
- Tell pairs to use the *Discussion Starters* to share their thinking.

Day 1 Wrap Up Collect papers at the end of the partner discussion. Select two or three for the Compare step on Day 2. Look for strategies that are similar to and different from the *Ready* strategies.

Step 1 Make Sense of the Problem
- What is the problem about?
- What are you trying to find out?
- What information is important?

Problem Place the backpack beside a bench.

Grade K   Think-Share-Compare Routine   Day 1 Step 1   ©Curriculum Associates, LLC   Copying is permitted.

Step 2 Solve and Support Your Thinking
- Solve the problem.
- Record your process.
- Solve another way.

Problem Place the backpack beside a bench.
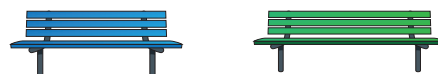
Grade K   Think-Share-Compare Routine   Day 1 Step 2   ©Curriculum Associates, LLC   Copying is permitted.

Step 3 Discuss
- Share your thinking.

Discussion Starters
Use these to start sharing your thinking.

- I did it this way because…
- I don't understand why…
- Show me how you did it.
- What if we did this?

Grade K   Think-Share-Compare Routine   Day 1 Step 3   ©Curriculum Associates, LLC   Copying is permitted.

Think-Share-Compare Routine

Teacher-Toolbox.com

Step 4 Compare
• Compare class strategies.
• Compare your strategy to *Ready* strategies.

Model It Place the backpack beside a bench.

Grade K   Think-Share-Compare Routine Day 2 Step 4   ©Curriculum Associates, LLC   Copying is permitted.

Step 5 Connect and Reflect
• Discuss the *Connect It* questions.
• Reflect on what you learned.

Connect It Use a model to solve the problem.

1 Look at the *Model It.* What do you notice about it?

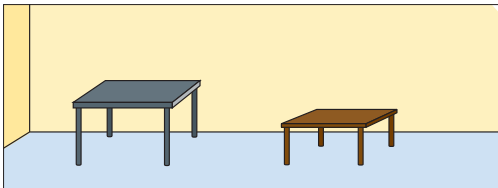**2** Why is there more than one place you can put a backpack beside a bench?

Grade K   Think-Share-Compare Routine Day 2 Step 5   ©Curriculum Associates, LLC   Copying is permitted.

Step 6 Apply
• Apply thinking to a new problem.
• Support your thinking.

Try It Place the backpack beside a table.

Grade K   Think-Share-Compare Routine Day 2 Step 6   ©Curriculum Associates, LLC   Copying is permitted.

Step By Step

Step 4 Compare

Return *Preview 1* papers from Day 1. **Display Step 2 again.** Use the items below to facilitate a whole-class discussion among children to **compare** strategies. Remind them that the problem they solved was placing a backpack **beside** a bench.

• Show selected samples and ask the child who completed each paper to explain his or her strategy. Encourage discussion by asking:
  • *Who can repeat what [child] said?*
  • *Who can say what [child] said using your own words?*
  • *Did you choose the same place or a different place than [child]?*
• **Display Step 4.** Tell children to look at the *Ready* strategy shown on the Step 4 page. Ask:
  • *Does yours look like this picture? [indicate the Step 4 page]*
  • *Where else could the backpack go?*

Step 5 Connect and Reflect

Display Step 5. Use the items below to help children make math connections and reflect on their work.

• Read the *Connect It* questions while displaying Step 4 again so they can see the *Model It.*
• Allow time for children to discuss the questions with a partner.
• Have volunteers share their responses with the whole class.
• Encourage children to explain how their strategy, their partner's strategy, and the *Ready* strategies connect.
• Questions similar to these for use in all lessons can be found under Mathematical Discourse and in the side column of the Teacher Resource Book. Additional *Talk About It* questions are at the bottom of the Student Book pages.

Step 6 Apply

Display Step 6. Use the items below to help children apply what they learned to the *Try It* problem.

• Say: *Place the backpack **beside** a table. Mark where you put it.*
• Ask children to consider the following questions as they solve the problem.
  • *How is this problem like other problems I have solved before?*
  • *How can I use a model to help me?*
• Encourage children to not only solve the problem but also be able to explain how using a model or a picture helps to support their thinking when using position words.

Think-Share-Compare Routine

DAY 3 Steps 1–3

Teacher-Toolbox.com

To prepare for Grade K
Learn *Ready* Think-Share-Compare Routine
Preview *Shapes* (Grade K, Lesson 29)

Step By Step

Step 1 Make Sense of the Problem

Use the items below to help children make sense of the problem.

- Display samples of a square, rectangle, triangle, and circle. Call on children to name each shape and describe each one. Ensure that children understand a circle to be a round shape with no sides or corners.
- Ask children to look around the room for examples of these shapes. Have children point to and name the shapes they see, reinforcing the attributes of each shape.
- **Display Step 1.** Ask children to point out any squares, triangles, or rectangles in the scene. Then read the problem. Ask the following questions:
  - *What is the problem about?*
  - *What are you trying to find out?*
  - *What information is important?*

Step 2 Solve and Support Your Thinking

Hand out *Preview 2* from the Teacher Toolbox and crayons. **Display Step 2.** Use the items below to set up children's individual **think**-time work.

- Help children to see that the black line drawing on their paper is the same as the colored picture they see displayed.
- Tell children to use their crayon to color the circles they see as a way to support their thinking in solving the problem.
- Encourage children to persevere if they find only one circle.
- As you monitor their work, choose a role-play partner for Step 3.

Step 3 Discuss

Display Step 3. Have children work in pairs. Use the items below to help partners **share** their thinking.

- Tell children that the goal of the Discuss step is to share their thinking and to understand their partner's thinking.
- Model how to use the *Discussion Starters* from Step 3 with a child. For example, say to your partner, *What did you do?* Allow time for the child to respond and show his/her paper.
- Tell pairs to use one or more of the *Discussion Starters* to help them get started sharing their thinking.

Day 3 Wrap Up Collect papers at the end of the partner discussion. Select two or three samples to use for the Compare step on Day 4. Look for strategies that are similar to and different from the *Ready* strategies.

Step 1 Make Sense of the Problem
- What is the problem about?
- What are you trying to find out?
- What information is important?

Problem Find circles in the picture.

Grade K   Think-Share-Compare Routine Day 3 Step 1   ©Curriculum Associates, LLC   Copying is permitted.

Step 2 Solve and Support Your Thinking
- Solve the problem.
- Record your process.
- Solve another way.

Problem Find circles in the picture.

Grade K   Think-Share-Compare Routine Day 3 Step 2   ©Curriculum Associates, LLC   Copying is permitted.

Step 3 Discuss
- Share your thinking.

Discussion Starters
Use these to start sharing your thinking.

- What did you do?
- I know...
- I started by...
- Can you help me...?

Grade K   Think-Share-Compare Routine Day 3 Step 3   ©Curriculum Associates, LLC   Copying is permitted.
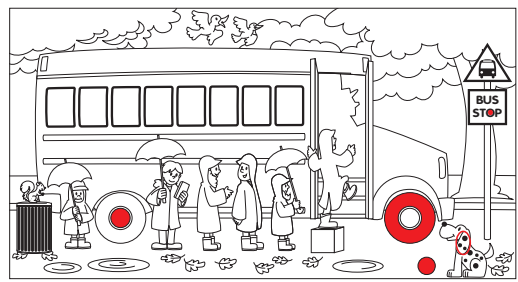
Think-Share-Compare Routine
DAY 4 Steps 4–6

Teacher-Toolbox.com

Step 4 Compare
• Compare class strategies.
• Compare your strategy to *Ready* strategies.

Model It Find circles in the picture.

Grade K Think-Share-Compare Routine Day 4 Step 4   ©Curriculum Associates, LLC Copying is permitted.

Step 5 Connect and Reflect
• Discuss the *Connect It* questions.
• Reflect on what you learned.

Connect It Use a model to solve the problem.

1 Look at the *Model It.* Are there more circles to color? Where?

2 How can you tell if a shape is a circle?

Grade K Think-Share-Compare Routine Day 4 Step 5   ©Curriculum Associates, LLC Copying is permitted.

Step 6 Apply
• Apply thinking to a new problem.
• Support your thinking.

Try It Find circles in the picture.

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Step By Step

Step 4 Compare

Return *Preview 2* papers from Day 3. **Display Step 2 again.**
Use the items below to facilitate a whole-class discussion among children to **compare** strategies.

• Ask selected children to show their papers and explain their strategies.
  Encourage discussion by asking,
  • *What do others think about what [child] said?*
  • *Would anyone like to add to what was said?*
• **Display Step 4.** Tell children to look at the *Ready* model shown on the Step 4 page. Ask:
  • *How does your picture compare to the* Ready *model?*
  • *How can different circles look?*
  • Listen for children who notice that circles can be large or small, solid black or outlined, and in the case of the bus tires and wheels, a smaller circle within a larger circle.
• Discuss how the puddles may be circles but appear as ovals.

Step 5 Connect and Reflect

Display Step 5. Use the items below to help children make math connections and reflect on their work.

• Read the first *Connect It* question while displaying Step 4 again so children can see the *Model It.*
• Allow time for children to discuss what they notice with a partner and then have volunteers share their responses with the whole class.
• Read the second *Connect It* question and allow time for children to discuss this with a partner.
• Discuss *Connect It* question 2 as a class to reflect on how children recognize and describe circles.
• Encourage children to explain how their model, their partner's model, and the *Ready* model helped them solve the problem.

Step 6 Apply

Display Step 6. Use the items below to help children apply what they learned to the *Try It* problem.

• Read the *Try It* problem. Ask children to consider the following questions as they solve the problem.
  • *What does a circle look like?*
  • *How can I find circles in a picture?*
• Encourage children to persevere in finding more than one circle and be able to explain how they used a strategy to find circles.

Think-Share-Compare Routine
DAY 5 Steps 1–3

Teacher-Toolbox.com

To prepare for Grade K
Learn *Ready* Think-Share-Compare Routine
Preview *Position words and shapes*
(Grade K, Lesson 29)

Step By Step

Step 1 Make Sense of the Problem

Display Step 1. Use the items below to help children make sense of the problem.

- Tell children: *Today we are going to use shapes and position words to solve a problem.* Review shapes by having children practice drawing in the air or on paper or dry erase boards. Review position words by giving directions for students to follow.
- Read the problem. Ask the first question below. Have children discuss their answers with a partner before sharing with the class. Repeat this process for the second and third questions.
  - *What is the problem about?*
  - *What are you trying to find out?*
  - *What information is important?*

Step 2 Solve and Support Your Thinking

Hand out *Preview 3* from the Teacher Toolbox. Give each child one square and triangle pattern block and crayons to match. *Display Step 2.* Use the items below to set up children's **think**-time work.

- Tell children to work on the problem on their own.
- Ask children to place the blocks where they think they can go.
- Tell children to use crayons to draw their solution.
- Encourage children to try different solutions to the problem.

Step 3   Discuss

Display Step 3. Have children work in pairs. Use the items below to help partners **share** their thinking.

- Tell children that the goal of the Discuss step is to share their thinking and to understand their partner's thinking.
- Tell children to actively listen to understand their partner's strategy.
- Tell pairs to use one or more of the *Discussion Starters* to help them get started sharing their thinking.

Prepare to Compare Tell certain children that you plan to share their strategy with the whole class. Monitor children's work and make a short list of the order in which to present these strategies. Consider starting with a common or simple strategy and then work towards more complex models.

Step 1 Make Sense of the Problem
- What is the problem about?
- What are you trying to find out?
- What information is important?

Problem Put a square above the bike.
Put a triangle below the bike.

Step 2 Solve and Support Your Thinking
- Solve the problem.
- Record your process.
- Solve another way.

Problem Put a square above the bike.
Put a triangle below the bike.

Step 3 Discuss
- Share your thinking.

Discussion Starters
Use these to start sharing your thinking.

- I did it this way because...
- Show me how you did it.
- I started by...
- Can you help me...?

Think-Share-Compare Routine
DAY 5 Steps 4–6

Step 4 Compare
- Compare class strategies.
- Compare your strategy to *Ready* strategies.

Model It Put a square above the bike.
Put a triangle below the bike.

Step 5 Connect and Reflect
- Discuss the *Connect It* questions.
- Reflect on what you learned.

Connect It Use a model to solve the problem.

1 Look at the *Model It.* What do you notice about it?

2 How did you decide where to put the triangle?

Step 6 Apply
- Apply thinking to a new problem.
- Support your thinking.

