POWELL ALGEBRA STUDENTS
Summer Math Skills
INCOMING ALGEBRA STUDENTS

Dear Parents/Guardians and Incoming Algebra I Students,

The Algebra teachers at Powell Middle School are looking forward to working with you to ensure a productive school year! Powell Middle School maintains high expectations and we are expecting students to practice and develop their skills over the summer to start the year off strong! We have put together this packet with important information and valuable practice activities to prepare you for the beginning of the school year. Some of these skills may be new to you as they are taught in Math 8 and are used in Algebra. This work is to be completed prior to your first day of school. The skills packet is due on Friday, September 7, 2018. It is expected that you complete this packet, as it will count as your first formative assessment grade for the first semester of the 2018-2019 school year.

Enjoy your summer!

Powell Middle School Algebra Teachers
Ms. Terri Braniff and Ms. Lindsey Zito

ESSENTIAL SKILLS:

- Operations with Rational Numbers
- Combining Like Terms
- Distributive Property
- Solving Equations
- Proportions
- Basic Perimeter and Area
- the Real Number System
- Graphing Points
- Slope
- Graphing Lines

DIRECTIONS:

• Use the resources provided on Khan Academy to watch videos, access note pages, and complete practice problems for immediate feedback.

• You should complete all the problems in this packet.

• YOU MUST SHOW ALL WORK FOR EACH PROBLEM IN ORDER TO RECEIVE CREDIT.

Use the resource links provided at the beginning of each new concept to view a video tutorial prior to starting. If you should misplace or lose your packet, you can download a copy from Ms. Braniff's and Ms. Zito's Planbook pages. In addition, Powell will be open for the entire summer, and the packets will be available in the flyer rack outside the office.

Do your best to complete this math skills packet. Be sure to spend adequate time answering the questions with accuracy. The more you prepare for this upcoming school year, the more successful you will be! ☺

Part 1: Adding Rational Number – Find each sum. Show all work and write all answers in simplest form.

RESOURCE LINKS:

Adding and subtracting rational numbers:
https://tinyurl.com/and-rationalnumbers

Adding and subtracting positive/negative fractions:
https://tinyurl.com/add-subpositive-negative

1. 9 + (-3) =	**2.** -12 + -5 =	**3.** -11 + 6 =
4. -12 + 7 + (-3) =	**5.** $-\frac{4}{5}+\frac{3}{20}=$	**6.** -8 + $-\frac{6}{7}=$
7. $-\frac{7}{2}+3\frac{2}{3}=$	**8.** 7.23 + (-8.36) =	**9.** -8.5 + (-9.38) =

Part 2: Subtracting Rational Number – Find each difference. Show all work and write all answers in simplest form.

10. 4 – (-6) =	**11.** -10 – 4 =	**12.** 6 – (-6) – 9 =
13. $-\frac{1}{6}-\frac{5}{12}=$	**14.** $\frac{9}{10}-3=$	**15.** $5\frac{3}{4}-\ -4\frac{5}{6}=$
16. $-\frac{1}{3}-\ -\frac{9}{4}=$	**17.** -12.41 – (-9.95) =	**18.** 2 – 8.25 =

Part 3: Multiplying & Dividing Rational Number – Find each product or quotient. Show all work and write all answers in simplest form.

RESOURCE LINKS:

Multiplying positive/negative integers:
https://tinyurl.com/mult-integers

Multiplying positive/negative fractions:
https://tinyurl.com/mul-pos-neg-frac

Dividing positive/negative integers:
https://tinyurl.com/divide-pos-neg-numbers

Dividing positive/negative fractions:
https://tinyurl.com/divide-signed-fractions

19. $4 \cdot (-3) =$	**20.** $-6 \cdot 5 \cdot -2 =$	**21.** $-8(-2) =$
22. $12 \div -6 =$	**23.** $-35 \div -5 =$	**24.** $\frac{-21}{-3} =$
25. $\frac{-56}{7} =$	**26.** $-1.2 \cdot 2.5 =$	**27.** $-3.7 \cdot -2.1 =$
28. $-\frac{3}{14} \cdot \frac{21}{12} =$	**29.** $-\frac{3}{4} \cdot -\frac{10}{9} =$	**30.** $-\frac{3}{7} \div \frac{11}{35} =$ $\div$
31. $1\frac{5}{6}, (-30) =$	**32.** $-\frac{1}{9} \div \frac{13}{30} =$	**33.** $-0.81 \div -0.9 =$

Part 4: Order of Operations – Simplify each expression. Show all work.

RESOURCE LINK - Order of operations:
https://tinyurl.com/order-of-ops-Khan

34. $-12 - 5 \cdot 2 =$	**35.** $(10 - 12)^2 =$	**36.** $10 - 4(-5 - 1)^2 =$
37. $18 \div -6 - 5 \cdot -2 =$	**38.** $\frac{24-6}{2} =$	**39.** $9+(10\div 2+3^2)+5 =$

Part 5: Combining Like Terms – Simplify each expression.

