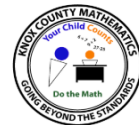




Algebra 1



KCS at Home

Algebra 1 Summer Packet

Activity Set 1

A. Quadratic Functions

Objective: The student will be able to:

- Graph quadratics embedded in a real-world situation.
- Factor a quadratic function to reveal the zeros of the function.
- Determine the minimum and maximum of a quadratic by completing the square.
- Know and apply the quadratic formula.

Activity Set 2

B. Linear Functions and Equations

Objective: The student will be able to:

- Calculate and write the equation for the slope of a line.
- Rewrite an equation in standard form to slope intercept form
- Model and compare linear functions using multiple representations.
- Represent and solve systems of linear functions
- Solve multi-step equations using properties of equality and number properties.

Activity Set 3

C. Exponent Laws and Exponential Functions

Objective: The student will be able to:

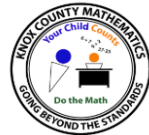
- Use properties of exponents to rewrite exponential expressions.
- Evaluate powers that have zeros or negative exponents.
- Write the explicit formula for geometric sequences in function form.
- Create an exponential function given a graph.
- Represent exponential growth and decay functions.

Activity Set 4

D. Polynomials Expressions

Objective: The student will be able to:

- Simply polynomials by adding and subtracting.
- Multiply monomials and polynomials using models and strategies.
- Use arithmetic operations to simply expressions.
- Identify the greatest common factor of the terms of a polynomial expression.
- Factor polynomials using strategies such as grouping or difference of squares.



Activity Set 2

A. Linear Functions and Equations

I. Calculate the slope of a line

- The slope intercept form for the equation of a line with a slope m and y -intercept b is $y = mx + b$.
- To find the slope of a line $\frac{y_2 - y_1}{x_2 - x_1}$

Ex. $(-3, 2)$ and $(2, 3)$

$$m = \frac{3-2}{2-(-3)} = \frac{1}{5}$$

The slope is $\frac{1}{5}$

II. Writing equations from two ordered pairs, a graph, or table

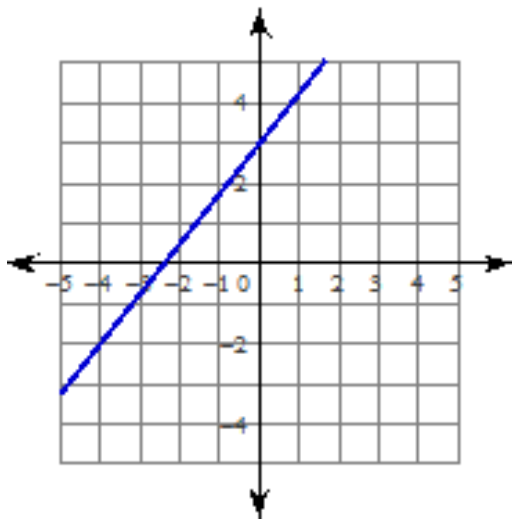
- Find the slope of the line (using steps from above).
- Using the equation $y = mx + b$, substitute the slope for m .
- Using one of the x and y coordinates from the set of points,
($y = 6$) substitute in the equation.
($x = -1$) substitute in the equation.
- Solve for b .
- Equation = $y = -5/3x + 13/3$

$(-1, 6)$ $(5, -4)$

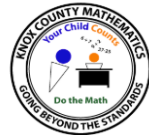
$$\begin{aligned} \text{slope} &= -5/3 \\ y &= -5/3x + b \end{aligned}$$

$$\begin{aligned} 6 &= -5/3(-1) + b \\ 18/3 &= 5/3 + b \\ -5/3 \quad -5/3 + b \\ 18/3 - 5/3 &= b \\ 13/3 &= b \end{aligned}$$