Try It Put a square above the desk.
Put a triangle below the desk.

Step By Step

Step 4 Compare

Display Step 2 again. Use the items below to facilitate a whole-class discussion between children to **compare** strategies.
- Ask selected children to show their work and explain their strategies. Encourage discussion by asking,
  - *Who can repeat what [child] said?*
  - *Did anyone solve it a different way?*
- ***Display Step 4.*** Tell children to look at the *Ready* model shown on the Step 4 page. Ask:
  - *How does your picture look like this picture?*
  - *Could the shapes go in different places?*

Step 5 Connect and Reflect

Display Step 5. Use the items below to help children make math connections and reflect on their work.
- Read the first *Connect It* question while displaying Step 4 again so children can see the *Model It*.
- Allow time for children to discuss what they notice with a partner and then have volunteers share their responses with the whole class.
- Read the second *Connect It* question and allow time for children to discuss this with a partner.
- Discuss *Connect It* question 2 as a class to reflect on how children chose the location for their triangle.
- Encourage children to explain how their strategy, their partner's strategy, and the *Ready* strategies helped them solve the problem.

Step 6 Apply

Display Step 6. Use the items below to help children apply what they learned to the *Try It* problem. Have them use the same blocks to place the shapes and crayons to color their solutions.
- Read the first statement of the *Try It* problem. Ask:
  - *What does a square look like?*
  - *How can I put it above the desk?*
- Read the second statement of the *Try It* problem. Ask:
  - *What is a triangle?*
  - *How can I put it below the desk?*
- Encourage children to consider several possible strategies and solutions as they solve the problem. Ask: *Have you solved a problem like this before?*

LESSON OVERVIEW

Lesson 0 *Access at Teacher-Toolbox.com*
Think-Share-Compare Routine

CCSS Focus

Domain
Operations and Algebraic Thinking

Cluster
A. Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.

Standard
K.OA.A.2 Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem.
K.OA.A.3 Decompose numbers less than or equal to 10 into pairs in more than one way, e.g., by using objects or drawings, and record each decomposition by a drawing or equation (e.g., $5 = 2 + 3$ and $5 = 4 + 1$).
K.OA.A.4 For any number from 1 to 9, find the number that makes 10 when added to the given number, e.g., by using objects or drawings, and record the answer with a drawing or equation.
K.OA.A.5 Fluently add and subtract within 5.

Additional Standards
K.CC.A.3, K.CC.B.4c, K.OA.A.1, K.OA.A.2

Standards for Mathematical Practice (SMP)
1 Make sense of problems and persevere in solving them.
2 Reason abstractly and quantitatively.
3 Construct viable arguments and critique the reasoning of others.
4 Model with mathematics.
5 Use appropriate tools strategically.
6 Attend to precision.
7 Look for and make use of structure.
8 Look for and express regularity in repeated reasoning.critique the reasoning of others.

Lesson Objectives

Routine Objectives
• Use best practices during a *Ready* mathematics lesson.
• Identify and explain models or strategies used to solve problems.
• Critique and compare solution strategies of others and those provided in *Ready*.
• Use math talk practices to efficiently share and compare strategies for solving problems.
• Apply math knowledge and modeling techniques to new, similar problems.

Mathematical Objectives
• Show and name number pairs for 9 and 10 using objects and drawings.
(Reviews Grade K Lessons 10 and 13)
• Solve addition word problems within 5 using pictures or objects.
(Reviews Grade K Lesson 15)
• Solve take-away subtraction word problems within 10 using pictures or objects.
(Reviews Grade K Lesson 19)

Prerequisite Skills

• Count up to 10 objects.
• Recognize the numbers $0 - 10$.
• Recognize the plus sign (+), the minus sign (−), and the equal sign (=).
• Solve take-away subtraction word problems within 5 using pictures or objects.
• Read addition and subtraction number sentences.

Lesson Vocabulary

• **equal, equal to, same as** the same quantity or amount
• **add** to put together two or more quantities, to find the total of two or more numbers, or to find how many in all
• **plus (+)** the math term and symbol that mean add
• **total** the result of adding two or more groups or quantities
• **subtract** take away or remove
• **minus (−)** the math term and symbol that mean subtract
• **difference** the result of subtraction

Learning Progression

Grade 1 Lesson 0 prepares children for Grade 1 Unit 1 by reviewing prerequisite content and introducing the Think-Share-Compare Routine for learning mathematics. Across the five days of Lesson 0, children solve addition and subtraction problems within 10 and use 5-frames, 10-frames, and fingers as models for composing and decomposing the numbers within 10. Children connect addition and subtraction number sentences with models that represent real-world problems.

In Grade 1 Unit 1, children will extend their understanding of addition and subtraction. They will use the counting on strategy to add and subtract, relate number sentences to addition and subtraction word problems, and explore subtraction as missing addend or comparison situations. Children will also develop strategies of their own in addition to Ready strategies.

Lesson Pacing Guide

Whole Class Instruction

Access materials at Teacher-Toolbox.com

Day 1
30 minutes

Routine Introduction
- Think-Share-Compare Routine Introduction *5 min* (on right)

Steps 1–3
- Make Sense of the Problem *5 min*
- Solve and Support Your Thinking *10 min*
- Discuss *10 min*

Day 2
30 minutes

Steps 4–6
- Compare *10 min*
- Connect and Reflect *10 min*
- Apply *10 min*

Practice and Problem Solving
Assign Kindergarten, Lesson 13 Additional Practice page 111.

Day 3
25–30 minutes

Steps 1–3
- Make Sense of the Problem *5 min*
- Solve and Support Your Thinking *10 min*
- Discuss *10 min*

Day 4
30 minutes

Steps 4–6
- Compare *10 min*
- Connect and Reflect *10 min*
- Apply *10 min*

Practice and Problem Solving
Assign Kindergarten, Lesson 15 Additional Practice page 131.

Day 5
45–60 minutes

Steps 1–6
- Make Sense of the Problem *5 min*
- Solve and Support Your Thinking *10 min*
- Discuss *10 min*
- Compare *10 min*
- Connect and Reflect *10 min*
- Apply *10 min*

Practice and Problem Solving
Assign Kindergarten, Lesson 19 Additional Practice page 163.

Materials for Lesson Activities

Per child:
- *Review Lesson 1* pages (Days 1 and 2)
- *Review Lesson 2* pages (Days 3 and 4)
- *Review Lesson 3* pages (Day 5)

Per pair: 1 plastic cup, 10 two-color counters, 1 yellow crayon, 1 red crayon

For display: 5-frame, 10-frame, 1 plastic cup, 18 two-color counters

Routine Introduction

Think-Share-Compare Routine

This routine offers a consistent six-step structure for in-depth collaborative problem solving.

- **Days 1–4** The routine is split into three steps per day to allow for shortened instructional times on the first few days of school. The slower pace also allows you extra time to evaluate children's work and their mathematical reasoning.
- **Day 5** The full routine is presented as it would be used during a *Ready Mathematics* lesson.

Introduce the routine.

- Display the Think-Share-Compare Routine shown below and found on Teacher-Toolbox.com.
- Briefly introduce the steps of the routine. Tell children that they will learn more about each step as they do the routine.
- Tell children they will use this routine during the math lessons throughout the year.

Start the routine.

Go to the Day 1–2 pages to start the lesson and practice the routine.

Ready | Mathematics

Think-Share-Compare Routine

1. Make Sense of the Problem
2. Solve and Support Your Thinking
3. Discuss
4. Compare
5. Connect and Reflect
6. Apply

Think-Share-Compare Routine
DAY 1 Steps 1–3

To prepare for Grade 1, Unit 1
Learn *Ready* Think-Share-Compare Routine
Review *Make 8 and 9* (Grade K, Lesson 10) and *Make 10* (Grade K, Lesson 13)

Step By Step

Step 1 Make Sense of the Problem

Display Step 1. Use the items below to help children make sense of the problem.

- Read the problem out loud. Ask the first question below. Have children discuss their answers with a partner before sharing with the class. Repeat this process for the second and third questions.
  - *What is the problem about?*
  - *What are you trying to find out?*
  - *What information is important?*

Step 2 Solve and Support Your Thinking

Hand out *Review Lesson 1* from the Teacher Toolbox. ***Display Step 2.*** Provide children with two-color counters and 2 colors of crayons. Use the items below to set up children's individual **think**-time work.

- Tell children to work on the problem on their own.
- Ask children to record their solution and any models or pictures they use to support their thinking.
- Encourage children to try another approach to solve the problem if they finish early.
- As you monitor children's work, look for a role-play partner for Step 3.

Step 3 Discuss

Display Step 3. Have children work in pairs. Use the items below to help partners **share** their thinking.

- Tell children that the goal of the Discuss step is to share their thinking and to understand their partner's thinking.
- Model how to use the *Discussion Starters* from Step 3 with a child. For example, say to your partner, *Here is what I did. First I put 6 red counters in the spaces. Then I filled the rest of the white spaces with 3 yellows. I know I have 9 counters in all because I counted all the counters.*
- Tell pairs to use one or more of the *Discussion Starters* to help them get started sharing their thinking.

Day 1 Wrap Up Collect papers at the end of the partner discussion. Select two or three for the Compare step on Day 2. Look for strategies that are similar to and different from the *Ready* strategies.

Teacher-Toolbox.com

Step 1 Make Sense of the Problem
- What is the problem about?
- What are you trying to find out?
- What information is important?

Problem How can you show 9 with counters?
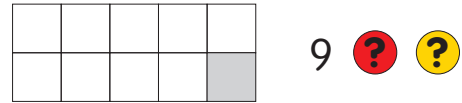
9 ❓ ❓

Step 2 Solve and Support Your Thinking
- Solve the problem.
- Record your process.
- Solve another way.

Problem How can you show 9 with counters?

9 ❓ ❓

Step 3 Discuss
- Share your thinking.

Discussion Starters
Use these to start sharing your thinking.
- Here is what I did …
- Did you find a different way?
- Why did you do it that way?
- I wonder if …

Think-Share-Compare Routine
DAY 2 Steps 4–6

Step 4 Compare
• Compare class strategies.
• Compare your strategy to *Ready* strategies.

Model It What are some other ways to make 9?

5 ⬤ and 4 ⬤ makes 9.

7 ⬤ and 2 ⬤ makes 9.

Grade 1 Think-Share-Compare Routine Day 2 Step 4 ©Curriculum Associates, LLC Copying is permitted.

Step 5 Connect and Reflect
• Discuss the *Connect It* questions.
• Reflect on what you learned.

Connect It Use a model to solve the problem.

1 Look at the *Model It.* What do you notice about making 9?

2 How did the counters and 10-frame help you?

Grade 1 Think-Share-Compare Routine Day 2 Step 5 ©Curriculum Associates, LLC Copying is permitted.

Step 6 Apply
• Apply thinking to a new problem.
• Support your thinking.

Try It What are three different ways to make 10?

Grade 1 Think-Share-Compare Routine Day 2 Step 6 ©Curriculum Associates, LLC Copying is permitted.

Step By Step

Step 4 Compare

Return *Review Lesson 1* papers from Day 1. ***Display Step 2 again*** while using the items below to facilitate a whole-class discussion among children to **compare** strategies.

• Ask selected children to show and explain their strategies. Encourage discussion by asking,
  • *Who can restate or retell [child's] explanation?*
  • *How is your strategy or solution similar to or different from [child's]?*
• ***Display Step 4.*** Tell children to look at the *Ready* strategies shown on the Step 4 page. Ask:
  • *How does your model compare to the* Ready *models?*
  • *How do the counters help you see the parts that make 9?*

Step 5 Connect and Reflect

Display Step 5. Use the items below to help children make math connections and reflect on their work.

• Read *Connect It* questions 1 and 2. As children work, display Step 4 again so they can see the *Model It*.
• Have children discuss the *Connect It* questions with a partner.
• Ask volunteers to share their responses with the whole class.
• Encourage children to explain how their different strategies and the *Ready* strategies helped them solve the problem.
• Discuss *Connect It* question 2 as a class to reflect on how children used the 10-frame to discover combinations that make 9 using different arrangements of colored counters.
• Questions similar to these can be found in every lesson. See the side column of the Teacher Resource Book and Mathematical Discourse questions.

Step 6 Apply

Display Step 6. Use the items below to help children apply what they learned to the *Try It* problem. After reading the problem aloud, ask children to consider:

  • *How is this problem like other problems I have solved before?*
  • *How can I use a model to help me?*
• Encourage children to not only solve the problem but also be able to explain how using a model or a picture helps to support their thinking when showing ways to make 10.
• Questions from the *Practice and Problem Solving* pages for each lesson can be used for *Try It* questions.