RESOURCE LINK - Combining Like Terms:
https://tinyurl.com/comining-like-terms-Khan

40. $5x + 8 - 2x$	**41.** $14x^3 - 2 + 7 - 3x^3$	**42.** $9x^3 + 3x - 4x^2 + 2x^3 + x^2$
43. $x^2 + 3x + 5x + 2x^2$	**44.** $3x - y + 17x + y$	**45.** $4n^2 - 7n + 3 + 5n - 1$

Part 6: Distributive Property – Simplify each expression by applying the distributive property and combining like terms.

RESOURCE LINK - Distributive Property:
https://tinyurl.com/distributive-property-Khan

46. 4(2x – 5) =	**47.** -9(3 + x) =	**48.** -2(x – 8) =
49. 5x + 3(5x + 1) =	**50.** -3(8x – 2) + 4(x – 1) =	**51.** 10 + -6(x + 3) – 2(7x – 1) =

Part 7: Solving One-Step Equations – Solve each equation. Show all work and check each solution.

RESOURCE LINKS:
One-Step Equations (positive/negative):
https://tinyurl.com/on-step-equations-Khan

One-Step Equations Decimals/Fractions:
https://tinyurl.com/one-step-add-sub-eqtn-frac

One-Step Equations Multiplication/Division:
https://tinyurl.com/one-step-mul-div-equations

One-Step Equations Multiplication/Division-Fractions and Decimals:
https://tinyurl.com/one-step-mul-div-frac-dec

52. $\frac{x}{9}=3$ Check Step:	**53.** -4.2w = -8.4 Check Step:	**54.** -18 – c = 32 Check Step:
55. 12.5 + h = -31.6 Check Step:	**56.** $\frac{p}{-2}=14$ Check Step:	**57.** $-\frac{1}{3}x=9$ Check Step:

Part 8: Solving Multi-Step Equations

RESOURCE LINK

Two-Step Equations:
https://tinyurl.com/two-step-eqtns

Multi-Step Equations with Variables on Both Sides:
https://tinyurl.com/eqtns-variables-both-sides

Multi-Step Equations with Distribution:
https://tinyurl.com/eqtns-w-distributive-property

Goal: When solving an equation, you are looking for the value of the variable that will make the equation true. To do so, we use opposite operations to isolate the variable. Sometimes it is necessary to simplify each side of the equation in order to solve.

Step 1: If necessary, simplify each side of the equal sign by applying the distributive property and combining like terms.

Step 2: Undo any addition or subtraction first. To do this, apply the inverse operation to both sides of the equal sign.

Step 3: Undo any multiplication or division by applying the inverse operation to both sides of the equal sign.

Step 4: Check each solution by substituting your answer for the variable into the original equation. Simplify. If you have a true statement, you solved the equation correctly but if you end with a false statement, you solved the equation incorrectly.

Two-Step Equation Example:

$2y + 3 = 9$	
$-3 \quad -3$	***Step 1: Subtract 3 from both sides of the equal sign***
$\frac{2y}{2} = \frac{6}{2}$	***Step 2: Divide both sides by 2***
$y = 3$	

Check:	$2(3) + 3 = 9$	***Substitute the answer for the variable into the original equation***
	$6 + 3 = 9$	***Simplify the left side of the equation by applying the order of operations***
	$9 = 9$	***True statement so the answer is correct!!!***

Multi-Step Equation Example:

Example: $\frac{1}{3}(6x - 12) - 10x = 20$

$2x - 4 - 10x = 20$	distribute the 1/3
$-8x - 4 = 20$	combine the like terms
$+4 = +4$	add 4 to each side
$\frac{-8x}{-8} = \frac{24}{-8}$	divide both sides by -8
$x = -3$	

Check the answer: $\frac{1}{3}(6(-3) - 12) - 10(-3) = 20$

$\frac{1}{3}(-18 - 12) + 30 = 20$

$\frac{1}{3}(-30) + 30 = 20$

$-10 + 30 = 20$

$20 = 20$

The x value of -3 makes the equation true, thus our solution is correct.

Solve each equation. Show all work and check each solution.

58. $-10 = 2 + 3y$ Check Step:	**59.** $2x + 3 = -9$ Check Step:	**60.** $5(2x - 3) = -5$ Check Step:
61. $-10 = -14x - 6x$ Check Step:	**62.** $6(2x - 1) = 13x$ Check Step:	**63.** $-(7 - 4x) = 9$ Check Step:
64. $-8 = -(x + 4)$ Check Step:	**65.** $2(4x - 3) - 8 = 4 + 2x$ Check Step:	**66.** $5x - 14 = 8x + 4$ Check Step:

Part 9: Proportions

RESOURCE LINK - Solve Proportions by Scaling:
https://tinyurl.com/solve-proportions-scaling

A proportion is when two ratios are equal. Students have solved proportions in Math 7 by scaling one ratio up or down. There are other ways to solve a proportion but one frequently used is by finding cross products. The cross products of a proportion are equal. These cross products can be used to solve for the unknown values.

Solve by Scaling Example:

x 4

$$\frac{1\ inch}{4\ feet} = \frac{x\ inches}{16\ feet}$$

x 4

Since both denominators are known, find the scale factor from 4 to 16 by dividing 16 by 4. The scale factor is 4 so multiply 1 by 4 to find the value of x.