Example from a Graph: (See KCS video) Example from a Table: (See KCS Video)



| x | F(x) |
|---|------|
| 1 | 8 |
| 2 | 17 |
| 4 | 35 |
| 6 | 53 |



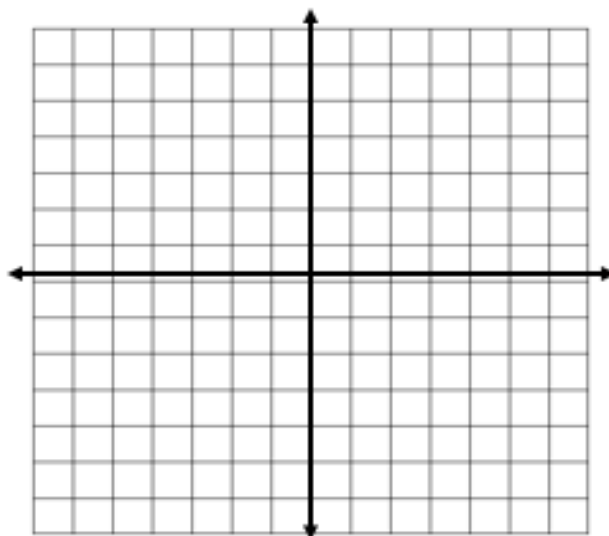
III. Standard form to slope intercept form

- Rewrite the equation in $ax + by = c$ form to $y = mx + b$ form to identify slope and y intercept.
- Solve for y by performing the inverse
- Divide to eliminate the coefficient for y.

$$\begin{aligned}
 2x - 3y &= 10 \\
 2x - 2x - 3y &= 10 - 2x \\
 \underline{-3y} &= \underline{10 - 2x} \\
 -3 & \quad -3 \\
 y &= \frac{2}{3}x - \frac{10}{3}
 \end{aligned}$$

Example: (See KCS Video for answers)

$$3x - 4y = -12$$

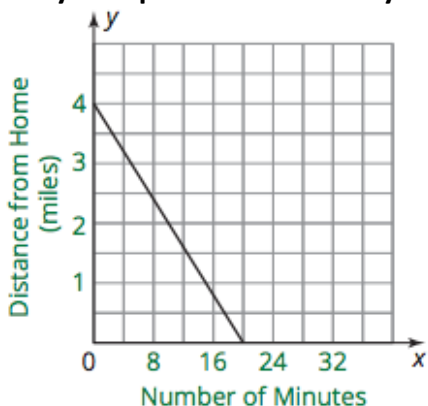


IV. Multiple ways to represent linear functions.

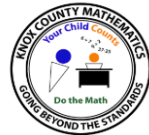
Tonya and Milo bike home from the park at the same time. Tonya is 4 miles from her house. She bikes towards her house going the same distance each minute until she reaches her house. Milo is 3 miles from his house and travels 0.3 mile each minute until he reaches his house.

Tonya's Equation: $4 - 0.2x = y$

Milo's Equation: $3 - 0.3x = y$



| Minutes | Miles |
|---------|-------|
| X | Y |
| 0 | 3 |
| 5 | 1.5 |
| 10 | 0 |



V. Solving equations using properties

| Properties of Equality | For all numbers a , b , and c |
|-------------------------------------|--|
| Addition Property of Equality | If $a = b$, then $a + c = b + c$. |
| Subtraction Property of Equality | If $a = b$, then $a - c = b - c$. |
| Multiplication Property of Equality | If $a = b$, then $ac = bc$. |
| Division Property of Equality | If $a = b$ and $c \neq 0$, then $\frac{a}{c} = \frac{b}{c}$. |

Example 1:

$$3(2x + 1) = 4x + 6$$

$$3(2x + 1) = 4x + 6$$

$$6x + 3 = 4x + 6$$

Distribution Property

$$6x - 4x + 3 =$$

$$4x - 4x + 6$$

Subtraction Property
of Equality

$$2x + 3 - 3 = 6 - 3$$

Subtraction Property
of Equality

$$\frac{2x}{2} = \frac{3}{2}$$

Division Property of
Equality

$$x = 1\frac{1}{2}$$

| Number Properties | For all numbers a , b , and c |
|-----------------------|--|
| Commutative Property | $a + b = b + a$ $ab = ba$ |
| Associative Property | $a + (b + c) = (a + b) + c$ $a(bc) = (ab)c$ |
| Distributive Property | $a(b + c) = ab + ac$ |