Day 2 Wrap Up For homework, have children complete Grade K, Lesson 13 *Practice and Problem Solving,* Additional Practice p. 111 found on the Teacher Toolbox.

Think-Share-Compare Routine
DAY 3 Steps 1–3

Teacher-Toolbox.com

To prepare for Grade 1, Unit 1
Learn *Ready* Think-Share-Compare Routine
Review *Add Within 5* (Grade K, Lesson 15)

Step By Step

Step 1 Make Sense of the Problem

Display Step 1. Use the items below to help children make sense of the problem.

- Say: *There are 4 orange butterflies and 1 blue butterfly. How many butterflies are there in all?*
- Ask the first question below. Have children discuss their answers with a partner before sharing with the class. Repeat this process for the second and third questions.
  - *What is the problem about?*
  - *What are you trying to find out?*
  - *What information is important?*

Step 2 Solve and Support Your Thinking

Hand out *Review Lesson 2* from the Teacher Toolbox. *Display Step 2.* Provide children with counters and crayons. Use the items below to set up children's individual **think**-time work.

- Tell children to work on the problem on their own.
- Ask children to record their solution and any models or pictures they use to support their thinking.
- Encourage children to try another approach to solve the problem if they finish early.
- As you monitor their work, choose a role-play partner for Step 3.

Step 3 Discuss

Display Step 3. Have children work in pairs. Use the items below to help partners **share** their thinking.

- Tell children that the goal of the Discuss step is to share their thinking and to understand their partner's thinking.
- Model how to use the *Discussion Starters* from Step 3 with a child. For example, say to your partner, *How did you get started?* Allow time for the child to respond.
- Tell pairs to use one or more of the *Discussion Starters* to help them get started sharing their thinking.

Day 3 Wrap Up Collect papers at the end of the partner discussion. Select two or three strategies to use for the Compare step on Day 4. Look for strategies that are similar to and different from the *Ready* strategy. Consider the impact of the order in which you choose to present these strategies.

Step 1 Make Sense of the Problem
- What is the problem about?
- What are you trying to find out?
- What information is important?

Problem How many butterflies are there in all?

4

1

$4 + 1 = \underline{\qquad}$

Grade 1 Think-Share-Compare Routine Day 3 Step 1   ©Curriculum Associates, LLC. Copying is permitted.

Step 2 Solve and Support Your Thinking
- Solve the problem.
- Record your process.
- Solve another way.

Problem How many butterflies are there in all?

4

1

$4 + 1 = \underline{\qquad}$

Grade 1 Think-Share-Compare Routine Day 3 Step 2   ©Curriculum Associates, LLC. Copying is permitted.

Step 3 Discuss
- Share your thinking.

Discussion Starters
Use these to start sharing your thinking.

- I knew . . . so I . . .
- I don't understand how . . .
- How did you get started?
- I disagree with this part because . . .

Grade 1 Think-Share-Compare Routine Day 3 Step 3   ©Curriculum Associates, LLC. Copying is permitted.

Think-Share-Compare Routine
DAY 4 Steps 4–6

Step 4 Compare
- Compare class strategies.
- Compare your strategy to *Ready* strategies.

Model It Find **4 + 1.**

4 🦋

1 🦋

🔴🔴🔴🔴🔵

$4 + 1 = \underline{\hspace{1cm}}$

Step 5 Connect and Reflect
- Discuss the *Connect It* questions.
- Reflect on what you learned.

Connect It Use a model and equation to solve the problem.

1 Look at the *Model It.* How can you add different numbers of objects?

2 How did the counters and 5-frame help you?

Step 6 Apply
- Apply thinking to a new problem.
- Support your thinking.

Try It How many flowers are there in all?

2 🌻

3 🌸

$2 + 3 = \underline{\hspace{1cm}}$

Step By Step

Step 4 Compare

Return *Review Lesson 2* papers from Day 3. **Display Step 2 again.** Use the items below to facilitate a whole-class discussion among children to **compare** strategies.

- Ask selected children to explain their strategies. Encourage discussion by asking,
  - *What do others think about what [child] said?*
  - *Would anyone like to add to what was said?*
- **Display Step 4.** Tell children to look at the *Ready* model shown on the Step 4 page. Ask:
  - *How do your models compare to the* Ready *model?*
  - *How can a different way of filling the 5-frame also be correct?*

Step 5 Connect and Reflect

Display Step 5. Use the items below to help children make math connections and reflect on their work.

- Read *Connect It* questions 1 and 2. As children work, display Step 4 again so they can see the *Model It.*
- Have children discuss the *Connect It* questions with a partner.
- Ask volunteers to share their responses with the whole class.
- Encourage children to explain how their different strategies and the *Ready* strategy helped them solve the problem.
- Discuss *Connect It* question 2 as a class to reflect on how the 5-frame and counters are helpful.

Step 6 Apply

Display Step 6. Use the items below to help children apply what they learned to the *Try It* problem.

- Say: *There are 2 light-colored flowers and 3 dark-colored flowers. How many flowers are there in all?*
- Ask children to consider the following questions as they solve the problem.
  - *How can a 5-frame help me to solve this problem?*
  - *How could I check my answer?*
- Encourage children to not only solve the problem but also be able to explain how using a 5-frame or a different model could support their thinking.

Day 4 Wrap Up For homework, have children complete Grade K, Lesson 15 *Practice and Problem Solving,* Additional Practice p. 131 found on the Teacher Toolbox.

Think-Share-Compare Routine
DAY 5 Steps 1–3

Teacher-Toolbox.com

To prepare for Grade 1, Unit 1
Learn *Ready* Think-Share-Compare Routine
Review *Subtract Within 10* (Grade K, Lesson 19)

Step By Step

Step 1 Make Sense of the Problem

Display Step 1. Use the items below to help children make sense of the problem.

- Say: *There are 9 crayons in a box. Jon takes out 5 crayons. How many crayons are still in the box?*
- Ask the first question below. Have children discuss their answers with a partner before sharing with the class. Repeat this process for the second and third questions.
  - *What is the problem about?*
  - *What are you trying to find out?*
  - *What information is important?*

Step 2 Solve and Support Your Thinking

Hand out *Review Lesson 3* from the Teacher Toolbox. ***Display Step 2.*** Use the items below to set up children's individual **think**-time work.

- Tell children to work on the problem on their own.
- Ask children to record their solution and any models or pictures they use to support their thinking.
- Encourage children to try another approach to solve the problem if they finish early.

Step 3 Discuss

Display Step 3. Have children work in pairs. Use the items below to help partners **share** their thinking.

- Tell children that the goal of the Discuss step is to share their thinking and to understand their partner's thinking.
- Tell children to actively listen to understand their partner's strategy.
- Tell pairs to use one or more of the *Discussion Starters* to help them get started sharing their thinking.

Prepare to Compare Choose 3-4 work samples representing different strategies. Tell those children that you plan to share their strategy with the whole class. Monitor their work and make a short list of the order in which to present these strategies. Consider starting with a common or simple strategy and then work towards more complex models.

Step 1 Make Sense of the Problem
- What is the problem about?
- What are you trying to find out?
- What information is important?

Problem How many crayons are still in the box?

$9 - 5 = $ _____

Grade 1   Think-Share-Compare Routine Day 5 Step 1 ©Curriculum Associates, LLC   Copying is permitted.

Step 2 Solve and Support Your Thinking
- Solve the problem.
- Record your process.
- Solve another way.

Problem How many crayons are still in the box?

$9 - 5 = $ _____

Grade 1   Think-Share-Compare Routine Day 5 Step 2 ©Curriculum Associates, LLC   Copying is permitted.

Step 3 Discuss
- Share your thinking.

Discussion Starters
Use these to start sharing your thinking.

- A model I used was . . .
  It helped me . . .

- At first, I thought . . .

- Can you explain that again?

- I agree with you about . . . because . . .

Grade 1   Think-Share-Compare Routine Day 5 Step 3 ©Curriculum Associates, LLC   Copying is permitted.

Think-Share-Compare Routine
DAY 5 Steps 4–6

Step 4 Compare
- Compare class strategies.
- Compare your strategy to *Ready* strategies.

Model It Find $9 - 5$.

$$9 - 5 = \underline{}$$

Step 5 Connect and Reflect
- Discuss the *Connect It* questions.
- Reflect on what you learned.

Connect It Use a model and equation to solve the problem.

1 Look at the *Model It.* How can you subtract one number from another?

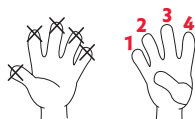2 How can you subtract in different ways?

Step 6 Apply
- Apply thinking to a new problem.
- Support your thinking.

Try It How many crayons are still in the box?

$$10 - 4 = \underline{}$$

Step By Step

Step 4 Compare

Display Step 2 again. Use the items below to facilitate a whole-class discussion among children to **compare** strategies.

- Ask selected children to explain their strategies. Encourage discussion by asking,
  - *Who can restate or retell [child's] explanation?*
  - *Did anyone solve it a different way?*
- ***Display Step 4.*** Tell children to look at the *Ready* model shown on the Step 4 page. Ask:
  - *How does your model compare to the* Ready *model?*
  - *How do you know to begin with one thumb down?*

Step 5 Connect and Reflect

Display Step 5. Use the items below to help children make math connections and reflect on their work.

- Read *Connect It* questions 1 and 2. As children work, display Step 4 again so they can see the *Model It.*
- Have children discuss the *Connect It* questions with a partner.
- Ask volunteers to share their responses with the whole class.
- Encourage children to explain how their different strategies and the *Ready* strategy helped them solve the problem.
- Discuss *Connect It* question 2 as a class to reflect on how subtraction can be shown using fingers and other models.

Step 6 Apply

Display Step 6. Use the items below to help children apply what they learned to the *Try It* problem.

- Say: *There are 10 crayons in a box. Jon takes out 4 crayons. How many crayons are still in the box?*
- Ask children to consider the following questions as they solve the problem.
  - *How could I begin to model this problem?*
  - *Is there more than one model I could use to solve this?*
  - *Is my answer reasonable?*
- Encourage children to solve the problem and also be able to explain how using their 10 fingers can support their thinking.

Day 5 Wrap Up For homework, have children complete Grade K, Lesson 19 *Practice and Problem Solving,* Additional Practice p. 163 found on the Teacher Toolbox.

LESSON OVERVIEW

Lesson 0 *Access at Teacher-Toolbox.com*
Think-Share-Compare Routine

CCSS Focus

Domain
Number and Operations—Base Ten

Cluster
A. Understand place value.
B. Use place value understanding and properties of operations to add and subtract.

Standards
2.NBT.A.4 Compare two three-digit numbers based on meanings of the hundreds, tens, and ones digits, using $>$, $=$, and $<$ symbols to record the results of comparisons.

2.NBT.B.7 Add and subtract within 1000, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method. Understand that in adding or subtracting three-digit numbers, one adds or subtracts hundreds and hundreds, tens and tens, ones and ones; and sometimes it is necessary to compose or decompose tens or hundreds.

2.NBT.B.9 Explain why addition and subtraction strategies work, using place value and the properties of operations.

Standards for Mathematical Practice (SMP)
1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
6. Attend to precision.
7. Look for and make use of structure.

Lesson Objectives

Routine Objectives
- Use best practices during a *Ready* mathematics lesson.
- Identify and explain models or strategies used to solve problems.
- Critique and compare solution strategies of others and those provided in *Ready*.
- Use math talk practices to efficiently share and compare strategies for solving problems.
- Apply math knowledge and modeling techniques to new, similar problems.

Mathematical Objectives
- Evaluate models of three-digit numbers to determine whether numbers are greater than, less than, or equal to each other.
  (Reviews Grade 2 Lesson 12)
- Break apart numbers and use place-value models to add and subtract three-digit numbers.
  (Reviews Grade 2 Lessons 13 and 14)

Prerequisite Skills

- Identify place value in three-digit numbers.
- Understand the concepts of *greater than*, *less than*, and *equal to*.
- Model three-digit numbers.
- Perform two-digit addition and subtraction with and without regrouping.

