Eighth Grade Math

This packet includes four sections that cover the major content of 8th grade math. Each section includes four pages of notes and practice for each topic. For additional support, visit KCS TV on YouTube for instructional videos that accompany each section.

The following content is included in this packet:

	Topic			
	I. Solving Equations and Systems of Equations	**II. The Pythagorean Theorem**	**III. Proportional Relationships and Functions**	**IV. Exponents and Scientific Notation**
Activity 1	Equations with the Distributive Property	The Pythagorean Theorem	Representing Proportional Relationships	Integer Exponents
Activity 2	Solving Systems of Linear Equations by Graphing	Converse of the Pythagorean Theorem	Interpreting the Unit Rate as Slope	Scientific Notation with Positive Powers of 10
Activity 3	Solving Systems by Substitution	Distance Between Two Points	Writing Linear Equations from a Table	Scientific Notation with Negative Powers of 10
Activity 4	Solving Systems by Elimination	Distance Between Two Points 2	Identifying and Representing Functions	Operations with Scientific Notation

Name _____ Date _____ Class_____

Representing Proportional Relationships

A **proportional relationship** is a relationship between two sets of quantities in which the ratio of one quantity to the other quantity is constant. If you divide any number in one group by the corresponding number in the other group, you will always get the same quotient.

   Example: Martin mixes a cleaning spray that is 1 part vinegar to 5 parts water.

Proportional relationships can be shown in tables, graphs, or equations.

Table

The table below shows the number of cups of vinegar Martin needs to add to certain amounts of water to mix his cleaning spray.
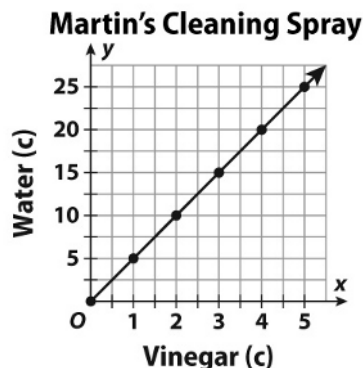
Martin's Cleaning Spray

Vinegar (c)	1	2	3	4	5
Water (c)	5	10	15	20	25

Notice that if you divide the amount of water by the amount of vinegar, the quotient is always 5.

Martin's Cleaning Spray

Graph
On the graph, you can see that for every 1 unit you move to the right on the *x*-axis, you move up 5 units on the *y*-axis.

Equation
Let *y* represent the number of cups of water.
Let *x* represent the cups of vinegar.

   $y = 5x$

Use the table below for Exercises 1–3.

| Distance Driven (mi)	100	200		400		600
Gas Used (gal)	5		15			30

1. There is a proportional relationship between the distance a car drives and the amount of gas used. Complete the table.

2. Find each ratio. $\dfrac{\text{miles}}{\text{gallons}} \rightarrow \dfrac{100}{5} = \dfrac{200}{\rule{1cm}{0.4pt}} = \dfrac{\rule{1cm}{0.4pt}}{15} = \dfrac{400}{\rule{1cm}{0.4pt}} = \dfrac{\rule{1cm}{0.4pt}}{\rule{1cm}{0.4pt}} = \dfrac{600}{30}$

   Each ratio is equal to _____.

3. a. Let *x* represent gallons of gas used. Let *y* represent _____.

   b. The equation that describes the relationship is _____.

Section III Activity 2 | Interpreting the Unit Rate as Slope

Information about rates can be presented in different ways. For example, a graph and a table can present the same type of information in different formats.

Use the graph to complete Exercises 1–3.

Rainfall on Monday
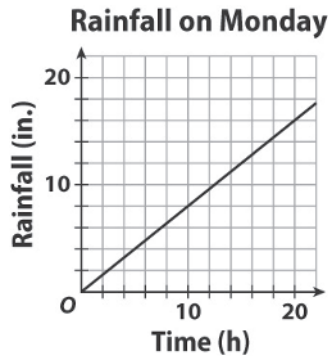
1. How many inches of rain fell in 10 hours? _____

2. How many inches of rain fell in 1 hour? _____

3. What is the slope of the graph and the unit rate?

_____

Use the table to complete Exercises 4–7.

Rainfall on Tuesday

Time (h)	1	2	3	4
Rainfall (in.)	3	6	9	12

4. How many inches of rain fell in 4 hours? _____

5. How many inches of rain fell in 1 hour? _____

6. What is the unit rate? _____

7. What would be the slope of the graph of the data in the table? Explain how you know.

_____

Name _____ Date _____ Class _____

<table>
<tr><td>Section III
Activity 3</td><td colspan="2">**Writing Linear Equations from a Table**</td></tr>
</table>

A linear relationship can be described using an equation in slope-intercept form, $y = mx + b$, where m is the slope and b is the y-intercept. Recall that the y-intercept b is where the graph of the equation crosses the y-axis, which is at point $(0, b)$.