Example 2:

$$\frac{1}{2}x - 6 = 2 + (2x + 1)$$

$$\frac{1}{2}x - 6 = 2 + (2x + 1)$$

$$\frac{1}{2}x - 6 = 2 + (1 + 2x)$$

Commutative
Property

$$\frac{1}{2}x - 6 = (2 + 1) + 2x$$

Associative Property

$$\frac{1}{2}x - \frac{1}{2}x - 6 = 3 +$$

$$2x - \frac{1}{2}x$$

Subtraction Property
of Equality

$$-6 - 3 = 3 - 3 + \frac{3}{2}x$$

Subtraction Property
of Equality

$$\frac{2}{3}(-9) = \frac{2}{3}\left(\frac{3}{2}x\right)$$

Multiplication

Property of Equality

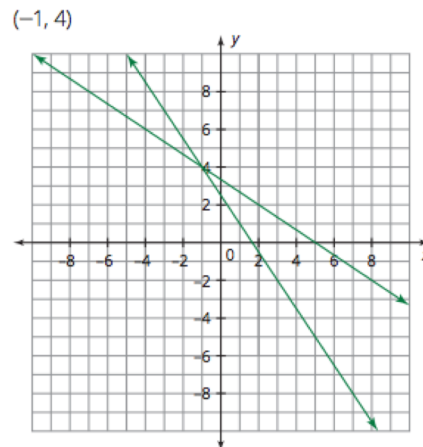
$$x = -6$$

VI. Solving System of Equations by Graphing

- Solve a system of equations by graphing,

$$\begin{cases} 2x = 10 - 3y \\ 3x + 2y = 5 \end{cases}$$

- Change the equations from standard Form to slope intercept form
- Graph each equation.
- The solution will be where they intersect.



VII. Solving System of Equations using linear combinations

- Consider the system of equations

$$\begin{cases} 7x + 2y = 24 \\ 4x + y = 15 \end{cases}$$

- Multiply the second equation by a constant That results in coefficients that are additive Inverses for one of the variables.
 - Now that the y-values are additive inverses, You can solve this linear system for x.
 - Substitute the value for x into one of the Equations to determine the value for y.
- FOR ANOTHER EXAMPLE SEE KCS VIDEO.

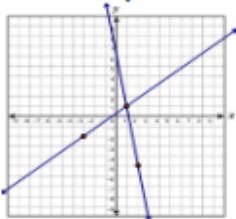
$$\begin{aligned} 7x + 2y &= 24 \\ -2(4x + y) &= -2(15) \end{aligned}$$

$$\begin{array}{r} 7x + 2y = 24 \\ + \quad -8x - 2y = -30 \\ \hline -x = -6 \\ x = 6 \end{array}$$

$$\begin{aligned} 7(6) + 2y &= 24 \\ 42 + 2y &= 24 \\ 2y &= -18 \\ y &= -9 \end{aligned}$$

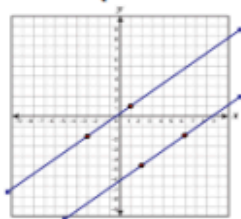
VIII. Solutions to Systems of Equations

One Solution (Intersection)



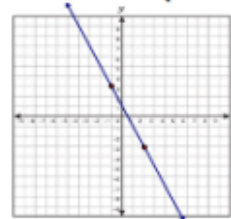
Different Slopes

No Solution (No Intersection)



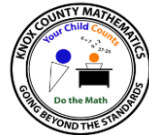
Equal Slopes, Different y intercepts

Infinite Solutions (Same Line)