Lesson Vocabulary

- **greater than symbol ($>$)** a symbol used to compare two numbers when the first is greater than the second
- **less than symbol ($<$)** a symbol used to compare two numbers when the first is less than the second
- **equal sign ($=$)** a symbol used to compare two numbers that have the same value
- **regroup** to compose or decompose ones, tens, or hundreds. For example, 10 ones can be regrouped as 1 ten, or 2 hundreds can be regrouped as 20 tens.
- **sum** the result of addition
- **difference** the result of subtraction

Learning Progression

Grade 4 Lesson 0 prepares students for Grade 4 Unit 1 by reviewing prerequisite content and introducing the Think-Share-Compare Routine for learning mathematics. Students compare three-digit numbers using quick draw place-value models, place-value charts, number sentences with comparison symbols, and strategies of their own. Students add and subtract three-digit numbers with regrouping using break-apart strategies, place-value models, and strategies of their own.

In Grade 4 Unit 1, students will add, subtract, and compare with greater numbers. They will explore the concept that a digit in one place has 10 times the value it has in the place to its right. Students will use place-value understanding to round numbers to any place. Students will also develop strategies of their own in addition to *Ready* strategies.

Lesson Pacing Guide

Whole Class Instruction

Access materials at Teacher-Toolbox.com

Day 1
30 minutes

Routine Introduction
- Think-Share-Compare Routine Introduction *5 min* (on right)

Steps 1–3
- Make Sense of the Problem *5 min*
- Solve and Support Your Thinking *10 min*
- Discuss *10 min*

Day 2
30 minutes

Steps 4–6
- Compare *10 min*
- Connect and Reflect *10 min*
- Apply *10 min*

Practice and Problem Solving
Assign Grade 2, Lesson 12 pages 121–122.

Day 3
25–30 minutes

Steps 1–3
- Make Sense of the Problem *5 min*
- Solve and Support Your Thinking *10 min*
- Discuss *10 min*

Day 4
30 minutes

Steps 4–6
- Compare *10 min*
- Connect and Reflect *10 min*
- Apply *10 min*

Practice and Problem Solving
Assign Grade 2, Lesson 13 pages 131–132.

Day 5
45–60 minutes

Steps 1–6
- Make Sense of the Problem *5 min*
- Solve and Support Your Thinking *10 min*
- Discuss *10 min*
- Compare *10 min*
- Connect and Reflect *10 min*
- Apply *10 min*

Practice and Problem Solving
Assign Grade 2, Lesson 14 pages 141–142.

Materials for Lesson Activities

Per student:
- *Review Lesson 1* student page (Days 1 and 2)
- *Review Lesson 2* student page (Days 3 and 4)
- *Review Lesson 3* student page (Day 5)

Optional: You may wish to provide hundreds, tens, and ones base-ten blocks to help students solve problems.

Routine Introduction

Think-Share-Compare Routine

This routine offers a consistent six-step structure for in-depth collaborative problem solving.

- **Days 1–4** The routine is split into three steps per day to allow for shortened instructional times on the first few days of school. The slower pace also allows you extra time to evaluate students' work and their mathematical reasoning.
- **Day 5** The full routine is presented as it would be used during a *Ready Mathematics* lesson.

Introduce the routine.

- Display the Think-Share-Compare Routine shown below and found on Teacher-Toolbox.com.
- Briefly introduce the steps of the routine. Tell students that they will learn more about each step as they do the routine.
- Tell students they will use this routine during the math lessons throughout the year.

Start the routine.

Go to the Day 1–2 pages to start the lesson and practice the routine.

Ready | Mathematics

Think-Share-Compare Routine

1. Make Sense of the Problem
2. Solve and Support Your Thinking
3. Discuss
4. Compare
5. Connect and Reflect
6. Apply

Think-Share-Compare Routine

DAY 1 Steps 1–3

To prepare for Grade 4, Unit 1
Learn *Ready* Think-Share-Compare Routine
Review *Compare Three-Digit Numbers*
(Grade 2, Lesson 12)

Step By Step

Step 1 Make Sense of the Problem

Display Step 1. Use the items below to help students make sense of the problem.

- Have a student read the problem out loud. Ask the first question below. Have students discuss their answers with a partner before sharing with the class. Repeat this process for the second and third questions.
  - *What is the problem about?*
  - *What are you trying to find out?*
  - *What information is important?*

Step 2 Solve and Support Your Thinking

Hand out *Review Lesson 1* from the Teacher Toolbox. ***Display Step 2.*** Use the items below to set up students' individual **think**-time work.

- Tell students to work on the problem on their own.
- Ask students to record their solution and any models or pictures they use to support their thinking.
- Encourage students to try another approach to solve the problem if they finish early.
- As you monitor students' work, look for a role-play partner for Step 3.

Step 3 Discuss

Display Step 3. Have students work in pairs. Use the items below to help partners **share** their thinking.

- Tell students that the goal of the Discuss step is to share their thinking and to understand their partner's thinking.
- Model how to use the *Discussion Starters* from Step 3 with a student. For example, say to your partner, *The strategy I used to find the answer was to draw base-ten blocks to show 467 and 463. It helped me to see how many hundreds, tens, and ones are in each number so I could compare them.*
- Tell pairs to use one or more of the *Discussion Starters* to help them get started sharing their thinking.

Day 1 Wrap Up Collect papers at the end of the partner discussion. Select two or three for the Compare step on Day 2. Look for strategies that are similar to and different from the *Ready* strategies.

Teacher-Toolbox.com

Step 1 Make Sense of the Problem
- What is the problem about?
- What are you trying to find out?
- What information is important?

Problem **Think about ways to solve the problem.**

These two paintings are in the school art contest.
Which painting has more votes?
Use a picture or model to show that you are correct.

Painting A: 467 Votes   Painting B: 463 Votes

Grade 4   Think-Share-Compare Routine   Day 1 Step 1   ©Curriculum Associates, LLC   Copying is permitted.

Step 2 Solve and Support Your Thinking
- Solve the problem.
- Record your process.
- Solve another way.

Problem **Think about ways to solve the problem.**

These two paintings are in the school art contest.
Which painting has more votes?
Use a picture or model to show that you are correct.

Painting A: 467 Votes   Painting B: 463 Votes

Grade 4   Think-Share-Compare Routine   Day 1 Step 2   ©Curriculum Associates, LLC   Copying is permitted.

Step 3 Discuss
- Share your thinking.

Discussion Starters
Use these to start sharing your thinking.

- I'm not sure how to find the answer because …
- The strategy I used to find the answer was …
- Do you agree with me? Why or why not?
- Why did you choose that strategy?

Grade 4   Think-Share-Compare Routine   Day 1 Step 3   ©Curriculum Associates, LLC   Copying is permitted.
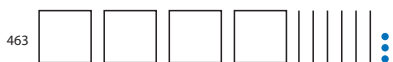
Think-Share-Compare Routine

Teacher-Toolbox.com

Step 4 Compare
• Compare class strategies.
• Compare your strategy to *Ready* strategies.

Picture It You can show the numbers in a quick drawing.

467

463

Model It You can model the numbers in a chart.

Hundreds	Tens	Ones
4	6	7
4	6	3

Grade 4 Think-Share-Compare Routine Day 2 Step 4   ©Curriculum Associates, LLC Copying is permitted.

Step 5 Connect and Reflect
• Complete and discuss the *Connect It* questions.
• Reflect on what you learned.

Connect It Compare hundreds, tens, and ones.

1 Look at the models on the previous page. Compare the hundreds and tens. What do you notice?

2 Which place do you need to look at to compare the numbers? Why?

3 Use the numbers 467 and 463 to complete each number sentence.

_____ > _____   _____ < _____

4 Why can you write two different number sentences to compare 467 and 463?

5 Which painting has more votes? How do you know?

Grade 4 Think-Share-Compare Routine Day 2 Step 5   ©Curriculum Associates, LLC Copying is permitted.

Step 6 Apply
• Apply thinking to a new problem.
• Support your thinking.

Try It Try another problem.

6 Write > or < in each blank.

a. 264 _____ 462   **c.** 954 _____ 950   **e.** 718 _____ 788
b. 372 _____ 379   **d.** 876 _____ 867   **f.** 653 _____ 553

Grade 4 Think-Share-Compare Routine Day 2 Step 6   ©Curriculum Associates, LLC Copying is permitted.

Step By Step

Step 4 Compare

Return *Review Lesson 1* papers from Day 1. **Display Step 4.**
Use the items below to facilitate a whole-class discussion among students to **compare** strategies.

• Ask selected students to explain their strategies. Encourage discussion by asking,
  • *Who can restate or retell [student's] explanation?*
  • *How is your strategy or solution similar to or different from [student's]?*
• Tell students to look at the *Ready* strategies shown on the Step 4 page. Ask:
  • *How do your strategies compare to the* Ready *strategies?*
  • *Look at the* Model It. *How can thinking about the number of hundreds, tens, and ones help you decide which of these numbers is greater?*

Step 5 Connect and Reflect

Display Step 5. Use the items below to help students make math connections and reflect on their work.

• Tell students to complete *Connect It* questions 1–4 on their handouts on their own. Display Step 4 as students work so they can see the *Picture It* and *Model It*.
• Allow time for students to discuss *Connect It* questions 1 and 2 with a partner.
• Have volunteers share their responses with the whole class.
• Encourage students to explain how their strategy, their partner's strategy, and the *Ready* strategies helped them solve the problem.
• Discuss *Connect It* question 5 as a class to reflect on how to compare any two numbers using place value.

Step 6 Apply

Display Step 6. Use the items below to help students apply what they learned to the *Try It* problem.

• Ask students to consider the following questions as they solve the problem.
  • *How is this problem like other problems I have solved before?*
  • *How can I use a model to help me?*
• Encourage students to not only solve the problem but also be able to explain how using a place-value model or a different strategy could support their thinking.

Day 2 Wrap Up For homework, have students complete Grade 2, Lesson 12 *Practice and Problem Solving*, pp. 121–122 found on the Teacher Toolbox.

Think-Share-Compare Routine
DAY 3 Steps 1–3

Teacher-Toolbox.com

To prepare for Grade 4, Unit 1
Learn *Ready* Think-Share-Compare Routine
Review *Add Three-Digit Numbers*
(Grade 2, Lesson 13)

Step By Step

Step 1 Make Sense of the Problem

Display Step 1. Use the items below to help students make sense of the problem.

- Have a student read the problem out loud. Ask the first question below. Have students discuss their answers with a partner before sharing with the class. Repeat this process for the second and third questions.
  - *What is the problem about?*
  - *What are you trying to find out?*
  - *What information is important?*

Step 2 Solve and Support Your Thinking

Hand out *Review Lesson 2* from the Teacher Toolbox. *Display Step 2.* Use the items below to set up students' individual **think**-time work.

- Tell students to work on the problem on their own.
- Ask students to record their solution and any models or pictures they use to support their thinking.
- Encourage students to try another approach to solve the problem if they finish early.
- As you monitor students' work, look for a role-play partner for Step 3.

Step 3 Discuss

Display Step 3. Have students work in pairs. Use the items below to help partners **share** their thinking.

- Tell students that the goal of the Discuss step is to share their thinking and to understand their partner's thinking.
- Model how to use the *Discussion Starters* from Step 3 with a student. For example, say to your partner, *How did you get started?* Allow time for the student to respond.
- Tell pairs to use one or more of the *Discussion Starters* to help them get started sharing their thinking.

Day 3 Wrap Up Collect student papers at the end of the partner discussion. Select two or three student strategies to use for the Compare step on Day 4. Look for strategies that are similar to and different from the *Ready* strategies. Consider the impact of the order in which you choose to present these strategies.

Step 1 Make Sense of the Problem
- What is the problem about?
- What are you trying to find out?
- What information is important?

Problem Think about ways to solve the problem.
There are 476 rocks and 148 minerals in a museum display. What is the total number of rocks and minerals in the display?

Grade 4 Think-Share-Compare Routine Day 3 Step 1   ©Curriculum Associates, LLC Copying is permitted.

Step 2 Solve and Support Your Thinking
- Solve the problem.
- Record your process.
- Solve another way.

Problem Think about ways to solve the problem.
There are 476 rocks and 148 minerals in a museum display. What is the total number of rocks and minerals in the display?

Grade 4 Think-Share-Compare Routine Day 3 Step 2   ©Curriculum Associates, LLC Copying is permitted.

Step 3 Discuss
- Share your thinking.

Discussion Starters
Use these to start sharing your thinking.

- I knew … so I …
- I don't understand how …
- How did you get started?
- I disagree with this part because …

Grade 4 Think-Share-Compare Routine Day 3 Step 3   ©Curriculum Associates, LLC Copying is permitted.

Think-Share-Compare Routine
DAY 4 Steps 4–6

Step 4 Compare
- Compare class strategies.
- Compare your strategy to *Ready* strategies.

