

Warm-Up

If you have completed your extra credit opportunity, please place it on your inbox.

On everyone's desk should be paper and a pencil for notes. We are covering all of Quarter 1 in one day, so we need to be ready to start when the bell rings!

Announcements

Today is the last day to fundraise for DC

Extra Credit Opportunity - due Monday!

Midterm is on the 11th

MALM Implementation due on the 11th

Math MAPS are on the 16th

Math NC Check Ins are February 6

Quarter 1 Review

1/4/2019

Turn a Repeating Decimal into a Fraction

.3333333...

.2222.....

.24242424.....

.08888888.....

1. Set the repeating decimal equal to x
2. Above that, but $10x$, $100x$, $1000x$... whatever it takes to line up the repeating decimal with itself
3. Subtract and solve

Simplify each expression.

9. $\sqrt{36}$

10. $\sqrt{169}$

11. $\sqrt{16}$

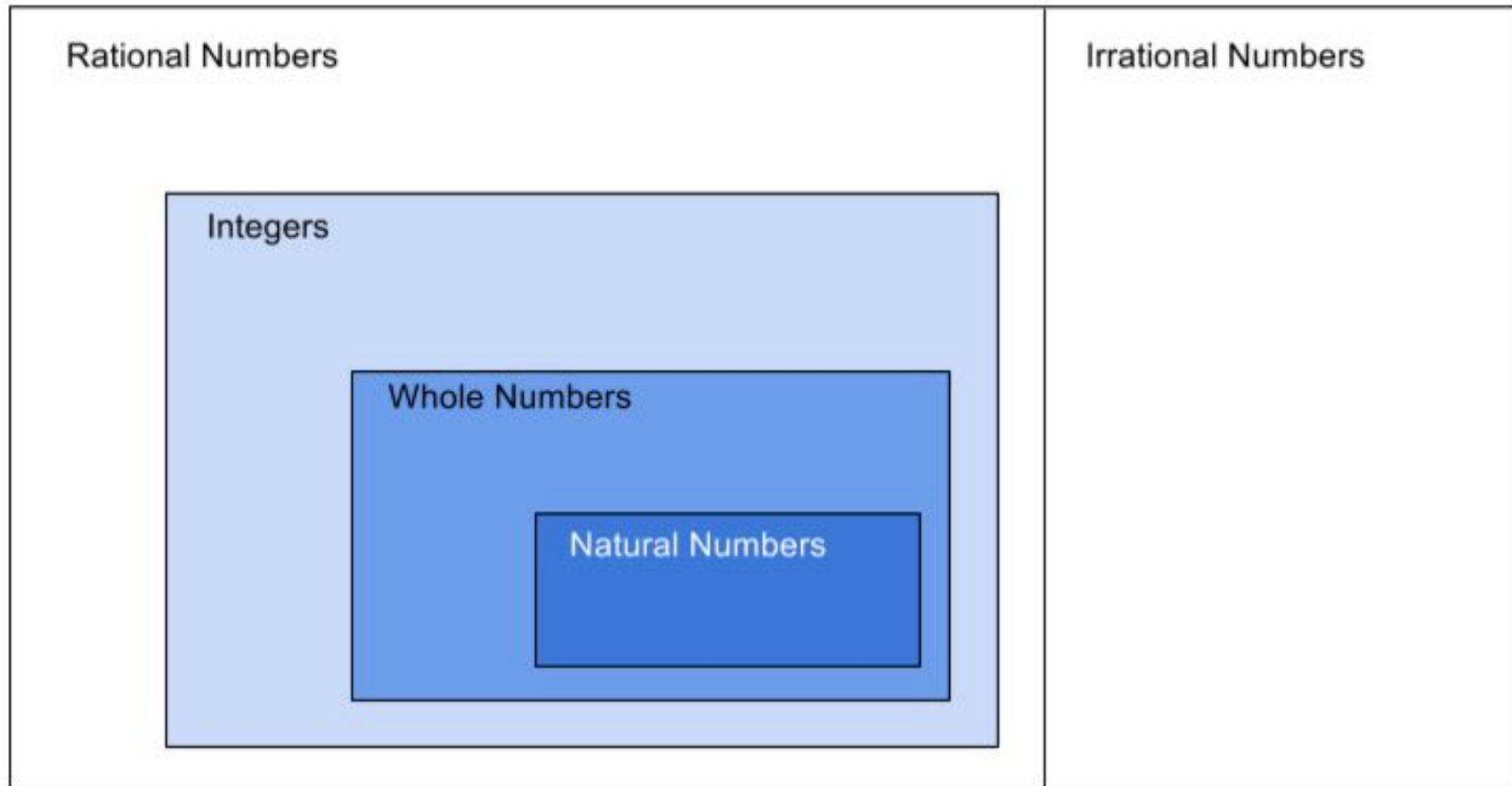
Estimate the square root. Round to the nearest integer.