Equal Slopes, Same y intercept

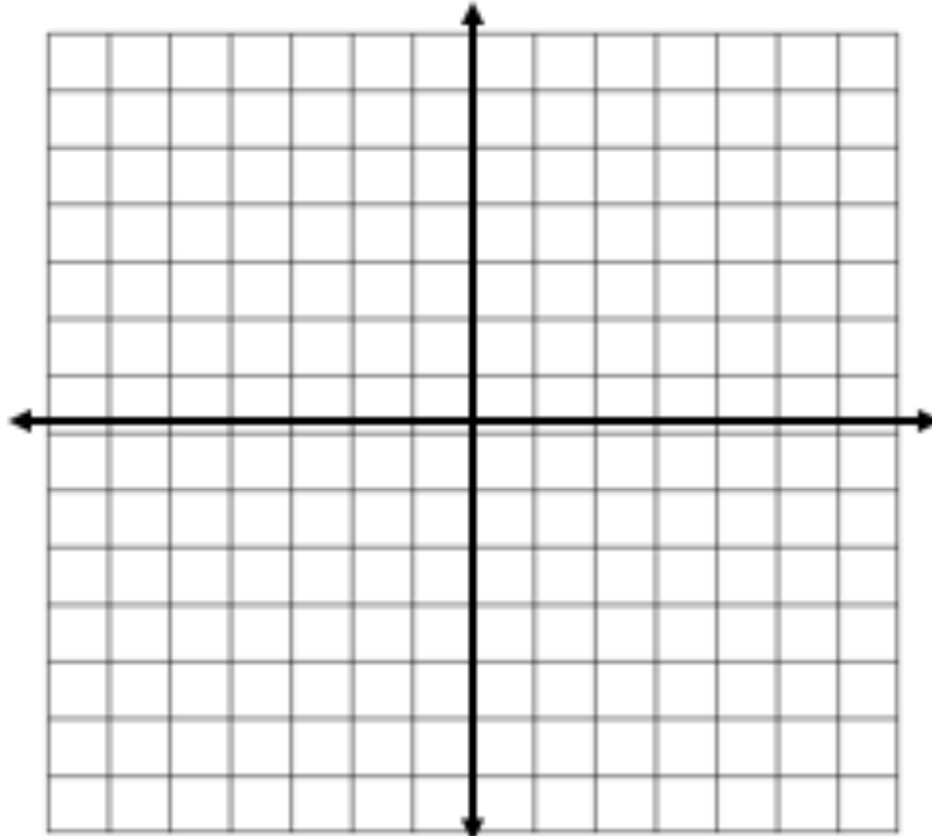
| One Solution | No Solution (No Intersection) | Infinite Solutions (Same Line) |
|--|--|---|
| $y = 2x - 3$ $y = 5x + 8$ | $y = 3x + 8$ $y = 3x - 1$ | $2y = 6x + 8$ $y = 3x + 4$ |
| $y = \frac{2}{3}x + 4$ $y = 3x - 2$ | $y = -\frac{5}{4}x + 4$ $y = -\frac{5}{4}x - 1$ | $5y = -x + 30$ $y = -\frac{1}{5}x + 6$ |

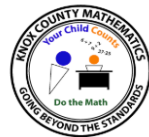


Real Life Scenario Example: (See KCS Video for answers)

Marcus opens a new bank account. He deposits \$25 that he won from a robotics competition. He also plans on depositing \$10 a week from tutoring. Phillip decides he wants to save money as well and opens an account. He already saved \$40 from mowing lawns. He deposits this money and also saves \$10 a week from his allowance.

- **Write equations to represent the amount of money Marcus and Phillip saves.**
- **Create a graph to determine when Marcus and Phillip will have the same amount of money.**
- **How would the equation need to change for Marcus and Phillip to have the same amount of money at any point in time?**
- **How much would Marcus have to save each week in order to have more money than Phillip?**
- **Would there be a time both Marcs and Phillip had the same amount of money in the bank if Marcus saved \$15 a week?**



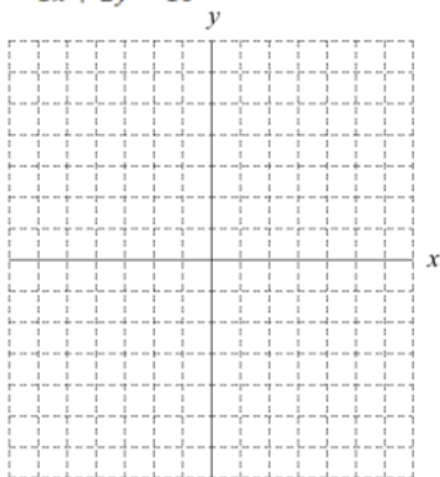


PRACTICE

1. Graph the functions

A.