Model It You can show each number as hundreds, tens, and ones.

$$476 \rightarrow 4 \text{ hundreds} + 7 \text{ tens} + 6 \text{ ones}$$
$$+ 148 \rightarrow 1 \text{ hundred} + 4 \text{ tens} + 8 \text{ ones}$$
$$5 \text{ hundreds} + 11 \text{ tens} + 14 \text{ ones}$$

Model It You can add hundreds, then tens, then ones.

$$476$$
$$+ 148$$
$$500 \rightarrow 400 + 100$$
$$110 \rightarrow 70 + 40$$
$$14 \rightarrow 6 + 8$$
$$500 + 110 + 14$$

Model It You can add ones, then tens, then hundreds.

$$476$$
$$+ 148$$
$$14 \rightarrow 6 + 8$$
$$110 \rightarrow 70 + 40$$
$$500 \rightarrow 400 + 100$$
$$14 + 110 + 500$$

Grade 4 Think-Share-Compare Routine Day 4 Step 4   ©Curriculum Associates, LLC Copying is permitted.

Step 5 Connect and Reflect
- Complete and discuss the *Connect It* questions.
- Reflect on what you learned.

Connect It Make a ten and a hundred to add.

1 Look at the first *Model It*. Write the value of the total hundreds, tens, and ones.

5 hundreds = _____   11 tens = _____   14 ones = _____

2 Look at the last *Model It*. How many ones, tens, and hundreds are there? Fill in the blanks.

14 = _____ ones   110 = _____ tens   500 = _____ hundreds

3 What is the same about the numbers in Problems 1 and 2? What is different?

4 What is the total number of rocks and minerals in the display? Show your work.

Grade 4 Think-Share-Compare Routine Day 4 Step 5   ©Curriculum Associates, LLC Copying is permitted.

Step 6 Apply
- Apply thinking to a new problem.
- Support your thinking.

Try It Try another problem.

5 What is 649 + 184? Show your work.

Grade 4 Think-Share-Compare Routine Day 4 Step 6   ©Curriculum Associates, LLC Copying is permitted.

Step By Step

Step 4 Compare

Return *Review Lesson 2* papers from Day 3. **Display Step 4.** Use the items below to facilitate a whole-class discussion between students to **compare** strategies.
- Ask selected students to explain their strategies. Encourage discussion by asking,
  - *What do others think about what [student] said?*
  - *Would anyone like to add to what was said?*
- Tell students to look at the *Ready* strategies shown on the Step 4 page. Ask:
  - *How do your strategies compare to the* Ready *strategies?*

Step 5 Connect and Reflect

Display Step 5. Use the items below to help students make math connections and reflect on their work.
- Tell students to complete the *Connect It* questions on their handouts on their own. Display Step 4 as students work so they can see the *Picture It* and *Model It.*
- Allow time for students to discuss *Connect It* question 3 with a partner.
- Have volunteers share their responses with the whole class.
- Encourage students to explain how their strategy, their partner's strategy, and the *Ready* strategies helped them solve the problem.
- To help students reflect on the lesson, ask: *Which strategy would you choose to solve a similar problem in the future?*

Step 6 Apply

Display Step 6. Use the items below to help students apply what they learned to the *Try It* problem.
- Ask students to consider the following questions as they solve the problem.
  - *Which picture or model would help me to solve this problem?*
  - *How could I check my steps or my answer?*
- Encourage students to not only solve the problem but also be able to explain how using a place-value model or a different strategy could support their thinking.

Day 4 Wrap Up For homework, have students complete Grade 2, Lesson 13 *Practice and Problem Solving*, pp. 131–132 found on the Teacher Toolbox.

Think-Share-Compare Routine

DAY 5 Steps 1–3

Teacher-Toolbox.com

To prepare for Grade 4, Unit 1
Learn *Ready* Think-Share-Compare Routine
Review *Subtract Three-Digit Numbers*
(Grade 2, Lesson 14)

Step By Step

Step 1 Make Sense of the Problem

Display Step 1. Use the items below to help students make sense of the problem.

- Have a student read the problem out loud. Ask the first question below. Have students discuss their answers with a partner before sharing with the class. Repeat this process for the second and third questions.
  - *What is the problem about?*
  - *What are you trying to find out?*
  - *What information is important?*

Step 2 Solve and Support Your Thinking

Hand out *Review Lesson 3* from the Teacher Toolbox. ***Display Step 2.*** Use the items below to set up students' individual **think**-time work.

- Tell students to work on the problem on their own.
- Ask students to record their solution and any models or pictures they use to support their thinking.
- Encourage students to try another approach to solve the problem if they finish early.

Step 3 Discuss

Display Step 3. Have students work in pairs. Use the items below to help partners **share** their thinking.

- Tell students that the goal of the Discuss step is to share their thinking and to understand their partner's thinking.
- Tell students to actively listen to understand their partner's strategy.
- Tell pairs to use one or more of the *Discussion Starters* to help them get started sharing their thinking.

Prepare to Compare Tell certain students that you plan to share their strategy with the whole class. Monitor student work and make a short list of the order in which to present these strategies. Consider starting with a common or simple strategy and work towards more complex models.

Step 1 Make Sense of the Problem
- What is the problem about?
- What are you trying to find out?
- What information is important?

Problem Think about ways to solve the problem.
There are 450 campers at Camp Cody. One day, 218 campers did art projects. The rest did sports. How many campers did sports that day?

Grade 4 Think-Share-Compare Routine Day 5 Step 1 ©Curriculum Associates, LLC Copying is permitted.

Step 2 Solve and Support Your Thinking
- Solve the problem.
- Record your process.
- Solve another way.

Problem Think about ways to solve the problem.
There are 450 campers at Camp Cody. One day, 218 campers did art projects. The rest did sports. How many campers did sports that day?

Grade 4 Think-Share-Compare Routine Day 5 Step 2 ©Curriculum Associates, LLC Copying is permitted.

Step 3 Discuss
- Share your thinking.

Discussion Starters
Use these to start sharing your thinking.

- A model I used was …
  It helped me …

- At first, I thought …

- Can you explain that again?

- I agree with you about … because …

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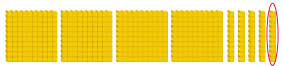
Think-Share-Compare Routine

Teacher-Toolbox.com
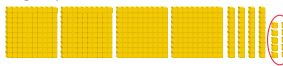

Step 4 **Compare**
- Compare class strategies.
- Compare your strategy to *Ready* strategies.

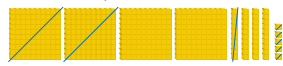**Picture It** You can subtract using base-ten blocks.

Show 450.

Regroup 1 ten as 10 ones.

Then take away 218.

Model It You can subtract hundreds, tens, and ones.

Think: $218 = 200 + 10 + 8$

$$
\begin{array}{r}
450 \\
- \ 200 \\
\hline
250 \\
- \ 10 \\
\hline
240 \\
- \ 8 \\
\hline
?
\end{array}
$$

Grade 4 **Think-Share-Compare Routine** Day 5 Step 4 · ©Curriculum Associates, LLC Copying is permitted.

Step 5 **Connect and Reflect**
- Complete and discuss the *Connect It* questions.
- Reflect on what you learned.

Connect It Find the difference.

1 Look at *Picture It*. Why do you need to trade 1 ten for 10 ones?

2 Fill in the boxes to find $450 - 218$.

$$
\begin{array}{ccccc}
400 & + & \boxed{} & + & 10 \\
- \ 200 & + & 10 & + & 8 \\
\hline
\boxed{} & + & \boxed{} & + & \boxed{}
\end{array}
$$

3 How many campers did sports?

4 **Talk About It** Look at *Model It*. How is the way the problem is solved like the way shown in *Picture It*? How is it different?

Grade 4 **Think-Share-Compare Routine** Day 5 Step 5 · ©Curriculum Associates, LLC Copying is permitted.

Step 6 **Apply**
- Apply thinking to a new problem.
- Support your thinking.

Try It Try another problem.

5 Jim has 572 stamps. Leo has 347 stamps. How many more stamps does Jim have than Leo? Show your work.

Grade 4 **Think-Share-Compare Routine** Day 5 Step 6 · ©Curriculum Associates, LLC Copying is permitted.

Step By Step

Step 4 Compare

Return *Review Lesson 3* papers. **Display Step 4.** Use the items below to facilitate a whole-class discussion between students to **compare** strategies.

- Ask selected students to explain their strategies. Encourage discussion by asking,
  - *Who can restate or retell [student's] explanation?*
  - *Did anyone solve it a different way?*
- Tell students to look at the *Ready* strategies shown on the Step 4 page. Ask:
  - *How do your strategies compare to the* Ready *strategies?*
  - *How is subtracting three-digit numbers like subtracting two-digit numbers? How is it different?*

Step 5 Connect and Reflect

Display Step 5. Use the items below to help students make math connections and reflect on their work.

- Tell students to complete *Connect It* questions 1, 2, and 3 on their handouts on their own. Display Step 4 as students work so they can see the *Picture It* and *Model It.*
- Allow time for students to discuss *Connect It* questions 1 and 2 with a partner.
- Have volunteers share their responses with the whole class.
- Encourage students to explain how their strategy, their partner's strategy, and the *Ready* strategies helped them solve the problem.
- Discuss *Connect It* question 4 as a class to reflect on how to subtract three-digit numbers in different ways.

Step 6 Apply

Display Step 6. Use the items below to help students apply what they learned to the *Try It* problem.

- Ask students to consider the following questions as they solve the problem.
  - *How could I begin to think about this problem?*
  - *Is there more than one model I could use to solve this?*
  - *Is my answer reasonable?*
- Encourage students to not only solve the problem but also be able to explain how using a place-value model or a different strategy could be used to support their thinking.

Day 5 Wrap Up For homework, have students complete Grade 2, Lesson 14 *Practice and Problem Solving,* pp. 141–142 found on the Teacher Toolbox.

LESSON OVERVIEW

Lesson 0 *Access at Teacher-Toolbox.com*
Think-Share-Compare Routine

CCSS Focus

Domain
The Number System
Number and Operations—Fractions

Cluster
C. Apply and extend previous understandings of numbers to the system of rational numbers.
A. Use equivalent fractions as a strategy to add and subtract fractions.

Standards
6.NS.C.5 Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.
6.NS.C.7 Understand ordering and absolute value of rational numbers.
5.NF.A.2 Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. *For example, recognize an incorrect result $\frac{2}{5} + \frac{1}{2} = \frac{3}{7}$, by observing that $\frac{3}{7} < \frac{1}{2}$.*

Standards for Mathematical Practice (SMP)
1 Make sense of problems and persevere in solving them.
2 Reason abstractly and quantitatively.
3 Construct viable arguments and critique the reasoning of others.
4 Model with mathematics.
5 Use appropriate tools strategically.
6 Attend to precision.
7 Look for and make use of structure.
8 Look for and express regularity in repeated reasoning.

Lesson Objectives

Routine Objectives
- Use best practices during a *Ready* mathematics lesson.
- Identify and explain models or strategies used to solve problems.
- Critique and compare solution strategies of others and those provided in *Ready*.
- Use math talk practices to efficiently share and compare strategies for solving problems.
- Apply math knowledge and modeling techniques to new, similar problems.

Mathematical Objectives
- Write, interpret, and explain statements of order for rational numbers. Distinguish comparisons of absolute value from statements about order. *(Reviews Grade 6 Lesson 13)*
- Subtract fractions and mixed numbers with unlike denominators. Use benchmark fractions to estimate fraction differences. *(Reviews Grade 5 Lesson 11)*

Prerequisite Skills

- Compare and order whole numbers.
- Use number lines to show rational numbers and represent quantities.
- Add and subtract fractions and mixed numbers with like denominators.
- Rewrite fractions with unlike denominators as equivalent fractions with like denominators.

Lesson Vocabulary

- **absolute value** a number's distance from 0 on the number line
- **common denominator** a number that is a common multiple of the denominators of two or more fractions
- **equivalent fractions** two or more fractions that name the same part of a whole or the same point on a number line
- **benchmark fraction** a common fraction that you might compare other fractions to; for example, $\frac{1}{2}$ or $\frac{3}{4}$.

Learning Progression

Grade 7 Lesson 0 prepares students for Grade 7 Unit 1 by reviewing prerequisite content and introducing the Think-Share-Compare Routine for learning mathematics. Students review how to compare and order rational numbers, relating positive and negative values to their positions on a number line and to a real-world context. Students also review fraction computation as they find a common denominator for two mixed numbers in order to carry out a subtraction problem.