19. $\sqrt{17}$

20. $\sqrt{35}$

21. $\sqrt{242}$

The Real Number System



We should also be able to understand, use, and estimate cube roots

$$\sqrt[3]{8} =$$

$$\sqrt[3]{-8} =$$

$$\sqrt[3]{64} =$$

$$\sqrt[3]{81} =$$

Use order of operations

$$2[(8-4)^5 \div 8]$$

$$10-(2^3+4)\div 3-1$$

$$2[8+(67-2^6)^3]$$

9

Properties

Commutative Property

Associative Property

Identity Property for Addition or Multiplication

Inverse Property for Addition or Multiplication

Distributive Property

Zero Product Property

Properties

Addition Property of Equality

Subtraction Property of Equality

Multiplication Property of Equality

Division Property of Equality

When solving an equation for a variable, use reverse order of operations

$$7x + (2x + 4)6 = 39$$

$$2(5x-1)=3(x+11)$$

Solution Types

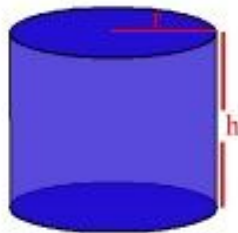
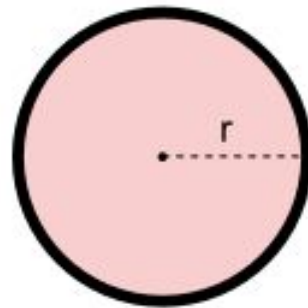
One solution

Infinitely many solutions

No solution

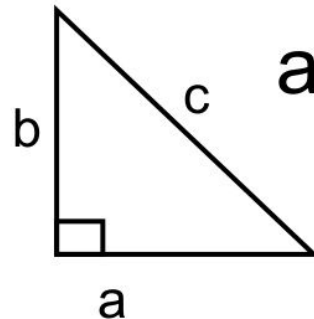
$$E = mc^2$$

$$\text{area} = \pi r^2$$



$$V = \pi r^2 h$$

Pythagorean Theorem



$$a^2 + b^2 = c^2$$

Solve each equation for y . Then find the value of y for each value of x .

11. $y + 2x = 5; x = -1, 0, 3$

12. $2y + 4x = 8; x = -2, 1, 3$

Solve each equation for x .


19. $mx + nx = p$

20. $ax - x = c$

21. $\frac{rx + sx}{t} = 1$



Steps to Solving an Equation Word Problem

1. Read the question carefully and make sure to understand what they are asking.
 2. Define the variable.
 3. Write out the equation.
 4. Simplify the equation if needed.
 5. Solve for the variable.
 6. Plug in and check.
 7. Don't forget your units.
- 

Equation Word Problem Example 3

The sum of three consecutive integers is 24. Find the three integers.

Define the variable:

Write the equation:

Solve:



Equation Word Problem Example 4

The sum of three consecutive odd integers is 45. Find the three integers.

Define the variable:

Write the equation:

Solve:



Solve Inequalities

Addition Property of Inequality

Subtraction Property of Inequality

Multiplication Property of Inequality

Division Property of Inequality

$$7. 4t - 3 > 2t + 5$$

$$8. 6(p - 2) \geq 9 - p$$

$$9. -\frac{1}{2}(x - 5) \leq x + 3$$

Compound Inequalities

Definition - Two distinct inequalities joined by the words “or” or “and”

If they are joined by “and” you are looking for the intersection of the two sets. That means where the two inequalities overlap

Example: $4 < x$ and $x > -2$

If they are joined by the word “or” you are looking for the union of the two sets. That means where both inequalities exist

Example: $x > 4$ or $x < 5$

Recall...

The absolute value is the distance a number is away from zero on a number line.

We know that $|4| = 4$ and we know that $|-4| = 4$

So, to solve $|x| = 4$ for x , there are two possibilities for x . x could equal 4, or x could equal -4.

To solve absolute value equations...

1. Isolate the absolute value
2. Set the absolute value and its opposite equal to c
3. Use equality properties to solve
4. Check your answer with substitution

Try these...

1. $|x-2| = 5$

2. $|2x-7| - 5 = 4$

3. $|6-4t| + 5 = 0$

4. $-3|2n+5| = -9$

Greater Than - if the inequality includes $>$ or \geq it is an “or” statement

$$|ax+b| > c \rightarrow ax+b > c \text{ OR } -(ax+b) > c$$

The answer comes from two statements

Less Than - if the inequality includes $<$ or \leq it is an “and” statement

$$|ax+b| < c \rightarrow ax+b < c \text{ AND } -(ax+b) < c$$

The answer comes from one statement

Remember greatOR than, less thAND

To solve absolute value inequalities...

1. Isolate the absolute value
2. Determine what type of inequality symbol you have
3. Write two new statements based on the inequality
4. Solve using properties
5. Write your answer in set builder and interval notation
(we will learn this later!)

4. $|x-3| > 12$

5. $|x+1| - 3 > 2$

So let's break that down

Roster form → lists all of the numbers inside of braces

Example: $\{1, 2, 3, \dots\}$

Set builder notation → defines a variable and then sets a rule for that variable

Example: $\{x \mid x < -4\}$ (read that as x, such that x is less than -4)

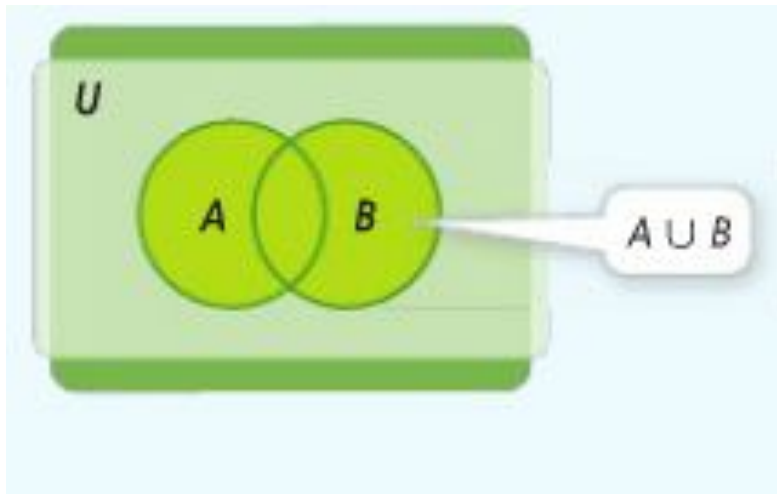
Interval notation → says that the variable is everything between two numbers