1 · 4 = 4

x = 4 inches

Solve Using Cross Products Example:

$$\frac{5}{12} = \frac{15}{x}$$

5x 180

$5x = 180$

$\frac{5x}{5} = \frac{180}{5}$

÷5 ÷5

$x = 36$

Since cross products are equal, multiply opposite numerator and denominators and set the two products equal to each other. You now have an equation to solve and find the unknown value.

Solve each proportion. Show all work and round to the nearest tenth if necessary.

67. $\frac{5}{4} = \frac{n}{8}$	**68.** $\frac{5}{9} = \frac{2}{x}$	**69.** $\frac{6}{c} = \frac{21}{28}$
70. $\frac{7}{v} = \frac{8}{7}$	**71.** $\frac{x}{10} = \frac{9}{6}$	**72.** $\frac{7}{5} = \frac{m}{3}$

Write and solve a proportion to solve each problem.

RESOURCE LINK - Writing & Solving Proportions for Word Problems:
https://tinyurl.com/proportion-word-problem

73. Anna walked 4 km by making 2 trips to school. How many trips will Anna have to make to walk a total of 14 km? Assume the relationship is proportional.

74. Aiden is going to Florida. The first 325 miles took 5 hours. Aiden knows the entire trip is about 1170 miles. If they can travel at the same rate, how many hours should the trip take?

75. The park ranger stocks the children's fishing pond keeping a ratio of 4 sunfish to 3 perch. If he puts 300 sunfish into the pond, how many perch should be put into the pond?

76. A certain shade of green paint is made from 5 parts yellow mixed with three parts blue. If 2 cans of yellow are used, how many cans of blue should be used?

Part 10: Graphing Points

RESOURCE LINK - Graphing Coordinate Points:

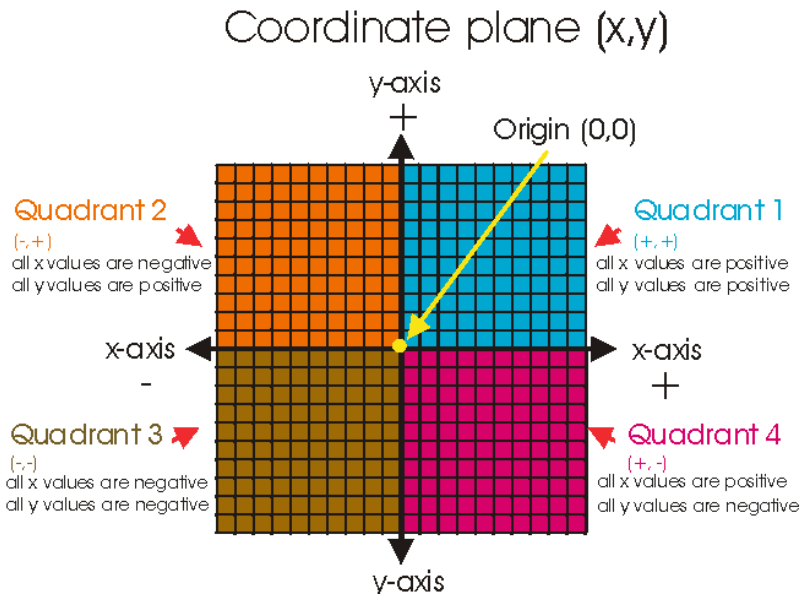
https://tinyurl.com/graph-coordinate-points

A point, or an **ordered pair or coordinate pair**, gives us a location on the coordinate plane relative to the origin (The origin is where the x and y axes intersect).

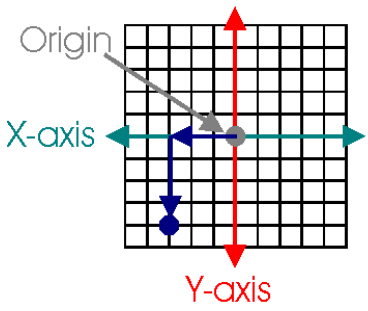
Ordered pairs are written in the form (x, y). The first number, the x –coordinate, tells you how far left or right from the origin. The second number, the y-coordinate, tells you how far up or down.

Positive x-values are to the right of the origin, and negative x-values to the left of the origin.

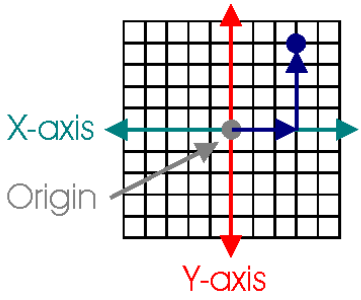
Positive y-values are above the origin, and negative y-values below the origin.



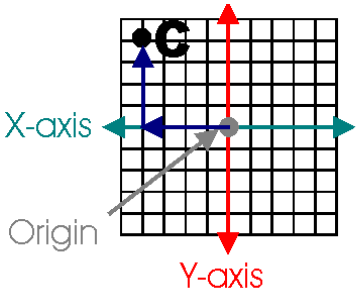
Examples:



To plot the point (-3,-4) start at the origin. Go to -3 on the x-axis. Then go to -4 on the y-axis and draw the point.