Students use benchmark fractions to make reasonable estimates for the subtraction problems.

In Grade 7 Unit 1, students will learn to add, subtract, multiply, and divide positive and negative integers. They will also learn how division results in either terminating or repeating decimals. Computation in the four operations is extended to the set of rational numbers.

Lesson Pacing Guide

Whole Class Instruction

Access materials at Teacher-Toolbox.com

Day 1
30 minutes

Routine Introduction
- Think-Share-Compare Routine Introduction *5 min* *(on right)*

Steps 1–3
- Make Sense of the Problem *5 min*
- Solve and Support Your Thinking *10 min*
- Discuss *10 min*

Day 2
30 minutes

Steps 4–6
- Compare *10 min*
- Connect and Reflect *10 min*
- Apply *10 min*

Practice and Problem Solving
Assign Grade 6, Lesson 13 pages 131–132.

Day 3
25–30 minutes

Steps 1–3
- Make Sense of the Problem *5 min*
- Solve and Support Your Thinking *10 min*
- Discuss *10 min*

Day 4
30 minutes

Steps 4–6
- Compare *10 min*
- Connect and Reflect *10 min*
- Apply *10 min*

Practice and Problem Solving
Assign Grade 6, Lesson 13 pages 133–134.

Day 5
45–60 minutes

Steps 1–6
- Make Sense of the Problem *5 min*
- Solve and Support Your Thinking *10 min*
- Discuss *10 min*
- Compare *10 min*
- Connect and Reflect *10 min*
- Apply *10 min*

Practice and Problem Solving
Assign Grade 5, Lesson 11 pages 115–116.

Materials for Lesson Activities

Per student:
- *Review Lesson 1* student page (Days 1 and 2)
- *Review Lesson 2* student page (Days 3 and 4)
- *Review Lesson 3* student page (Day 5)

Optional: You may wish to provide fraction strips on Day 5 to help students solve problems.

Routine Introduction

Think-Share-Compare Routine

This routine offers a consistent six-step structure for in-depth collaborative problem solving.

- **Days 1–4** The routine is split into three steps per day to allow for shortened instructional times on the first few days of school. The slower pace also allows you extra time to evaluate students' work and their mathematical reasoning.
- **Day 5** The full routine is presented as it would be used during a *Ready Mathematics* lesson.

Introduce the routine.

- Display the Think-Share-Compare Routine shown below and found on Teacher-Toolbox.com.
- Briefly introduce the steps of the routine. Tell students that they will learn more about each step as they do the routine.
- Tell students they will use this routine during the math lessons throughout the year.

Start the routine.

Go to the Day 1–2 pages to start the lesson and practice the routine.

Ready | Mathematics

Think-Share-Compare Routine

1. Make Sense of the Problem
2. Solve and Support Your Thinking
3. Discuss
4. Compare
5. Connect and Reflect
6. Apply

Think-Share-Compare Routine
DAY 1 Steps 1–3

Teacher-Toolbox.com

To prepare for Grade 7, Unit 1

Learn *Ready* Think-Share-Compare Routine

Review *Absolute Value and Ordering Numbers* (Grade 6, Lesson 13)

Step By Step

Step 1 Make Sense of the Problem

Display Step 1. Use the items below to help students make sense of the problem.

- Have a student read the problem out loud. Ask the first question below. Have students discuss their answers with a partner before sharing with the class. Repeat this process for the second and third questions.
  - *What is the problem about?*
  - *What are you trying to find out?*
  - *What information is important?*

Step 2 Solve and Support Your Thinking

Hand out *Review Lesson 1* from the Teacher Toolbox. *Display Step 2.* Use the items below to set up students' individual **think**-time work.

- Tell students to work on the problem on their own.
- Ask students to record their solution and any models or pictures they use to support their thinking.
- Encourage students to try another approach to solve the problem if they finish early.
- As you monitor students' work, look for a role-play partner for Step 3.

Step 3 Discuss

Display Step 3. Have students work in pairs. Use the items below to help partners **share** their thinking.

- Tell students that the goal of the Discuss step is to share their thinking and to understand their partner's thinking.
- Model how to use the *Discussion Starters* from Step 3 with a student. For example, say to your partner, *I'm not sure how to find the answer because I don't remember which number is greater, −7 or −9.* Then ask your partner for help.
- Tell pairs to use one or more of the *Discussion Starters* to help them get started sharing their thinking.

Day 1 Wrap Up Collect student papers at the end of the partner discussion. Select two or three student strategies to use for the Compare step on Day 2. Look for strategies that are similar to and different from the *Ready* strategies.

Step 1 Make Sense of the Problem
- What is the problem about?
- What are you trying to find out?
- What information is important?

Problem **Think about ways to solve the problem.**
One morning it was −9°F in Columbus, Ohio and −7°F in Pittsburgh, Pennsylvania. Was it warmer in Columbus or Pittsburgh?

Grade 7 Think-Share-Compare Routine Day 1 Step 1 ©Curriculum Associates, LLC Copying is permitted.

Step 2 Solve and Support Your Thinking
- Solve the problem.
- Record your process.
- Solve another way.

Problem **Think about ways to solve the problem.**
One morning it was −9°F in Columbus, Ohio and −7°F in Pittsburgh, Pennsylvania. Was it warmer in Columbus or Pittsburgh?

Grade 7 Think-Share-Compare Routine Day 1 Step 2 ©Curriculum Associates, LLC Copying is permitted.

Step 3 Discuss
- Share your thinking.

Discussion Starters
Use these to start sharing your thinking.

- I'm not sure how to find the answer because …
- The strategy I used to find the answer was …
- Do you agree with me? Why or why not?
- Why did you choose that strategy?

Grade 7 Think-Share-Compare Routine Day 1 Step 3 ©Curriculum Associates, LLC Copying is permitted.
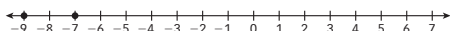
Think-Share-Compare Routine

Teacher-Toolbox.com

Step 4 **Compare**
- Compare class strategies.
- Compare your strategy to *Ready* strategies.

Picture It You can graph the numbers on a number line.

−9 −8 −7 −6 −5 −4 −3 −2 −1 0 1 2 3 4 5 6 7

Model It You can use the number line to write an inequality to compare the numbers.

−9 is to the left of −7 on the number line. This means that −9 is less than −7.

You can use symbols to compare the numbers.

The symbol < means *is less than*.
−9 < −7

Model It You can use the number line to write a second inequality to compare the numbers.

−7 is to the right of −9 on the number line. This means that −7 is greater than −9.

You can use symbols to compare the numbers.

The symbol > means *is greater than*.
−7 > −9

Grade 7 Think-Share-Compare Routine Day 2 Step 4   ©Curriculum Associates, LLC Copying is permitted.

Step 5 **Connect and Reflect**
- Complete and discuss the *Connect It* questions.
- Reflect on what you learned.

Connect It Now use the number line and the comparison statements to solve the problem.

1 Look at the number line in *Picture It*.
Where is −9 located?
Where is −7 located?

2 From left to right, does the number line show numbers from least to greatest or greatest to least?

3 Which is the warmer temperature, −9°F or −7°F?
Which city was warmer?

4 *Model It* shows that you can write two inequalities to compare −9 and −7.
Write two inequalities to compare −6 and 5. Tell how you decided.

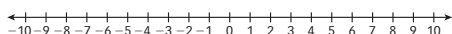**5** Explain how you can use a number line to compare any two numbers.

Grade 7 Think-Share-Compare Routine Day 2 Step 5   ©Curriculum Associates, LLC Copying is permitted.

Step 6 **Apply**
- Apply thinking to a new problem.
- Support your thinking.

Try It Use what you just learned to compare the numbers below. Use the number line to help if needed.

−10 −9 −8 −7 −6 −5 −4 −3 −2 −1 0 1 2 3 4 5 6 7 8 9 10

6 Write two inequalities to compare −5 and −3.

7 Write two inequalities to compare 9 and −9.

Grade 7 Think-Share-Compare Routine Day 2 Step 6   ©Curriculum Associates, LLC Copying is permitted.

Step By Step

Step 4 Compare

Return *Review Lesson 1* papers from Day 1. **Display Step 4.** Use the items below to facilitate a whole-class discussion among students to **compare** strategies.

- Ask selected students to explain their strategies. Encourage discussion by asking,
  - *Who can restate or retell [student's] explanation?*
  - *How is your strategy or solution similar to or different from [student's]?*
- Tell students to look at the *Ready* strategies shown on the Step 4 page. Ask:
  - *How do your strategies compare to the* Ready *strategies?*
  - *Did anyone use a number line? How can you use the numbers' positions on a number line to compare them?*

Step 5 Connect and Reflect

Display Step 5. Use the items below to help students make math connections and reflect on their work.

- Tell students to complete *Connect It* questions 1–4 on their handouts on their own. Display Step 4 as students work so they can see the *Picture It* and *Model Its.*
- Then allow time for students to discuss *Connect It* questions 3 and 4 with a partner.
- Have volunteers share their responses with the whole class.
- Encourage students to explain how their strategy, their partner's strategy, and the *Ready* strategies helped them solve the problem.
- Discuss *Connect It* question 5 as a class to reflect on how number lines can be used to compare any two numbers.

Step 6 Apply

Display Step 6. Use the items below to help students apply what they learned to the *Try It* problems.

- Ask students to consider the following questions as they solve the problem.
  - *How is this problem like other problems I have solved before?*
  - *How can I use a model to help me?*
- Encourage students to not only solve the problem but also be able to explain how using a number line model or a different strategy could support their thinking.

Day 2 Wrap Up For homework, have students complete Grade 6, Lesson 13 *Practice and Problem Solving*, pp. 131–132 found on the Teacher Toolbox.

Think-Share-Compare Routine

DAY 3 Steps 1–3

To prepare for Grade 7, Unit 1
Learn *Ready* Think-Share-Compare Routine
Review *Absolute Value and Ordering Numbers*
(Grade 6, Lesson 13)

Step By Step

Step 1 Make Sense of the Problem

Display Step 1. Use the items below to help students make sense of the problem.

- Have a student read the problem out loud. Ask the first question below. Have students discuss their answers with a partner before sharing with the class. Repeat this process for the second and third questions.
  - *What is the problem about?*
  - *What are you trying to find out?*
  - *What information is important?*

Step 2 Solve and Support Your Thinking

Hand out *Review Lesson 2* from the Teacher Toolbox. ***Display Step 2.*** Use the items below to set up students' individual **think**-time work.

- Tell students to work on the problem on their own.
- Ask students to record their solution and any models or pictures they use to support their thinking.
- Encourage students to try another approach to solve the problem if they finish early.
- As you monitor students' work, look for a role-play partner for Step 3.

Step 3 Discuss

Display Step 3. Have students work in pairs. Use the items below to help partners **share** their thinking.

- Tell students that the goal of the Discuss step is to share their thinking and to understand their partner's thinking.
- Model how to use the *Discussion Starters* from Step 3 with a student. For example, say to your partner *How did you get started?* Allow time for the student to respond.
- Tell pairs to use one or more of the *Discussion Starters* to help them get started sharing their thinking.

Day 3 Wrap Up Collect student papers at the end of the partner discussion. Select two or three student strategies to use for the Compare step on Day 4. Look for strategies that are similar to and different from the *Ready* strategies. Consider the impact of the order in which you choose to present these strategies.

Step 1 Make Sense of the Problem
- What is the problem about?
- What are you trying to find out?
- What information is important?

Problem Think about ways to solve the problem.
Five friends played a game where you earn positive and negative points. Their final scores were −3.5, 2, −3, −1, 1.5. What was the highest score? What was the lowest score?

Step 2 Solve and Support Your Thinking
- Solve the problem.
- Record your process.
- Solve another way.

Problem Think about ways to solve the problem.
Five friends played a game where you earn positive and negative points. Their final scores were −3.5, 2, −3, −1, 1.5. What was the highest score? What was the lowest score?

Step 3 Discuss
- Share your thinking.

Discussion Starters
Use these to start sharing your thinking.

- I knew … so I …
- I don't understand how …
- How did you get started?
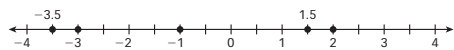- I disagree with this part because …

Think-Share-Compare Routine
DAY 4 Steps 4–6

Step 4 Compare
- Compare class strategies.
- Compare your strategy to *Ready* strategies.

Picture It You can graph the numbers on a number line.