Example: $(-\infty, -4]$

Example: $(4, +\infty)$

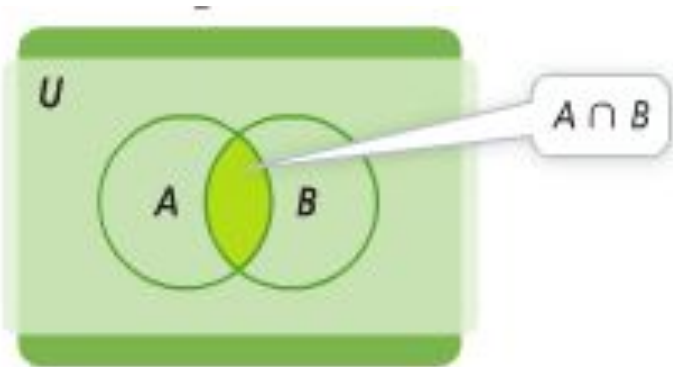
Union of Sets

A Union of sets is the set that contains ALL of the sets



Intersection of Sets

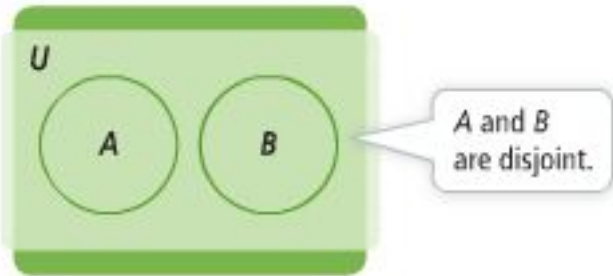
The intersection of sets is the set of elements that are common in all of the sets



Disjoint Sets

Some sets have nothing in common. This is called Disjoint.

The intersection of two disjoint sets is an empty set.



Let $X = \{2, 4, 6, 8, 10\}$, $Y = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$,
and $Z = \{1, 3, 5, 7, 9\}$. Find each union or intersection.

1. $X \cup Y$ 2. $X \cap Y$ 3. $X \cap Z$ 4. $Y \cup Z$

5. In a survey of 80 people who use their cell phones to take pictures and play games, 49 take pictures and 35 take pictures and play games. How many people only use their cell phones to play games?

- Relation:** A relation is a set of ordered pairs.
- Domain:** The domain of the relation is the set of all first components of the ordered pairs. This is also called the **x value** or the **input**.
- Range:** The range of the relation is the set of all second components of the ordered pairs. This is also called the **y value** or the **output**.

Now we will consider a special kind of relation called a function.

- Function:** In order for a relation to be called a **function**, each x value must have exactly one y value. You cannot have two or more y values or no y values.
- Vertical Line Test:** This is a special test that can be used to determine if a graph is a function. If you can draw a vertical line so that it intersects a graph more than once, the graph is **NOT A FUNCTION**. If you cannot draw a vertical line that intersects a graph more than once, then the graph **IS A FUNCTION**.

Graph it, map it, table, equation...

1.) $\{(-2, 5), (-1, 2), (0, 1), (2, 5)\}$

Does this relation represent a function?

Why or why not?

Linear vs. Nonlinear

Does the graph look like a straight line?

Are the points increasing or decreasing at a **CONSTANT** rate?

Are there no exponents in the equation?

Can something be a function, but nonlinear?

Function Notation

Continuous vs. Discrete

A sequence is a function that relates the term number to the value of the term. Consider the sequence 7, 11, 15, 19, . . . Think of each term as the output of a function. Think of the term number as the input.

term number	1	2	3	4	← input
term	7	11	15	19	← output

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term	7	11	15	19	← output

You can use the common difference of the terms of an arithmetic sequence to write a function rule for the sequence. For the sequence 7, 11, 15, 19, . . . , the common difference is 4.

Let n = the term number in the sequence.

Let $A(n)$ = the value of the n th term of the sequence.

$$\text{value of term 1} = A(1) = 7$$

$$\text{value of term 2} = A(2) = 7 + 4$$

$$\text{value of term 3} = A(3) = 7 + 4 + 4$$

$$\text{value of term 4} = A(4) = 7 + 4 + 4 + 4$$

$$\text{value of term } n = A(n) = 7 + 4 + 4 + \dots + 4 = 7 + (n - 1)4$$

The common difference is 4.

The number of 4's added is 1 less than the term number.

The function rule for the sequence above is $A(n) = 7 + (n - 1)4$.

You can find the tenth term by finding $A(10)$. So the tenth term is

$$A(10) = 7 + (10 - 1)4 = 7 + 36 = 43.$$

You can find any term of an arithmetic sequence if you know the first term and the common difference.

take note

Key Concept Rule For an Arithmetic Sequence

The n th term of an arithmetic sequence with first term $A(1)$ and common difference d is given by

$$A(n) = A(1) + (n - 1)d$$

\uparrow \uparrow \uparrow \swarrow
nth term first term term number common difference

Let n = the term number in the sequence.

Let $A(n)$ = the value of the n th term of the sequence.