$$5x + 2y = 10$$

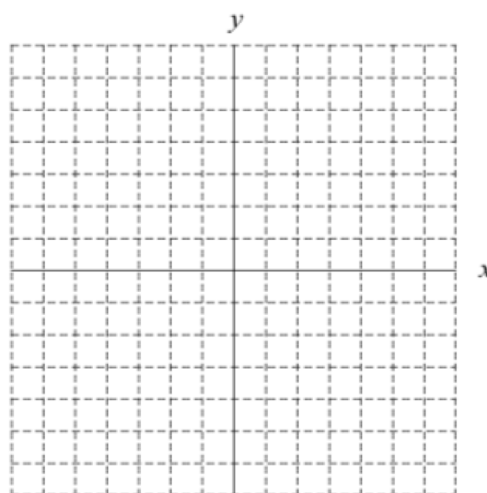


B.

$$y = \frac{1}{2}x - 3$$

Slope: _____

y-intercept _____



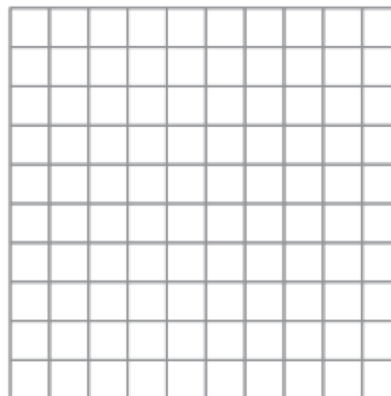
2. Find the slope of the line that contains each pair of points.

A. $(-1, 4)$ $(1, -2)$

B. $(3, 5)$ $(-3, 1)$

3. Tom has saved \$390. He plans to spend \$30 each month for music lessons. The function $s(t) = -30t + 390$ describes his savings, s , in dollars a function of t , time in months.

A. Graph the function that describes Tom's savings as a function of the time he works. Label the x and y intercepts and explain what they mean in the problem situation.



B. Write the function you graphed in factored form.

C. Determine how much Tom will have left of his Savings after 10 months.

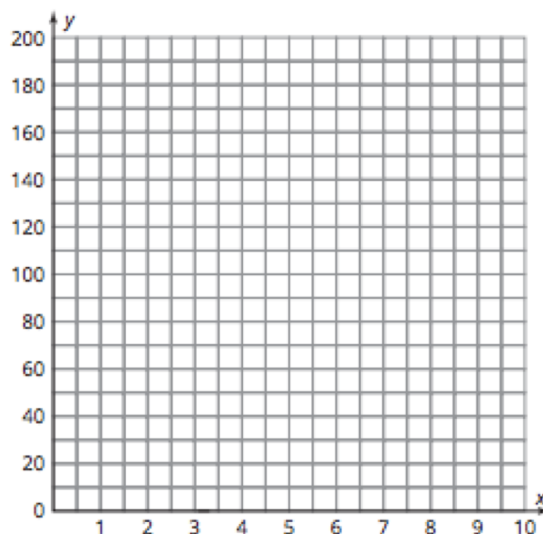
4. A satellite TV company offers two plans. Plan A costs \$115 plus \$30 per month. Plan B costs \$60 per month. How many months must Allie have the plan in order for the first plan to be the better buy? Fill in the table and write the equation for both plans then, graph both the plans.

| Plan A | |
|--------|---|
| X | Y |
| | |
| | |
| | |
| | |
| | |

Equation:

| Plan B | |
|--------|---|
| X | Y |
| | |
| | |
| | |
| | |
| | |

Equation:



5.A.

Solve the equation using the justification given for each step.

$$5x + 7 = \frac{(-15x - 1)}{3} + \frac{4}{3}$$

- _____ Multiplication Property of Equality
- _____ Distributive Property
- _____ Associative Property
- _____ Subtraction Property of Equality
- _____ Addition Property of Equality
- _____ Division Property of Equality

$$x = -\frac{3}{5}$$

B.