−3.5 and 1.5 plotted on a number line from −4 to 4.

Model It You can compare the positions of the numbers on the number line.

−3.5 is to the left of −3.
−3 is to the left of −1.
−1 is to the left of 1.5.
1.5 is to the left of 2.

Model It You can compare the positions of the numbers on the number line in another way.

2 is to the right of 1.5.
1.5 is to the right of −1.
−1 is to the right of −3.
−3 is to the right of −3.5.

Grade 7 Think-Share-Compare Routine Day 4 Step 4 ©Curriculum Associates, LLC Copying is permitted.

Step 5 Connect and Reflect
- Complete and discuss the *Connect It* questions.
- Reflect on what you learned.

Connect It Now use the number line to order the numbers and solve the problem.

1. Look at the first *Model It*. Order the numbers from least to greatest.
2. Look at the second *Model It*. Order the numbers from greatest to least.
3. What was the lowest score? How do you know?
4. What was the highest score? How do you know?
5. Explain how to use a number line to order numbers.

Grade 7 Think-Share-Compare Routine Day 4 Step 5 ©Curriculum Associates, LLC Copying is permitted.

Step 6 Apply
- Apply thinking to a new problem.
- Support your thinking.

Try It Use what you just learned about ordering numbers to solve these problems. Use a number line to help if needed.

6. Order the numbers from least to greatest.
   a. −8, −6, −5, −7
   b. −8.2, 6, −3.5, 8.2, −5

7. Order the numbers from greatest to least.
   a. $-\frac{3}{4}$, −1, $\frac{5}{4}$, 2
   b. −0.5, 1.5, 0, −5, 1.25

Grade 7 Think-Share-Compare Routine Day 4 Step 6 ©Curriculum Associates, LLC Copying is permitted.

Step By Step

Step 4 Compare

Return *Review Lesson 2* papers from Day 3. **Display Step 4.** Use the items below to facilitate a whole-class discussion among students to **compare** strategies.

- Ask selected students to explain their strategies. Encourage discussion by asking,
  - *What do others think about what [student] said?*
  - *Would anyone like to add to what was said?*
- Tell students to look at the *Ready* strategies shown on the Step 4 page. Ask:
  - *How do your strategies compare to the* Ready *strategies?*

Step 5 Connect and Reflect

Display Step 5. Use the items below to help students make math connections and reflect on their work.

- Tell students to complete *Connect It* questions 1–4 on their handouts on their own. Display Step 4 as students work so they can see the *Picture It* and *Model Its*.
- Allow time for students to discuss *Connect It* questions 3 and 4 with a partner.
- Have volunteers share their responses with the whole class.
- Encourage students to explain how their strategy, their partner's strategy, and the *Ready* strategies helped them solve the problem.
- Discuss *Connect It* question 5 as a class to reflect on how number lines can be used to compare any two numbers.

Step 6 Apply

Display Step 6. Use the items below to help students apply what they learned to the *Try It* problems.

- Ask students to consider the following questions as they solve the problem.
  - *Which picture or model would help me to solve this problem?*
  - *How could I check my steps or my answer?*
- Encourage students to not only solve the problem but also be able to explain how a number line model could be used to order positive and negative numbers.

Day 4 Wrap Up For homework, have students complete Grade 6, Lesson 13 *Practice and Problem Solving,* pp. 133–134 found on the Teacher Toolbox.

Think-Share-Compare Routine

DAY 5 Steps 1–3

To prepare for Grade 7, Unit 1
Learn *Ready* Think-Share-Compare Routine
Review *Add and Subtract Fractions in Word Problems*
(Grade 5, Lesson 11)

Step By Step

Step 1 Make Sense of the Problem

Display Step 1. Use the items below to help students make sense of the problem.

- Have a student read the problem out loud. Ask the first question below. Have students discuss their answers with a partner before sharing with the class. Repeat this process for the second and third questions.
  - *What is the problem about?*
  - *What are you trying to find out?*
  - *What information is important?*

Step 2 Solve and Support Your Thinking

Hand out *Review Lesson 3* from the Teacher Toolbox. ***Display Step 2.*** Use the items below to set up students' individual **think**-time work.

- Tell students to work on the problem on their own.
- Ask students to record their solution and any models or pictures they use to support their thinking.
- Encourage students to try another approach to solve the problem if they finish early.

Step 3 Discuss

Display Step 3. Have students work in pairs. Use the items below to help partners **share** their thinking.

- Tell students that the goal of the Discuss step is to share their thinking and to understand their partner's thinking.
- Tell students to actively listen to understand their partner's strategy.
- Tell pairs to use one or more of the *Discussion Starters* to help them get started sharing their thinking.

Prepare to Compare Tell certain students that you plan to share their strategy with the whole class. Monitor student work and make a short list of the order in which to present these strategies. Consider starting with a common or simple strategy and work towards more complex models.

Step 1 Make Sense of the Problem
- What is the problem about?
- What are you trying to find out?
- What information is important?

Problem Think about ways to solve the problem.

Frankie purchases a $3\frac{1}{2}$-pound bag of chicken.

He uses $1\frac{1}{3}$ pounds of chicken for fajitas.

How many pounds of chicken are left?

Step 2 Solve and Support Your Thinking
- Solve the problem.
- Record your process.
- Solve another way.

Problem Think about ways to solve the problem.

Frankie purchases a $3\frac{1}{2}$-pound bag of chicken.

He uses $1\frac{1}{3}$ pounds of chicken for fajitas.

How many pounds of chicken are left?

Step 3 Discuss
- Share your thinking.

Discussion Starters
Use these to start sharing your thinking.

- A model I used was …
  It helped me …

- At first, I thought …

- Can you explain that again?

- I agree with you about … because …

Think-Share-Compare Routine

Teacher-Toolbox.com

Step 4 — Compare
- Compare class strategies.
- Compare your strategy to *Ready* strategies.

Picture It You can picture the problem using a fraction strip.

The fraction strip below represents $3\frac{1}{2}$ pounds of chicken. It is separated into sections representing the $1\frac{1}{3}$ pounds used for fajitas and the unused amount.

$1\frac{1}{3}$ pounds for fajitas   unused amount

total amount of chicken
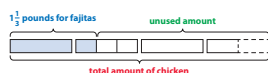
The model shows the difference $3\frac{1}{2} - 1\frac{1}{3}$.

Model It You can model the problem with a number line.

Since $2 \times 3 = 6$, the fractions in the problem, $3\frac{1}{2}$ and $1\frac{1}{3}$, can be rewritten using a common denominator of 6.

$3\frac{1}{2} = 3\frac{3}{6}$ and $1\frac{1}{3} = 1\frac{2}{6}$.

The number line below is divided into sixths. It shows starting with a total of $3\frac{1}{2}$ pounds, with two jumps to the left representing the $1\frac{1}{3}$ pounds of chicken used.

$-\frac{1}{3}$ -1

0   1   2   3 $3\frac{1}{2}$ 4

You can rewrite the difference $3\frac{1}{2} - 1\frac{1}{3}$ as $3\frac{3}{6} - 1\frac{2}{6}$.

Step 5 — Connect and Reflect
- Complete and discuss the *Connect It* questions.
- Reflect on what you learned.

Connect It Now you will estimate and then solve the problem from the previous page using benchmark fractions and an equation.

1. Identify the closest half on either side of $1\frac{1}{3}$.

   $1\frac{1}{3}$ is greater than _____ and less than _____.

2. Why are halves a good choice for benchmark fractions for $1\frac{1}{3}$?

3. The difference $3\frac{1}{2}$ minus $1\frac{1}{3}$ must be between _____ and _____.

   Estimate $3\frac{1}{2} - 1\frac{1}{3}$ and explain your estimate.

4. Find the actual difference.

   There are _____ pounds of chicken remaining.

5. Is this a reasonable answer based on your estimate? Explain.

Step 6 — Apply
- Apply thinking to a new problem.
- Support your thinking.

Try It Use what you just learned about estimating with benchmark fractions to solve this problem. Show your work on a separate sheet of paper.

6. Tim's bean sprout grew $3\frac{3}{8}$ inches. Teegan's bean sprout grew $2\frac{3}{4}$ inches. How many more inches did Tim's bean sprout grow than Teegan's? First, estimate the difference and explain your reasoning. Then find the actual difference.

Step By Step

Step 4 — Compare

Return *Review Lesson 3* papers. **Display Step 4.** Use the items below to facilitate a whole-class discussion among students to **compare** strategies.

- Ask selected students to explain their strategies. Encourage discussion by asking,
  - *Who can restate or retell [student's] explanation?*
  - *Did anyone solve it a different way?*
- Tell students to look at the *Ready* strategies shown on the Step 4 page. Ask:
  - *How do your strategies compare to the* Ready *strategies?*
  - *Look at the* Picture It *and* Model It. *How do they help solve the problem?*

Step 5 — Connect and Reflect

Display Step 5. Use the items below to help students make math connections and reflect on their work.

- Tell students to complete *Connect It* questions 1–5 on their handouts on their own. Display Step 4 as students work so they can see the *Picture It* and *Model It.*
- Allow time for students to discuss *Connect It* questions 3, 4, and 5 with a partner.
- Have volunteers share their responses with the whole class.
- Encourage students to explain how their strategy, their partner's strategy, and the *Ready* strategies helped them solve the problem.
- To help students reflect on the lesson, ask *Which strategy would you choose to solve a similar problem?*

Step 6 — Apply

Display Step 6. Use the items below to help students apply what they learned to the *Try It* problem.

- Ask students to consider the following questions as they solve the problem.
  - *How could I begin to think about this problem?*
  - *Is there more than one model I could use to solve this?*
  - *Is my answer reasonable?*
- Encourage students to not only solve the problem but also be able to explain how using a number line or bar model could support their thinking.

Day 5 Wrap Up For homework, have students complete Grade 5, Lesson 11 *Practice and Problem Solving,* pp. 115–116 found on the Teacher Toolbox.

Where to Find Discourse Resources

Teacher Resource Book

The Teacher Resource Book includes discourse questions specific to the mathematical content. These include:

- **Mathematical Discourse questions**
- **Step By Step questions**
- **Connect It questions**
- **Pair/Share questions** (Gr. 2–8 Guided Practice)

▶ **Mathematical Discourse**

1 *How is adding 18 + 7 like using the "make a ten" strategy?*
Children should notice that in adding 8 ones and 7 ones, the total is greater than 10, so composing a ten helps find the sum. In this problem, there is another ten to add so the sum has

Step By Step
- Read the problem aloud. Ask children to relate this situation to the Activity in the

Connect It
- Read **Connect It** as a class. Be sure to point out that the questions refer to the problem on the previous page.
- Remind students that "scale" is the increment by which the numbers change on the number line. Discuss that it makes sense to use $\frac{1}{8}$ as the scale because each width expressed as eighths.
- students which column of Xs would be llest if Kiera had 20 stickers that have a of $\frac{1}{2}$ inch. $\frac{1}{2}$-inch column of Xs
- students to understand that the line ows measurement data from least to greatest, resulting in a visual model that shows how the data are grouped.

- **Pair/Share** When students have completed each problem, have them Pair/Share to discuss their solutions with a partner or in a group.

Online Teacher Toolbox

The Teacher Toolbox includes resources to support *Ready*'s discourse-based instructional routine, Think-Share-Compare:

- **Lesson 0 Think-Share-Compare Introduction** and Resources
- **Think-Share-Compare Routine slides** are available for all Developing Skills and Strategies lessons

Talking can help us better understand ways to solve a problem.

**Think-Share-Compare Routine**

1. **Make Sense of the Problem**
   Read and understand the problem or question. Think about the key information.
2. **Solve and Support Your Thinking**
   Include pictures, models, and/or explanations in your solutions. If you have time, show another way to solve it.
3. **Discuss**
   Explain your thinking to a partner. Discuss how your strategies are alike and different.
4. **Compare**
   Compare your strategies with the class, including the strategies in the *Ready* book.
5. **Connect and Reflect**
   Complete and discuss the *Connect It* questions.
6. **Apply**
   Apply what you have learned to a new problem. Be sure to support your answer.

Ready Central

Ready Central provides general mathematical discussion questions and whitepapers on establishing and preparing for classroom discourse.