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$$\text{value of term 2} = A(2) = 7 + 4$$

$$\text{value of term 3} = A(3) = 7 + 4 + 4$$

$$\text{value of term 4} = A(4) = 7 + 4 + 4 + 4$$

$$\text{value of term } n = A(n) = 7 + 4 + 4 + \dots + 4 = 7 + (n - 1)4$$

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n th term first term term number common difference

Four Types of Slope

Positive Slope

Negative Slope

Zero Slope

Undefined Slope



Slope Dude will help us understand the 4 types of slope...

https://www.youtube.com/watch?v=avS6C6_kvXM

"Puff Puff Positive"

"Nice Negative"

"This is zero fun"

"UNDEFINED!"



ratio of the
change or diff.
in the dependent
variable to the
change or
difference in
the indep.
variable

Main Idea

RISE
RUN



SLOPE

Δ dependent
 Δ independent

Δy
 Δx

Finding Slope from a Graph (m)

$$\text{Slope} = \frac{\text{rise}}{\text{run}}$$

← Height of 
← Width of 

Reminders:

- Count spaces, not lines
- Always reduce or simplify if possible
- Ask yourself WWSDD (what would slope dude say)

Finding Slope From A Table or Points

The formula for slope is:

$$\text{slope} = \frac{\Delta y}{\Delta x}$$

*use your #line
to find Δy
and Δx !

Example 1:

Find the slope of the line that crosses through the points $(5, 2)$ and $(-10, 5)$.

$$\Delta x = -15 \quad \left(\begin{array}{c|c} x & y \\ \hline 5 & 2 \\ -10 & 5 \end{array} \right) \quad \Delta y = +3$$

$$\text{slope} = \frac{\Delta y}{\Delta x} = \frac{3}{-15} = \boxed{-\frac{1}{5}}$$

Direct Variation

1. What is it
 - a. A linear equation that crosses through $(0, 0)$
 - b. You may see it in problems written as: “y varies directly with or as x”
2. Equation
 - a. $y=kx$
 - b. “k” represents the constant of variation

You can solve an equation for y and see if it is in the form for a direct variation.

Does the equation represent a direct variation? If so, find the constant of variation.

1. $7y = 2x$

2. $3y + 4x = 8$

When given that the relationship between two quantities is direct, you can write the equations by substituting the known values into the equation $y=kx$.

Suppose y varies directly with x , and $y = 35$ when $x = 5$.

What direct variation equation relates x and y ? What is the value of y when $x = 9$?

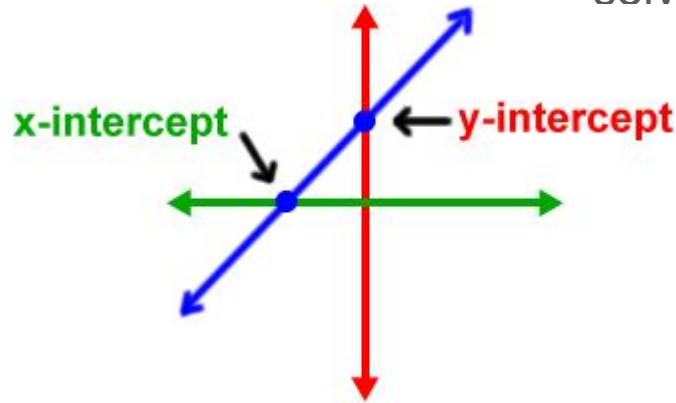
The x and y intercept

X-Intercept

- The point where a graph crosses the ___- axis.
- X-intercepts happen when the y-coordinate is zero.
- To find the x-intercept from an equation, replace y or $f(x)$ with zero and solve for x.

Y-Intercept

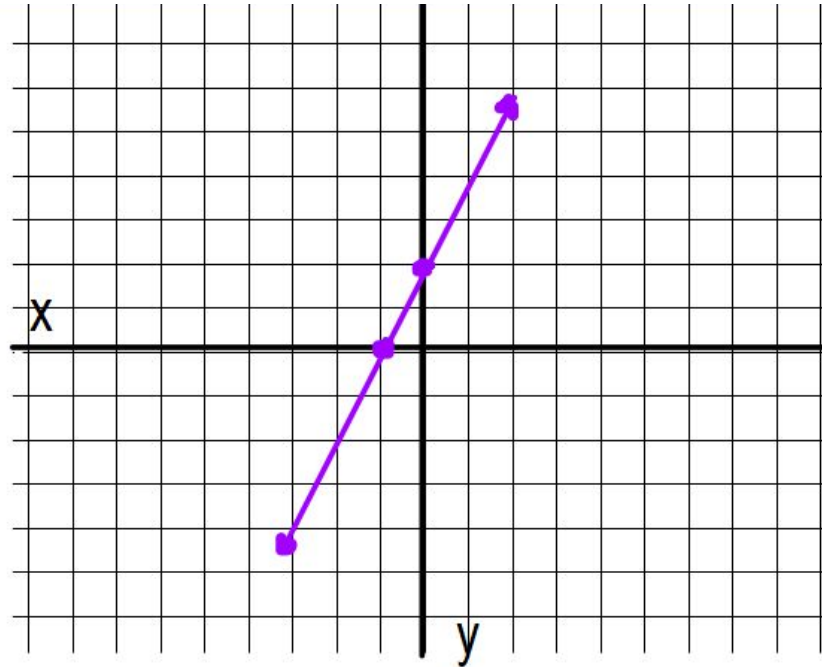
- The point where a graph crosses the ___- axis.
- Y-intercepts happen when the x-coordinate is zero.
- To find the y-intercept from an equation, replace x with zero and solve for y.



slope:

x intercept:

y intercept:



SLOPE Y-INTERCEPT FORM

$$(y = mx + b)$$

$$y = m \cdot x + b$$

Create Foldable

When our equation is in slope-intercept form ($y = mx + b$), we can use the equation to find the _____ and _____-intercept.