Write the property that justifies each step to solve the given equation.

$$-\frac{1}{3}(6x - 21) = -5(x + 1)$$

$$-2x + 7 = -5x - 5$$

$$-2x + 5x + 7 = -5x + 5x - 5$$

$$3x + 7 - 7 = -5 - 7$$

$$\frac{3x}{3} = \frac{-12}{3}$$

$$x = -4$$

6. Determine the solution to each system of equations.

a. $\begin{cases} -3x + y = 10 \\ 2x - 7y = 6 \end{cases}$

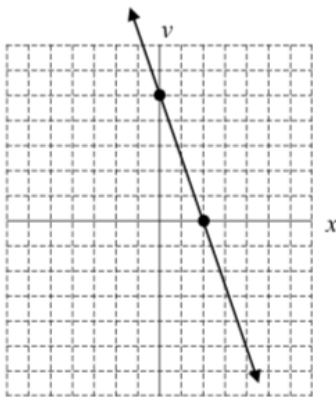
b. $\begin{cases} x - y = 2 \\ y - 3x = -20 \end{cases}$

c. $\begin{cases} 3x = 8y - 4 \\ 6x + 2y = 28 \end{cases}$

d. $\begin{cases} \frac{1}{10}x + \frac{3}{8}y = 1 \\ \frac{1}{4}y + 1 = -\frac{2}{5}x \end{cases}$

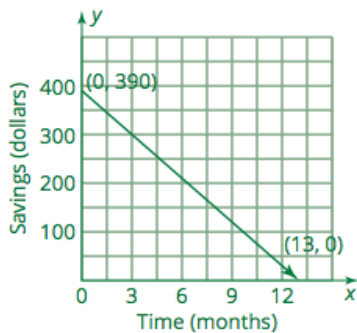
Activity Set 2 Answer Key

1. A.



2. $(-1, 4)$ $(1, -2)$
 $\frac{-2 - 4}{1 - (-1)} = \frac{-6}{2} = -3$

3. $S(t) = -30(t - 13)$



The y-intercept indicates that Tom has \$390 saved before any time has passed. The x-intercept indicates that he will have no money left in his savings after 13 months.

5.A

Distributive Property
 Addition Property of Equality
 Subtraction Property of Equality
 Division Property of Equality

6.a. One solution; $x = -28$

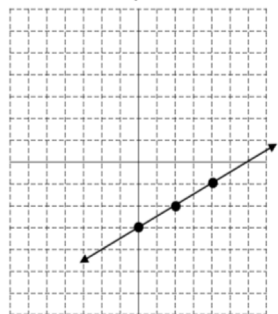
b. No solution

c. Infinite solution

d. No solution

B.

Slope: $\frac{1}{2}$
 y-intercept: $\frac{-3}{y}$



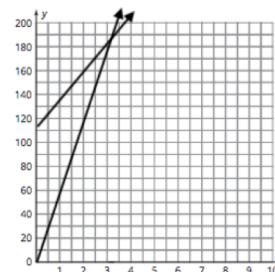
B. $(3, 5)$ $(-3, 1)$
 $\frac{1 - 5}{-3 - 3} = \frac{-4}{-6} = \frac{2}{3}$

4. At 4 months plan A is the better deal

| Plan A | | Plan B | |
|--------|-----|--------|-----|
| X | Y | X | Y |
| 0 | 115 | 0 | 0 |
| 1 | 145 | 1 | 60 |
| 2 | 175 | 2 | 120 |
| 3 | 205 | 3 | 180 |
| 4 | 235 | 4 | 240 |

Equation:
 $y = 115 + 30x$

Equation:
 $y = 60x$



B.

$$3(5x + 7) =$$

$$3\left(\frac{-15x - 1}{3} + \frac{4}{3}\right)$$

$$15x + 21 = (-15x - 1) + 4$$

$$15x + 21 = -15x + (-1 + 4)$$

$$15x + 21 - 21 = -15x + 3 - 21$$

$$15x + 15x = -15x + 15x - 18$$

$$\frac{30x}{30} = \frac{-18}{30}$$