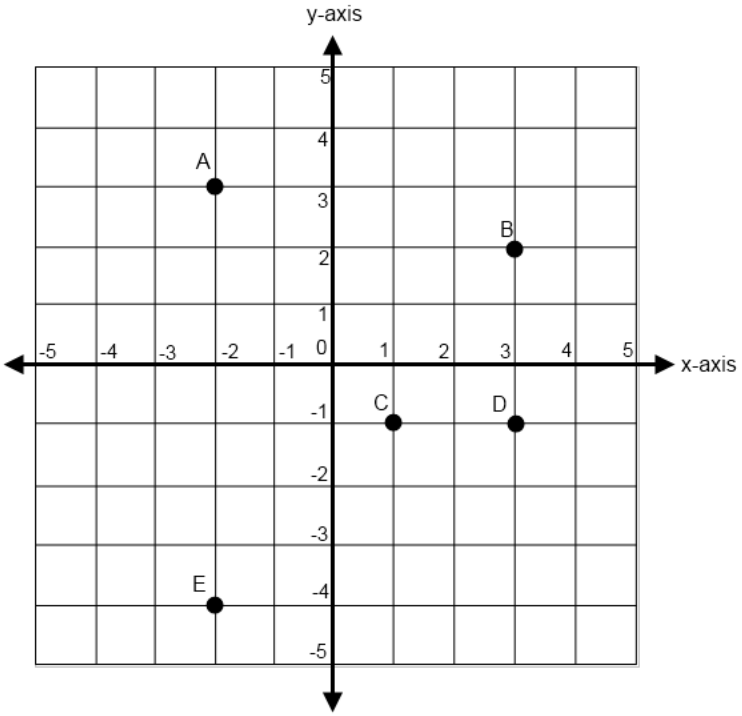


To plot the point (3,4) start at the origin. Go to 3 on the x-axis. Then go to 4 on the y-axis and draw the point.



What are the coordinates of point C? Start at the origin. Move along the x-axis until you line up with C. Then move up or down until you land on C. You moved -4 in the x-direction and 4 in the y-direction. The point is (-4, 4)

77. Practice reading each point on the graph below (A-E), then plot points (F-J) on the same coordinate grid.



A:_____ **F: (-4, 0)**

B:_____ **G: (-2 , -1)**

C:_____ **H: (4, -5)**

D:_____ **I: (0, 3)**

E:_____ **J: (5, 4)**

Part 11: Slope

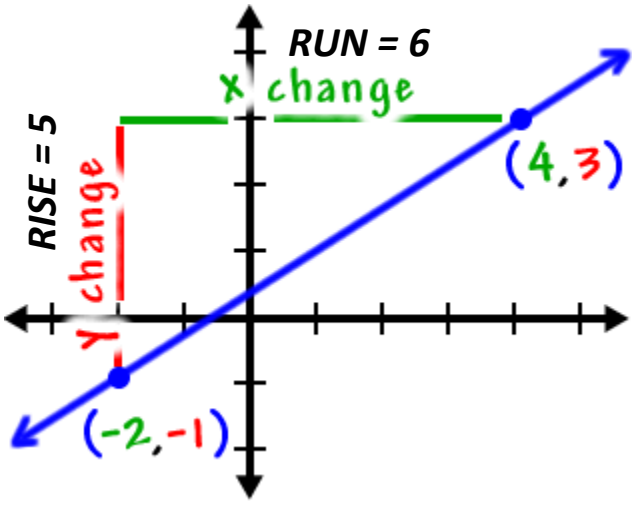
RESOURCE LINK - Slope from Graph:
https://tinyurl.com/slope-from-graph-Khan

The slope of a line refers to how steep the line is. **Slope** is often denoted by the letter **m**. The direction of a line is either increasing, decreasing, horizontal or vertical.

We often represent slope by finding $\frac{Rise\ of\ the\ line}{Run\ of\ the\ line}$ or $\frac{Chang\ in\ y}{Change\ in\ x}$. Rise is the difference in y-values from one point to another. Run is the difference in x-values from one point to another. We can find the slope of a line from counting the rise and run on the graph, calculating it between two points on the line using a formula, or using values in a table and finding the change in y-values over the change in x-values. The letter *m* will be use to represent the slope,

Example: Finding slope from a graph

The slope of the line is $\frac{5}{6}$



We determined the slope by counting the rise starting at (-2, -1) as up 5 (which is positive 5). The run was counted as right 6 (which is positive 6).

Example: Finding slope between two points using the formula

RESOURCE LINK - Slope from Two-Points:
https://tinyurl.com/slope-formula-Khan

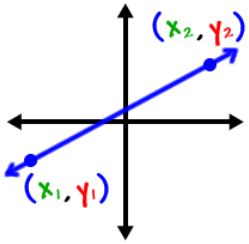
Find the slope of the line containing the following points:

(x_1, y_1) (x_2, y_2)

(-4, -2) and (5, 1)

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1 - (-2)}{5 - (-4)} = \frac{1 + 2}{5 + 4} = \frac{3}{9} = \frac{1}{3}$$

Always simplify your fractions!