If the equation is NOT in slope intercept form, we can rearrange it and then find the _____ and _____-intercept.

Identify the slope and y-intercept of the equation

$$y = 3x - 2$$

$$y = -7x + 9$$

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

Given the slope and y-intercept, write the equation

$$m = 5 \quad b = -9$$

$$m = -2 \quad b = 8$$

$$m = \frac{4}{5} \quad b = 17$$

Identify the slope and y-intercept of the equation

$$y + 3x = 15$$

$$2y - 4x = 8$$

$$y + 8 = 5x$$

Graphing Using Slope Intercept Form

1) Equation MUST be in _____ to graph.

2) Find _____ (slope) and _____ (y-intercept)

3) Plot _____ (y-intercept) on the graph.

**b is where you Begin.

4) Start at y-intercept and use _____ (slope) to plot points for the line.

** _____ is how many you Move

**if m is positive, move _____ and to the right.

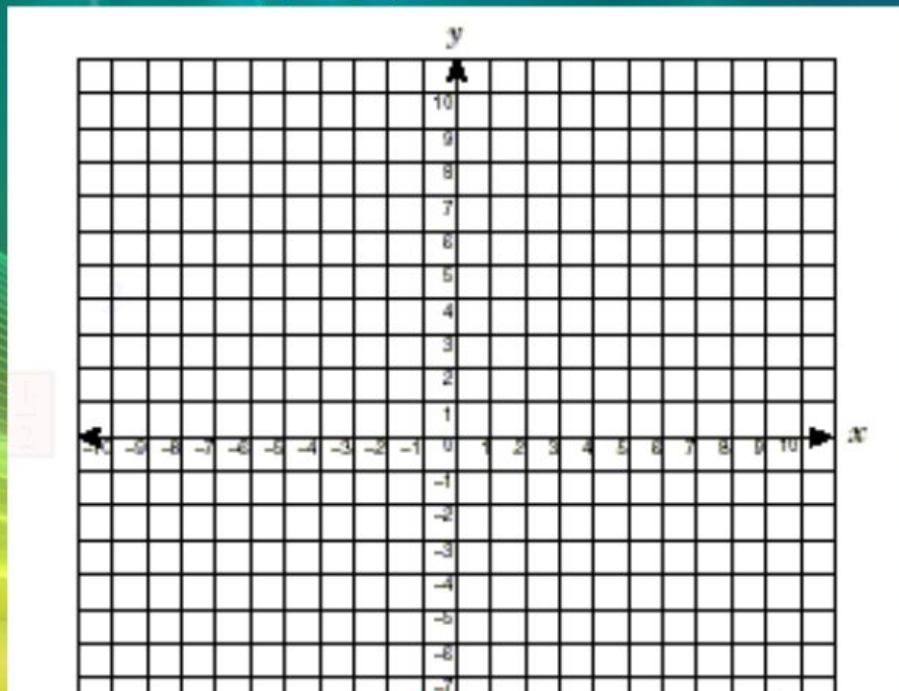
**if m is negative, move _____ and to the right.

5) Draw a _____ through the points.

SLOPE Y-INTERCEPT FORM

$$(y = mx + b)$$

Graph: $y = 3x - 2$



Standard Form of a Linear Equation

$$Ax+By=C$$

Special Rules:

1. A, B, and C cannot be fractions or decimals

The goal is to get the equation into the form $Ax+By=C$ with no fractions!

1. Get rid of the fractions
2. Move x and y to the same side

Change an equation into Standard Form

What is $y = -\frac{3}{7}x + 5$ written in standard form using integers?

$$y = -\frac{3}{7}x + 5$$

$$7y = 7\left(-\frac{3}{7}x + 5\right) \quad \text{Multiply each side by 7.}$$

$$7y = -3x + 35 \quad \text{Distributive Property}$$

$$3x + 7y = 35 \quad \text{Add } 3x \text{ to each side.}$$

You try...

Write each equation in standard form:

1. $y + 3 = 4(x-1)$

2. $y = \frac{1}{4}x - 2$

3. $y + 2 = \frac{2}{3}(x+4)$

The goal is to get the equation into the form $Ax+By=C$ with no fractions!

1. Get rid of the fractions
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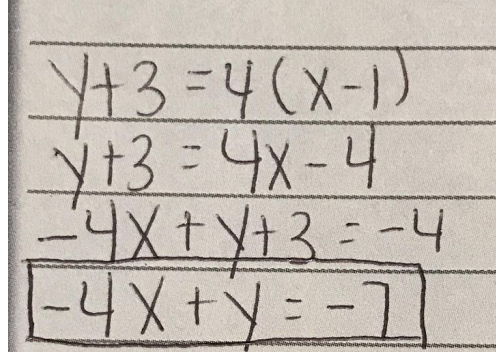
You try... Answers

Write each equation in standard form:

1. $y + 3 = 4(x-1)$

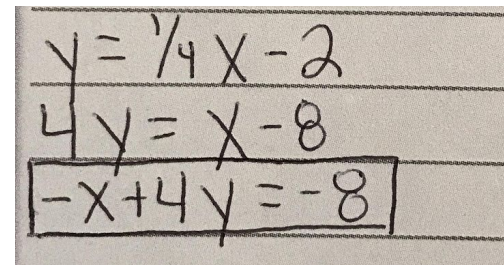
2. $y = \frac{1}{4}x - 2$

3. $y + 2 = \frac{2}{3}(x+4)$



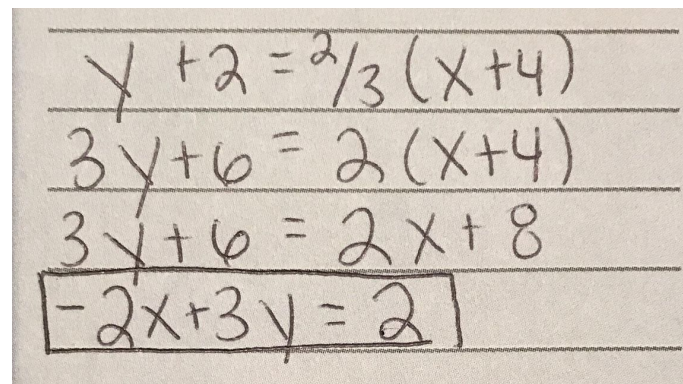
Handwritten work for problem 1:

$$y + 3 = 4(x-1)$$
$$y + 3 = 4x - 4$$
$$-4x + y + 3 = -4$$
$$\boxed{-4x + y = -7}$$



Handwritten work for problem 2:

$$y = \frac{1}{4}x - 2$$
$$4y = x - 8$$
$$\boxed{-x + 4y = -8}$$



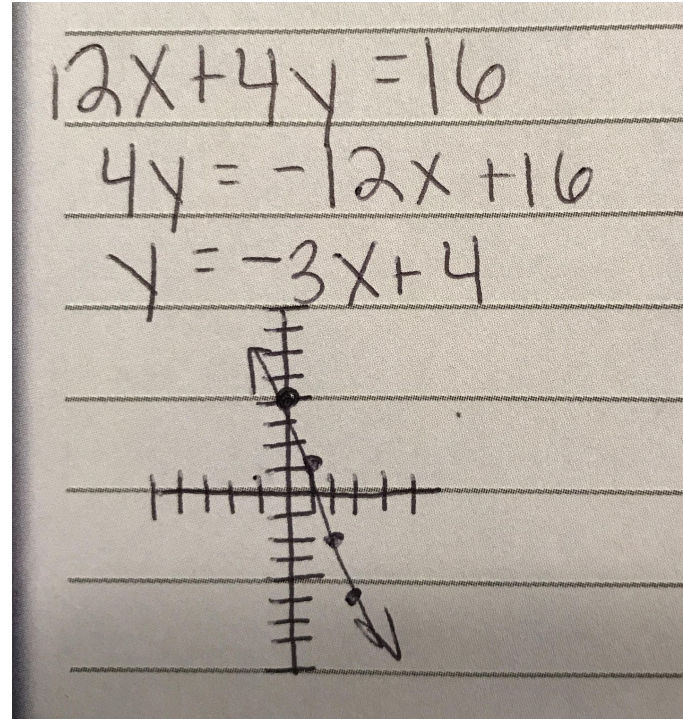
Handwritten work for problem 3:

$$y + 2 = \frac{2}{3}(x+4)$$
$$3y + 6 = 2(x+4)$$
$$3y + 6 = 2x + 8$$
$$\boxed{-2x + 3y = 2}$$

Graphing from Standard Form ($Ax+By=C$)

Method 1 - Change to Slope Intercept Form and graph

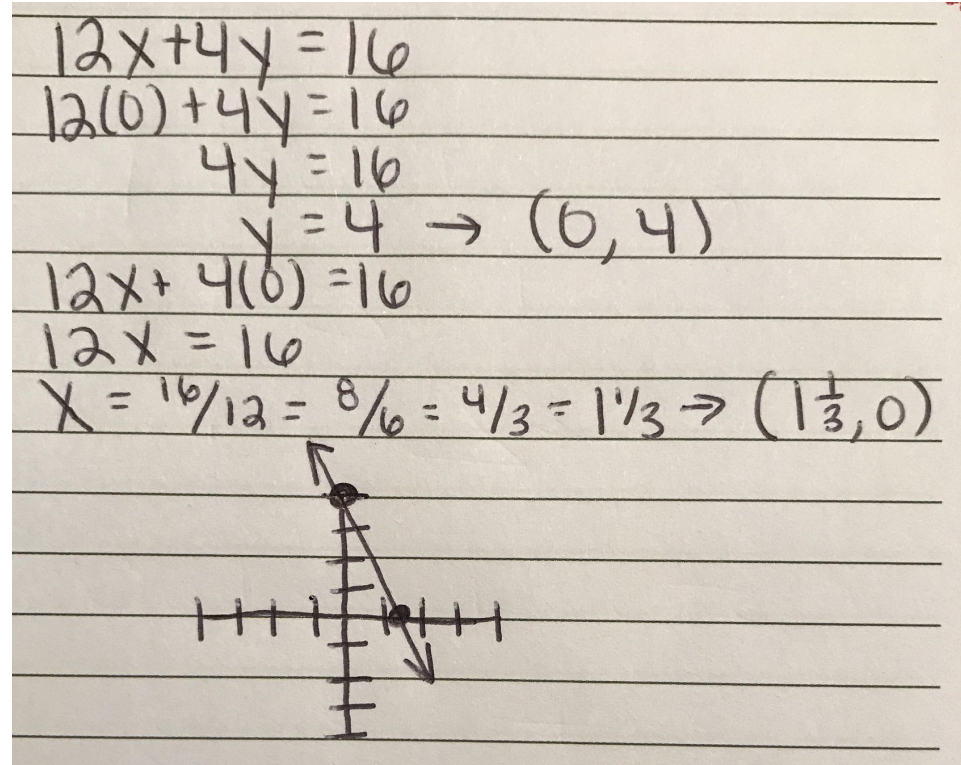
To change to Slope Intercept Form, just solve for y !