- **100 Questions That Promote Mathematical Discourse**
- **Whitepaper: Orchestrating Mathematical Discourse to Enhance Student Learning**
- **Whitepaper: Selecting and Sequencing Student Solutions**
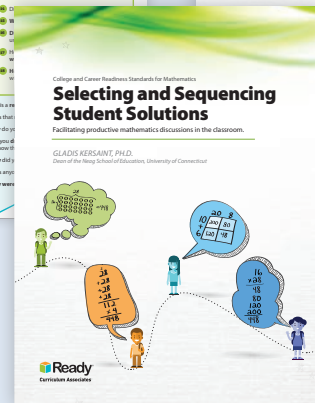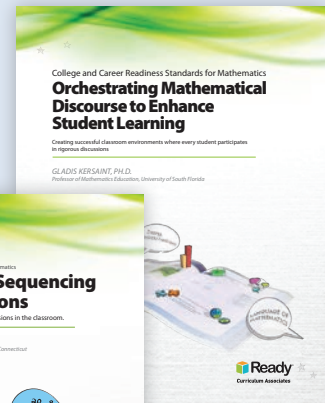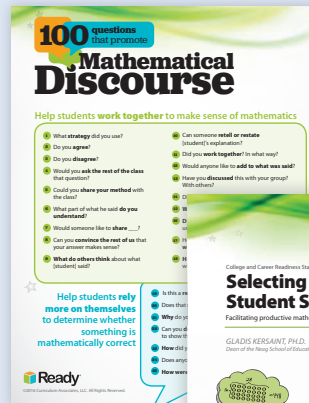
100 questions that promote Mathematical Discourse

Help students **work together** to make sense of mathematics

1. What **strategy** did you use?

2. Do you **agree**?

3. Do you **disagree**?

4. Would you **ask the rest of the class** that question?

5. Could you **share your method** with the class?

6. What part of what he said **do you understand**?

7. Would someone like to **share** ___?

8. Can you **convince the rest of us** that your answer makes sense?

9. **What do others think** about what [student] said?

10. Can someone **retell or restate** [student]'s explanation?

11. Did you **work together**? In what way?

12. Would anyone like to **add to what was said**?

13. Have you **discussed** this with your group? With others?

14. Did anyone get a **different answer**?

15. **Where** would you go for **help**?

16. **Did everybody get a fair chance** to talk, use the manipulatives, or be the recorder?

17. How could you help another student **without telling them the answer**?

18. **How would you explain** ___ to someone who missed class today?

Help students **rely more on themselves** to determine whether something is mathematically correct

19. Is this a **reasonable answer**?

20. Does that make **sense**?

21. **Why** do you think that? Why is that true?

22. Can you **draw a picture or make a model** to show that?

23. **How** did you reach that conclusion?

24. Does anyone want to **revise** his or her answer?

25. **How were you sure** your answer was right?

Ready®

Help students learn to reason mathematically

26 **How did you begin** to think about this problem?

27 What is **another way** you could solve this problem?

28 How could you **prove** _____?

29 Can you **explain how your answer is different from or the same as** [student]'s answer?

30 Let's **break the problem into parts**. What would the parts be?

31 Can you **explain this part more specifically**?

32 Does that **always work**?

33 Can you think of a case where that **wouldn't work**?

34 How did you **organize** your information? Your thinking?

Help students evaluate their own processes and engage in productive peer interaction

35 What do you need to do **next**?

36 What have you **accomplished**?

37 What are your **strengths and weaknesses**?

38 Was your **group participation appropriate and helpful**?

Help students with problem comprehension

39 What is this problem about? What can you **tell me about it**?

40 Do you need to **define or set limits** for the problem?

41 How would you **interpret** that?

42 Could you **reword that in simpler terms**?

43 Is there something that can be **eliminated** or that is **missing**?

44 Could you **explain** what the problem is asking?

45 What **assumptions** do you have to make?

46 What do you **know** about this part?

47 Which words were **most important**? Why?

Help students learn to **conjecture, invent, and solve** problems

48 **What would happen if ___?**

49 Do you see a **pattern**?

50 What are some **possibilities** here?

51 Where could you find the **information** you need?

52 How would you **check your steps** or your answer?

53 What **did not work**?

54 How is your solution method the **same as or different from** [student]'s method?

55 Other than retracing your steps, **how can you determine** if your answers are appropriate?

56 How did you **organize** the information? Do you have a **record**?

57 How could you solve this using **tables, lists, pictures, diagrams**, etc.?

58 What have you tried? What **steps** did you take?

59 How would it look if you used this **model** or these **materials**?

60 How would you draw a **diagram or make a sketch** to solve the problem?

61 Is there **another possible answer**? If so, explain.

62 Is there **another way to solve** the problem?

63 Is there **another model** you could use to solve the problem?

64 Is there anything you've **overlooked**?

65 **How did you think** about the problem?

66 What was your **estimate or prediction**?

67 How **confident** are you in your answer?

68 **What else** would you like to know?

69 What do you think comes **next**?

70 Is the solution **reasonable**, considering the context?

71 Did you have a **system**? Explain it.

72 Did you have a **strategy**? Explain it.

73 Did you have a **design**? Explain it.

Help students learn to **connect mathematics, its ideas, and its application**

74 What is the **relationship** between ___ and ___?

75 Have we ever solved a problem **like this before**?

76 What uses of mathematics did you find in the **newspaper** last night?

77 What is the **same**?

78 What is **different**?

79 Did you use skills or build on concepts that were **not necessarily mathematical**?

80 Which **skills or concepts** did you use?

81 What **ideas** have we explored before that were useful in solving this problem?

82 Is there a **pattern**?

83 **Where else** would this strategy be useful?

84 How does this **relate** to ___?

85 Is there a **general rule**?

86 Is there a **real-life situation** where this could be used?

87 How would your method work with **other problems**?

88 What other problem does this seem to **lead to**?

Help students **persevere**

89 Have you tried making a **guess**?

90 **What else** have you tried?

91 Would **another method** work as well or better?

92 Is there **another way** to draw, explain, or say that?

93 Give me another **related problem**. Is there an easier problem?

94 How would you **explain** what you know right now?

95 What was **one thing you learned** (or two, or more)?

96 Did you **notice any patterns**? If so, describe them.

97 What **mathematics topics** were used in this investigation?

98 What were the **mathematical ideas** in this problem?

99 What is mathematically **different about these two situations**?

100 What are the **variables** in this problem? What stays **constant**?

Help students focus on the mathematics from **activities**

Support student-led discourse with the *Ready Mathematics* Discourse Cards!

These questions and sentence starters provide a way to engage all students in meaningful mathematical conversations. These cards will help students initiate, deepen, and extend conversations with partners, small groups, or the whole class.

- Each card has two prompts on it, one on the front and one on the back!
- With each question, be sure to have students explain their reasoning in their response.

Some possible uses:

- Post the cards around the room and refer to them when solving problems as a class.
- Give each student a card to use during the "share" portion of the *Ready* Think-Share-Compare Routine, or other discourse-based problem solving routine.
- Choose a few cards to focus on each week, based on the content of your lesson.
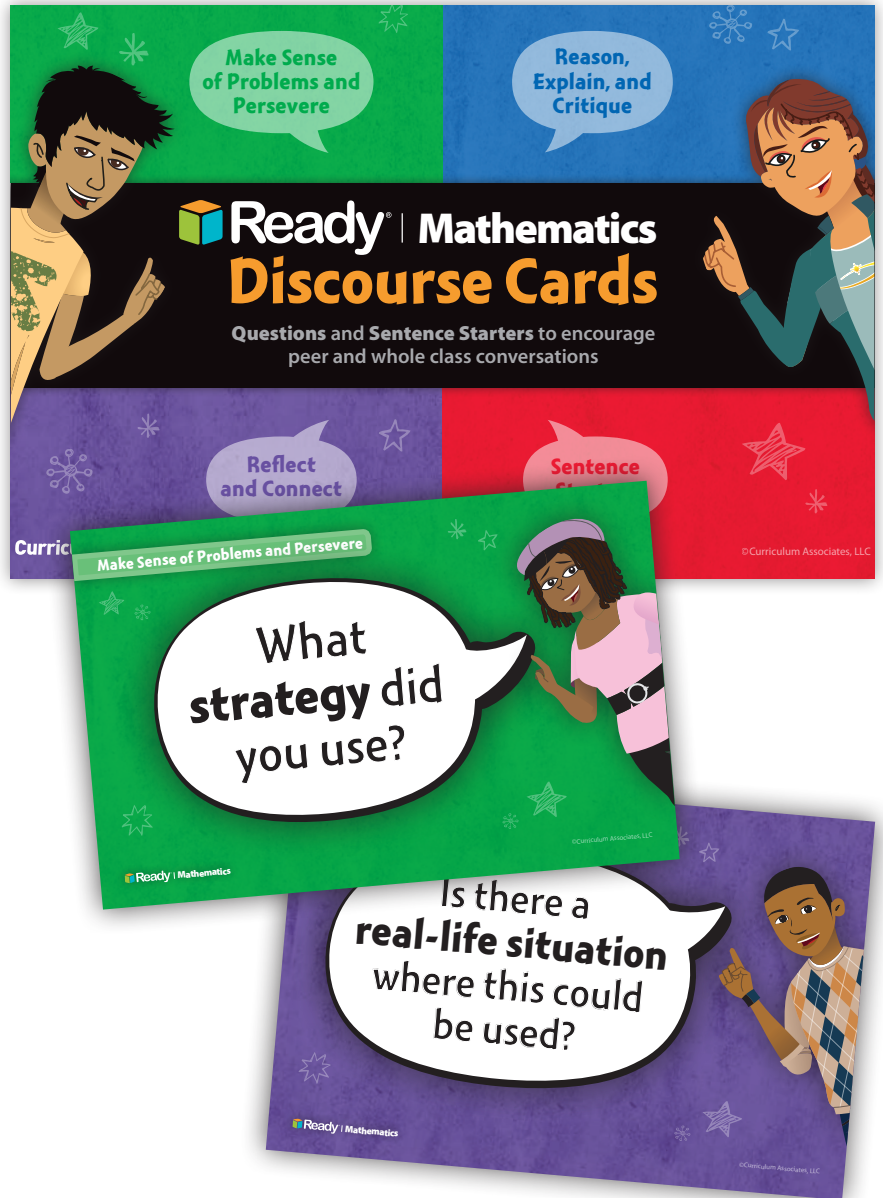
For information on how to order additional sets of the *Ready Mathematics* Discourse Cards, contact your *Ready Mathematics* Account Manager.

Tell us how you use the cards in your classroom at ReadyMathematics.com/MyIdea.

Ready Mathematics **Look-Fors**

Each *Ready Mathematics* Look-For corresponds to an Educator Best Practice. The indicators under "Teacher Actions" describe evidence of these best practices in action. This tool can be used to support lesson planning and observation.

Look For...	Teacher Actions
Purposeful Preparation	• Prepares questions to promote the goals of the lesson. • Understands and anticipates many different solution strategies that students may use and thinks about how to sequence those strategies for classroom discussions. • Recognizes and addresses misconceptions and errors.
Supporting Productive Struggle	• Allows students a long enough time to think before they share their solutions or answers with partners or the class. • Does not ask a question and accept an answer from the first student to raise his or her hand. • Asks students questions to encourage and support students if they get "stuck" rather than telling them what to do.
Facilitating Meaningful Discourse	• Poses purposeful questions that engage all students in doing the majority of thinking and talking. • Asks students to explain and critique their solution strategies and responses to questions, as well as those of their peers. • Frequently has students engage in partner or small group conversations before discussing with the class.
Discussing Multiple Strategies	• Encourages students to solve problems in more than one way and become flexible with multiple models and strategies. • Circulates during independent think time and partner discussions to select and sequence multiple solutions to share during whole class discussion that advance the lesson's goals. • Compares and connects students' solution strategies to one another and to those shown in *Ready* instruction.
Differentiating with Targeted Resources (as needed)	• Uses Quick Check to inform on-level lesson differentiation and remediates with activities in the Teacher Resource Book. • Uses *i-Ready* reports and the Teacher Toolbox to provide instruction and practice targeted to students' specific needs. • Provides opportunities for teacher-led small group work, student-led small groups, *i-Ready Instruction* time, and Independent time, as appropriate.

Notes

Notes

Contact information

24/7 Support at ReadyCentral.com!

Ready Central **is the destination for everything teachers, site leaders, and district leaders need to implement *Ready* successfully.** Packed with helpful resources, this new site provides 24/7 access to:

- Quick-start training videos
- Email templates
- "How-to" guides
- Planning tools

Customer Service:

800-225-0248
(M–Th 8:30am–7pm, Fri 8:30am–5pm ET)

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Name:

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Email:

Curriculum Associates