If you're given two points (x_1, y_1) and (x_2, y_2)

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

It doesn't matter which point you choose to be your (x_1, y_1) and (x_2, y_2), you will get the same slope.

(x_1, y_1) (x_2, y_2)

(5, 1) and (-4, -2) $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-2-1}{-4-5} = \frac{-2+-1}{-4+-5} = \frac{-3}{-9} = \frac{1}{3}$

Example: Finding slope from a table of values

	+2	+2	+2	+2	
x	-1	1	3	5	7
y	4	1	-2	-5	-8
	-3	-3	-3	-3	

HORIZONTAL TABLE

Slope is still the $\frac{Change\ in\ y}{Change\ in\ x}$ or $\frac{Rise}{Run}$

So in this example:

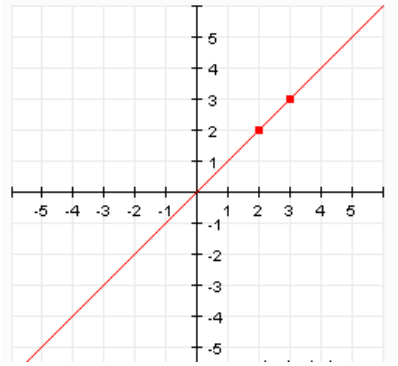
$M = \frac{Change\ in\ y}{Change\ in\ x} = \frac{-3}{2}$

	x	**y**	
+2	-1	4	-3
+2	1	1	-3
+2	3	-2	-3
+2	5	-5	-3
	7	-8	

VERTICAL TABLE

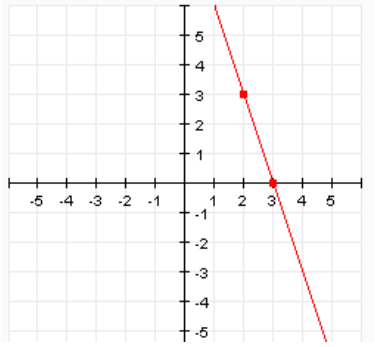
Find the slope for each of the following gra___

78.



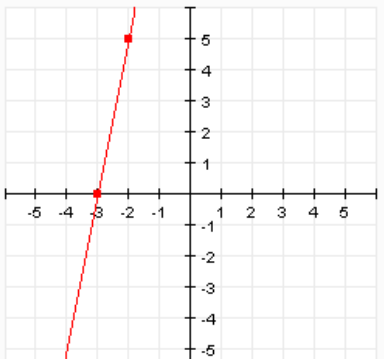
m = _____

79.



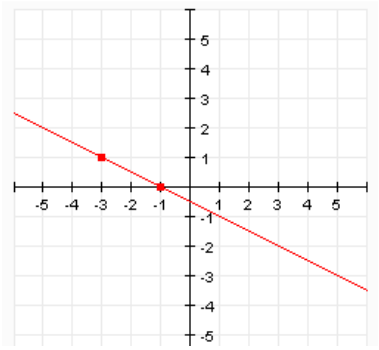
m = _____

80.



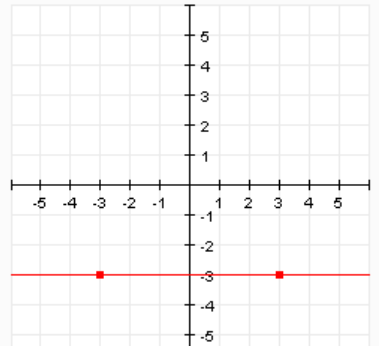
m = _____

81.



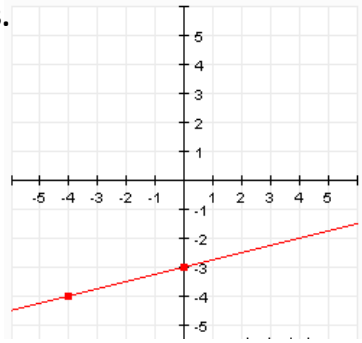
m = _____

82.



m = _____

83.



m = _____

Find the slope of each line using the points given.

84. (0, 0) and (-2, 8)

m = _____

85. (-1, 2) and (-9, 6)

m = _____

86. (1, -2) and (6, -2)

87. (1, -2) and (-6, 3)

m = _____

m = _____

Find the slope for each of the following tables.

88.

X	Y
2	3
5	9
6	11
8	15
10	19

m = _____

89.

X	Y
4	-10
5	-13
6	-16
7	-19
8	-22

m = _____

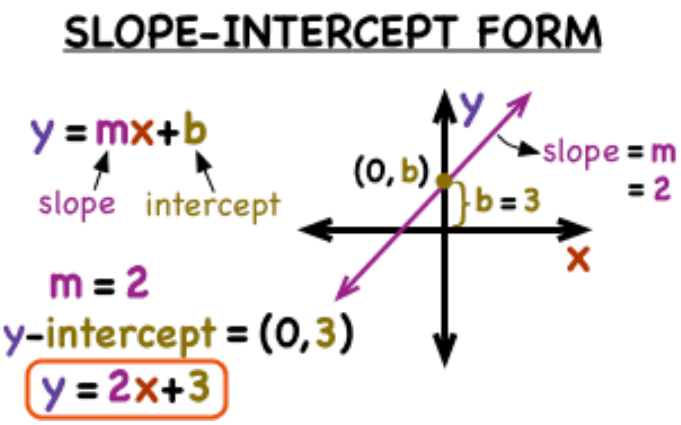
90.