The table below shows the linear relationship between the hours is takes to repair a car and the total cost of the repairs, including the cost of the parts.

Look for an x-value of 0.
The corresponding y-value, 325, is the y-intercept.

Hours Worked, x	Total Cost ($), y
0	325
2	425
4	525
6	625

+2   +100

Find changes in x-values and y-values.
Then use the values to find the slope:

$$m = \frac{\text{change in } y\text{-values}}{\text{change in } x\text{-values}} = \frac{100}{2} = 50$$

Using x-values that differ by 1 will require the least calculation.

Use the y-intercept, $b = 325$, and the slope, $m = 50$ to write an equation for the relationship.
$$y = mx + b$$
$$y = 50x + 325$$

Write an equation in slope-intercept form for each linear relationship.

1. The total monthly cost, y, for smartphone service depends on the number of text messages, x.

Text Messages, x	0	10	20	30
Cost ($), y	40.00	42.00	44.00	46.00

slope: _____

y-intercept: _____

equation: _____

2. The total cost, y, for a taxi ride depends on the number of miles traveled, x.

Distance (mi), x	0	1	5	10
Total Cost ($), y	2.50	5.00	15.00	27.50

slope: _____

y-intercept: _____

equation: _____

Section III Activity 4 | Identifying and Representing Functions

A **relation** is a set of ordered pairs.   {(1, 2), (3, 4), (5, 6)}

The **input** values are the first numbers in each pair.   {(**1**, 2), (**3**, 4), (**5**, 6)}

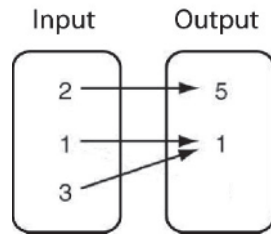The **output** values are the second numbers in each pair. {(1, **2**), (3, **4**), (5, **6**)}

Circle each input value. Underline each output value.

1. {(1, 1), (2, 3), (3, 5)}   2. {(6, 2), (5, 3), (4, 8)}

A relation is a **function** when each input value is paired with *only one* output value.

The relation below is a function.

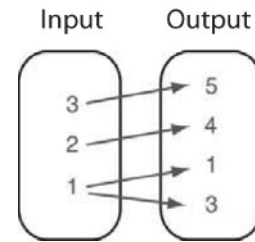The relation below is **not** a function.

Input value 2 is paired with *only one* output, 5.

Input value 1 is paired with *only one* output, 1.

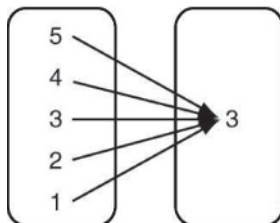Input value 3 is paired with *only one* output, 1.

Input value 1 is paired with *two* outputs, 1 and 3.

Tell whether each relation is a function. Explain how you know.

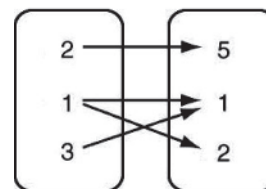3. {(1, 5), (3, 7), (6, 5), (9, 8)}   4. {(1, 2), (1, 8), (3, 6), (4, 8)}

_____   _____

_____   _____

5. Input   Output

6. Input   Output

_____   _____

_____   _____

Answer Key

III. Proportional Relationships and Functions

Activity 1: Representing Proportional Relationships

1.

Distance Driven (mi)	100	200	300	400	500	600
Gas Used (gal)	5	10	15	20	25	30

2. a. 10; 300; 20; 500/25
   b. 20:1
3. a. number of miles driven
b. $y = 20x$

Activity 2: Interpreting the Unit Rate as Slope

1. 8 in.
2. 0.8 in.
3. 0.8; 0.8 in./h
4. 12 in.
5. 3 in.
6. 3 in./h
7. The slope would be 3, because the slope of the graph is equal to the unit rate.

Activity 3: Writing Linear Equations from a Table

1. slope: 0.2, y-intercept: 40, equation: $y = 0.2x + 40$
2. slope: 2.5, y-intercept: 2.5, equation: $y = 2.5x + 2.5$

Activity 4: Identifying and Representing Functions

1. $\{ (\textbf{1}, 1), (\textbf{2}, 3), (\textbf{3}, 5) \}$
2. $\{ (\textbf{6}, 2), (\textbf{5}, 3), (\textbf{4}, 8) \}$

3. Yes; Each input value is paired with only one output value.
4. No; The input value 1 is paired with both 2 and 8.
5. Yes; Each input value is paired with only one output value.
6. No; The input value 1 is paired with both 1 and 2.