Graphing from Standard Form ($Ax+By=C$)

Method 2 - Find and graph your x and y intercepts

1. Find the y intercept
 - a. Plug in 0 for x
 - b. Solve for y
2. Find the x-intercept
 - a. Plug in 0 for y
 - b. Solve for x
3. Graph your intercepts and connect!

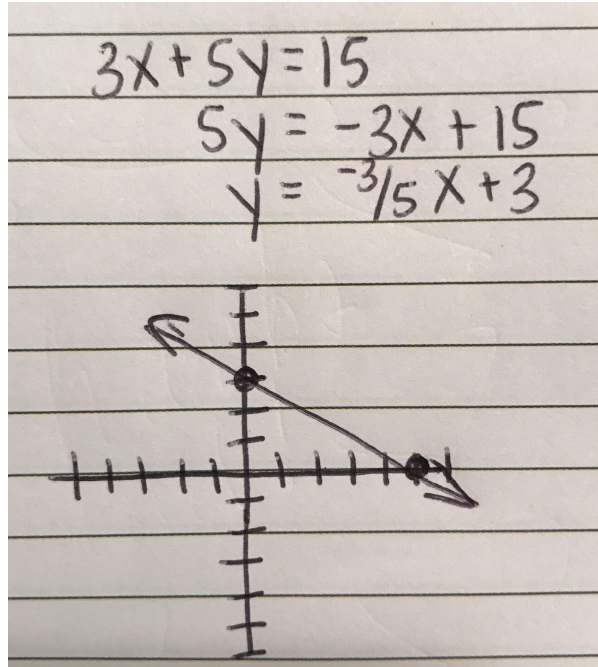


You try...

Example 1

Attempt using Method 1 → Change to Slope Intercept Form

Graph $3x + 5y = 15$

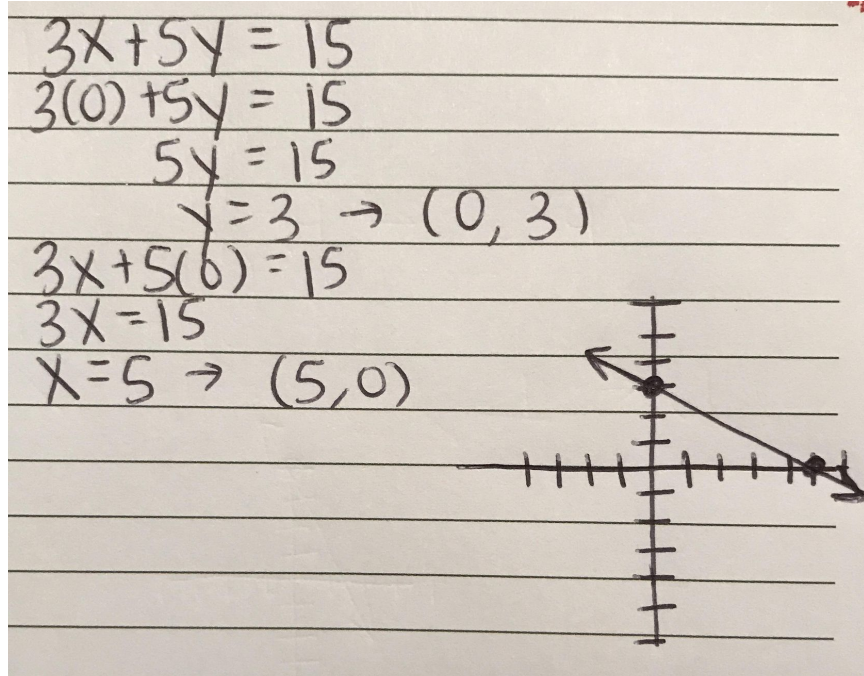


You try...

Example 2

Attempt Method 2 → Find the x and y intercepts

Graph $3x + 5y = 15$



Some things to notice about Standard Form

In standard form, A, B, and C **do not represent anything** (unlike m and b in slope intercept form). It's just the equation rearranged in a different order with specific rules!

You cannot just take an equation that's in standard form and graph it... you have to either find the intercepts or switch it to slope intercept form!

So... what's the point of Standard Form? Why even use it if A, B, and C don't really mean anything?

Well standard form makes a lot of sense in a lot of word problems... look at this example.

Online Shopping A media download store sells songs for \$1 each and movies for \$12 each. You have \$60 to spend. Write and graph an equation that describes the items you can purchase. What are three combinations of numbers of songs and movies you can purchase?

We would write the equation $1x + 12y = 60$ where x represents songs and y represents movies. It's natural to write this equation in standard form! So we need to know how to evaluate equations in standard form :)

Point Slope Form

Equation

Write Equation (Given Point and Slope)

Write Equation (Given Two Points)

Write Equation (Given a Table)

Graph Equation (from point-slope form)

$$y - y_1 = m(x - x_1)$$

slope
↓

↑
y-coordinate
of point

↑
x-coordinate
of point

Equation

Example:

Write the equation of the line that has a slope of -4 and passes through the point $(2, -3)$

Write Equation (Given Point and Slope)

Example:

Write the equation of the line that passes through the points $(2, -3)$ and $(4, 7)$.