X	0	3	6	9
Y	5	7	9	11

m = _____

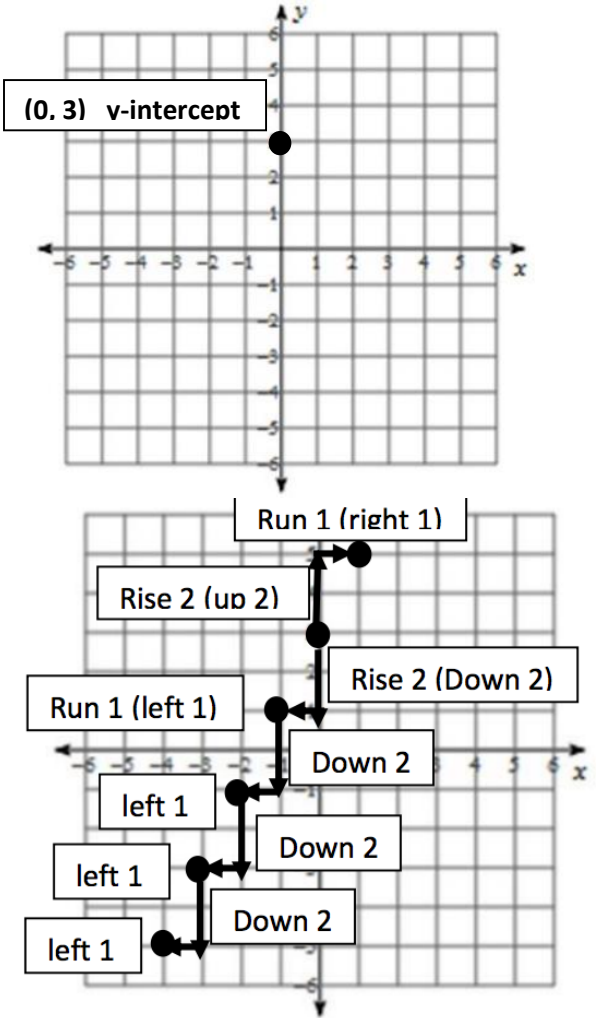
Part 12: Graphing Lines

RESOURCE LINK - Graph from Slope-Intercept Form:
https://tinyurl.com/graph-slope-int-form



Equations of lines can come in many forms.
Slope-Intercept is one form. y = mx + b
y = 2x + 3

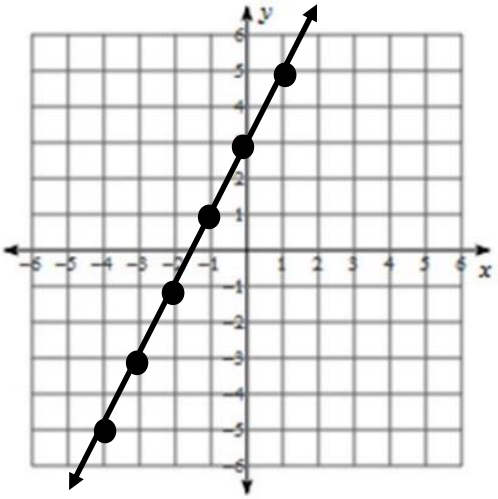
To graph a linear equation in slope intercept, start by plotting the y-intercept. In the example above, the y-intercept is (0, 3).



Use the slope (rise over run) to plot additional points. The slope in the above example is 2 (rise of 2, run of 1).

You can work up from the intercept by going up 2, right 1.

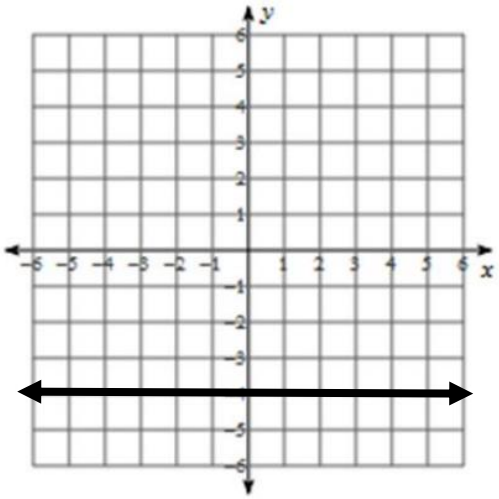
You can work down from the intercept by going down 2 left 1.



Finally, connect all the dots with a ruler and put arrows on each end.

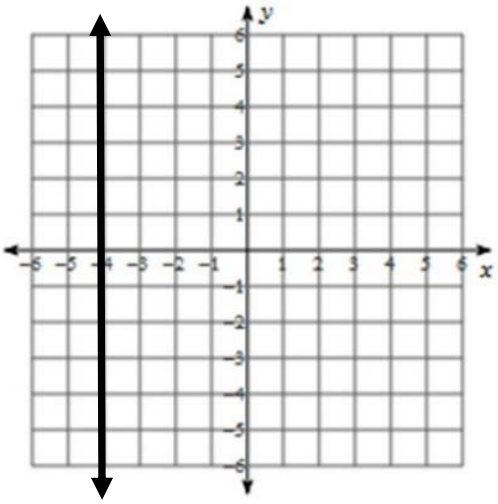
Horizontal Lines

y = -4 The slope is equal to zero



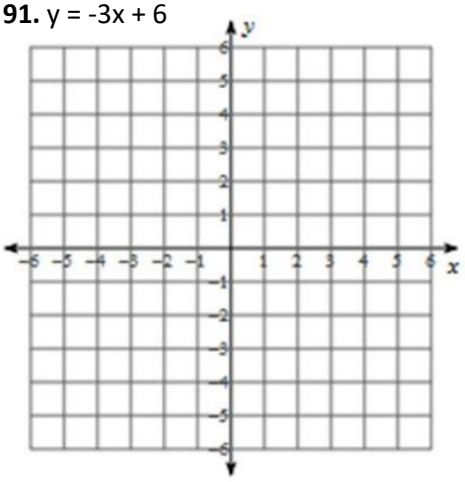
Vertical Lines

x = -4 The slope is undefined.

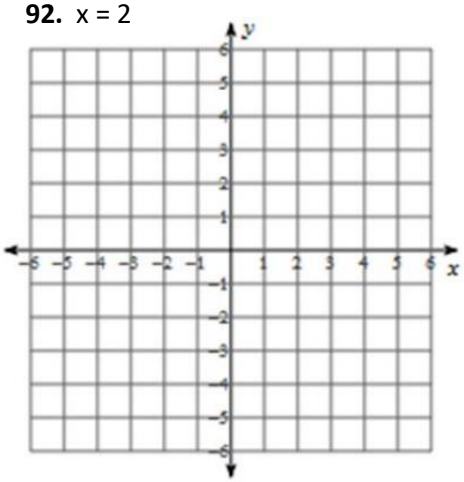


Graphing Practice: Sketch the graph of each line.

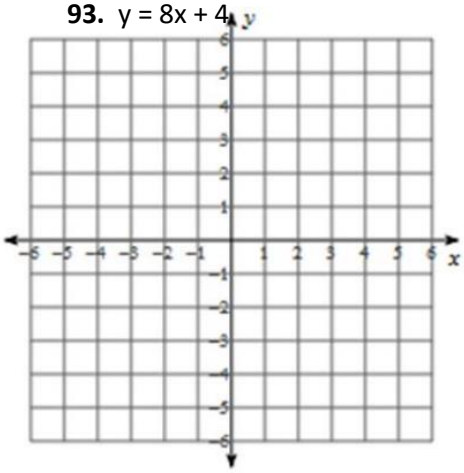
91. y = -3x + 6



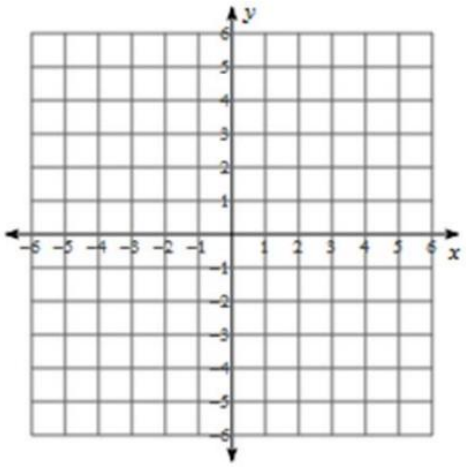
92. x = 2



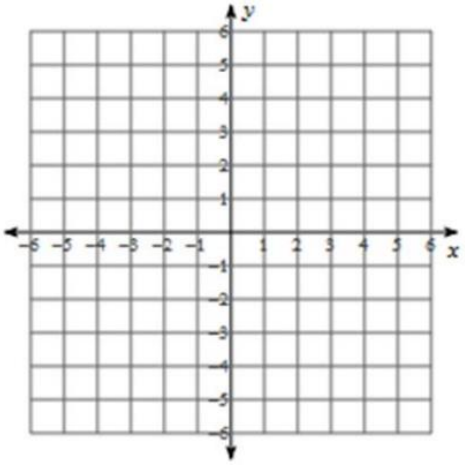
93. y = 8x + 4



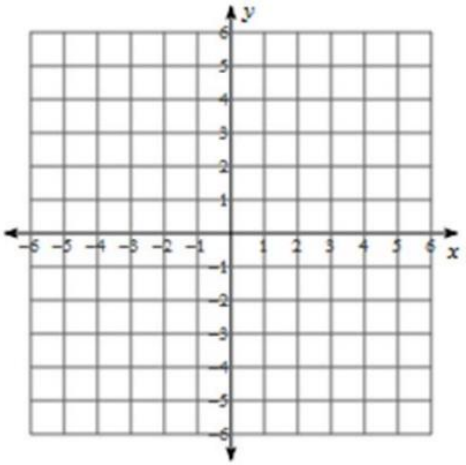
94. y = − 5/4 x + 1



95. y = 2/3x - 4



96. y = 5



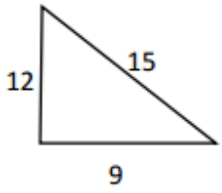
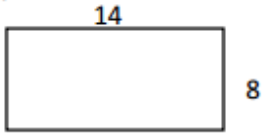
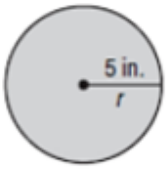
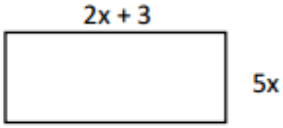
Part 13: Basic Perimeter and Area