Write Equation (Given Two Points)

Example:

What is the equation in point slope form and slope-intercept form for this table?

x	y
10	640
30	590
70	490
90	440

- ① Use two points to find slope.
- ② Choose one ordered pair to plug into point-slope form and plug in slope.
- ③ Change to slope-intercept form.

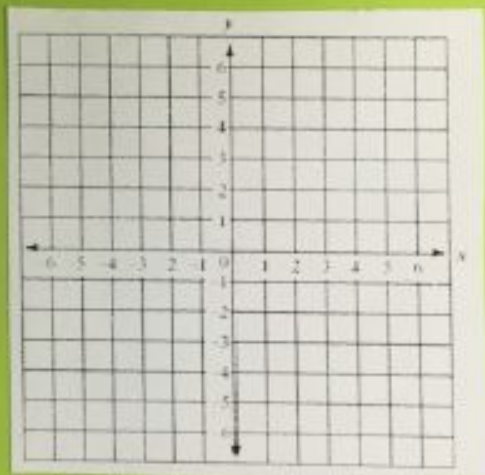
Write Equation (Given a Table)

What is the graph of the equation $y-1 = \frac{2}{3}(x-2)$?

*The equation is in point-slope form

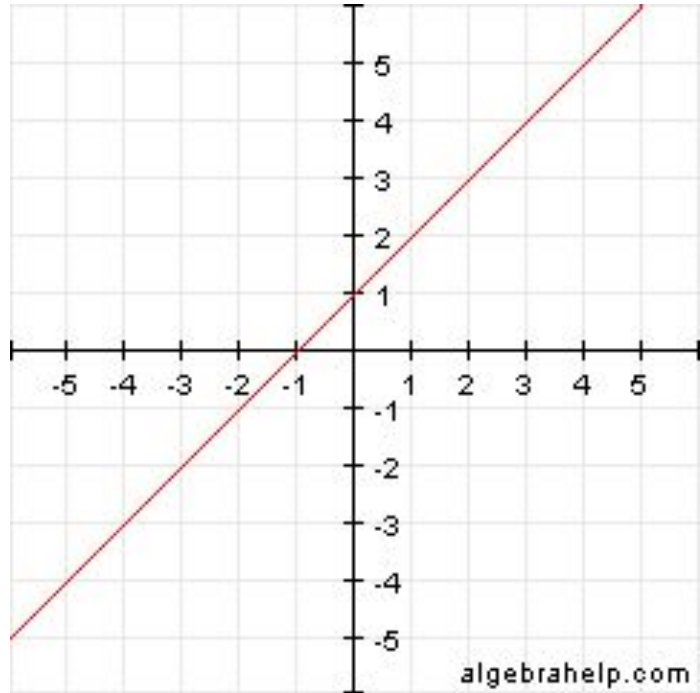
$y-y_1 = m(x-x_1)$. Find the slope and point from this equation.

- ① Graph point
- ② Use the slope to plot additional points.
- ③ Draw line



Graph Equation (from point-slope form)

Write an equation of the line in point slope form



Write the equation of the line that has a slope of 5 and passes through $(-1, 5)$.

Write the equation of the line that has a slope of $-\frac{1}{3}$ and passes through $(4, -7)$.

Write the equation of the line that passes through (1, 4) and (-2, 3).

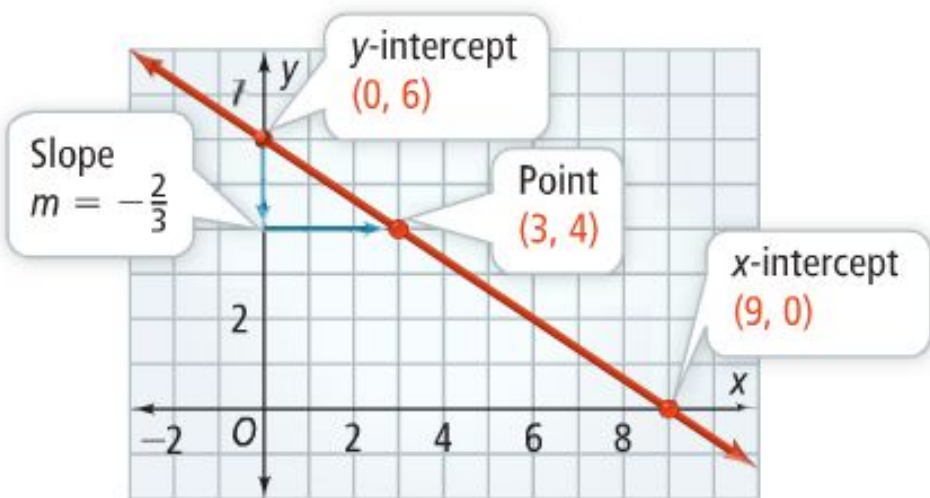
Write the equation of the line that passes through $(-2, 0)$ and $(4, 1)$.

take note

Concept Summary Linear Equations

You can describe any line using one or more of these forms of a linear equation. Any two equations for the same line are equivalent.

Graph



Forms

Slope-Intercept Form

$$y = mx + b$$

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

Point-Slope Form

$$y - y_1 = m(x - x_1)$$

$$y - 4 = -\frac{2}{3}(x - 3)$$

Standard Form

$$Ax + By = C$$

$$2x + 3y = 18$$