RESOURCE LINKS - Area and Perimeter:
https://tinyurl.com/area-perimeter-Khan

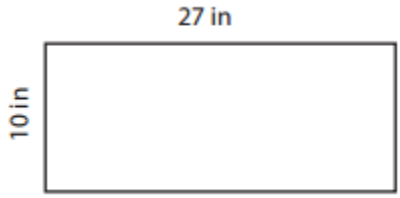
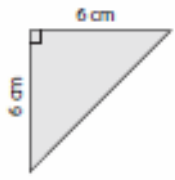
The **perimeter** of a figure refers to the distance around a two-dimensional figure. The **area** of a figure refers to the amount of space inside a two-dimensional figure.

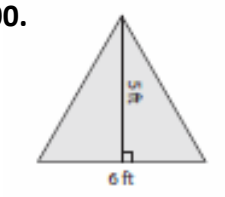
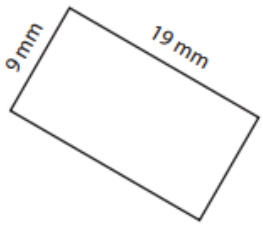
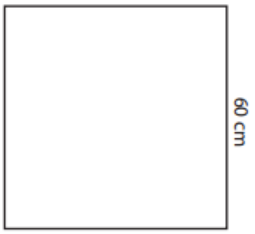
Figure	*Area Formula*	*Perimeter Formula*	*Variables*
Square	$A = s^2$	$P = 4s$	s = length of side
Rectangle	$A = lw$	$P = 2(l + w)$	l = length w = width
Triangle	$A = \frac{1}{2}bh$	$P = a + b + c$	a, c = sides b = base h = height
Circle	$A = \pi r^2$	$P = 2\pi r$	r = radius

Examples:

A. 	**perimeter = add all sides** P = 9 + 12 + 15 P = 36	**area = ½ l • w** A = ½ • 12 • 9 A = 54
B. 	**perimeter = add all sides** P = 14 + 8 + 14 + 8 P = 44	**area = l • w** A = 14 • 8 A = 112
C. 	**circumference = 2πr** C = 2 • π • 5 C = 10π inches	**area = πr²** A = π • 5² A = 25π inches squared
D. 	**perimeter = add all sides** P = 2x + 3 + 5x + 2x + 3 + 5 P = 14x + 6	**area = l • w** A = 5x(2x+ 3) A = 10x² + 15x

Find the perimeter and area of each shape. Show all work.

97.  Perimeter: Area:	**98.**  base = 6 cm height = 5 cm Perimeter: Area:	**99.**  radius = 3 cm Perimeter: Area:

100.  base = 6 feet height = 5 feet Area:	**101.**  Perimeter: Area:	**102.**  Perimeter: Area:

Part 14: The Real Number System

RESOURCE LINK - Intro to Rational and Irrational Numbers:
https://tinyurl.com/rational-irrational-intro

A **rational number** is a number that can written as a ratio. That means it can be written as a fraction where the numerator and denominator are whole numbers. When written as a decimal, rational numbers will terminate or repeat.

An **irrational number** is a real number that cannot be written as a ratio of integers. Therefore, when written as a decimal, irrational numbers do not terminate nor do they repeat.

REAL NUMBER SYSTEM

rational numbers: $\frac{7}{117}$, $0.25, 0.\overline{34}$

Match the definitions and numbers with their appropriate position in the diagram above.

103. All whole numbers and their negatives.	Type of number:
104. Any number that can be represented by a fraction. Numbers in decimal for will repeat or terminate.	Type of number:
105. Zero and all positive numbers without decimals or fractions.	Type of number:
106. Numbers that cannot be expressed in fraction form. If expressed as a decimal, will not repeat nor terminate.	Type of number:

107. $\frac{-36}{6}$ Type of number:	**108.** π Type of number:	**109.** $\sqrt{25}$ Type of number:
110. $\frac{3}{4}$ Type of number:	**111.** $\sqrt{7}$ Type of number:	**112.** $\frac{5}{2}$ Type of number:

ADDITIONAL RESOURCE LINKS –

Graphing Rates/Proportional Relationships:
https://tinyurl.com/graphing-proportional-rel

https://tinyurl.com/graph-proportional-rel-2

https://tinyurl.com/proportional-eqtns

Writing equations for proportional relationships:

https://tinyurl.com/writing-proportinal-eqtns