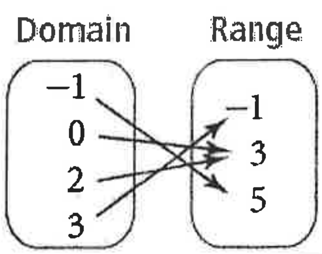
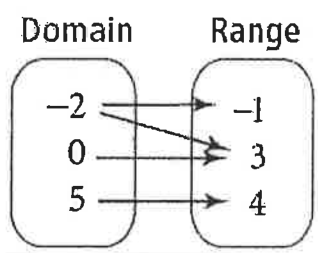
Functions versus not functions

Investigation: Compare the ***functions*** column with the ***not functions*** column.

Questions: What is a function?

How can you determine a relation is a function?

Is there a test you can use to determine if a graph is a function?

<table>
<tr><th>Functions</th><th>Not Functions</th></tr>
<tr><td>{(2,3), (3,4), (5,1), (6,2), (7,3)}</td><td>{(2,3), (3,4), (5,1), (6,2), (2,4)}</td></tr>
<tr><td>{(1, 1), (2, 2), (3, 5), (4, 10), (5, 2)}</td><td>{(1, -2), (-2, 0), (5,1), (-1,2), (1,3)}</td></tr>
<tr><td>
</td><td>
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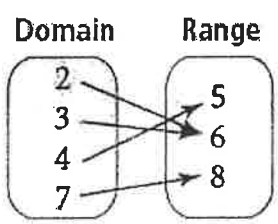
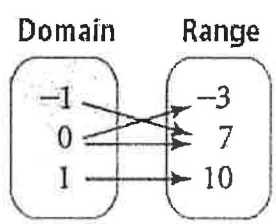
<tr><td>
</td><td>
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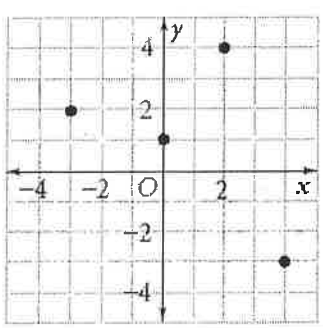
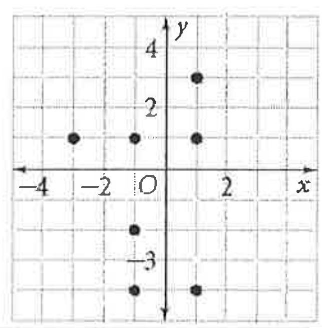
<tr><td>
</td><td>
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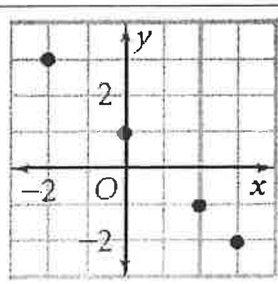
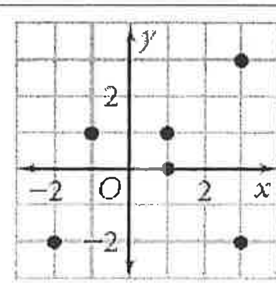
<tr><td>
</td><td>
</td></tr>
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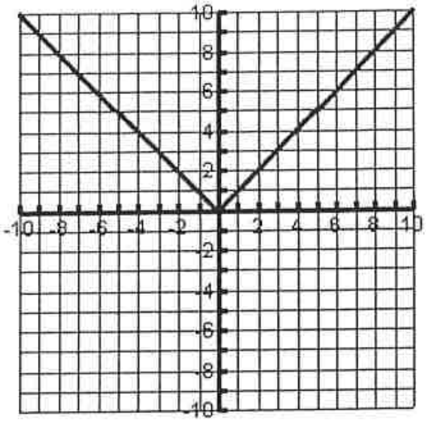
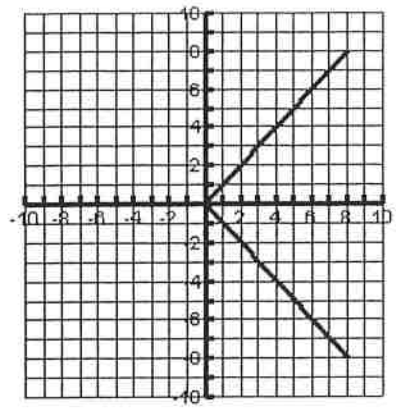
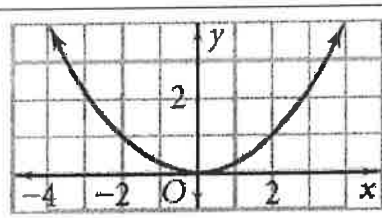
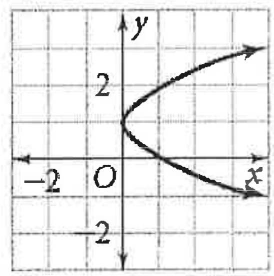
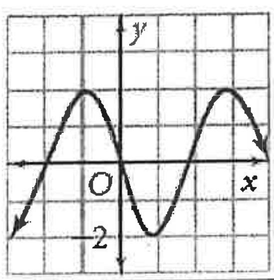
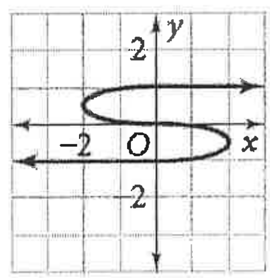
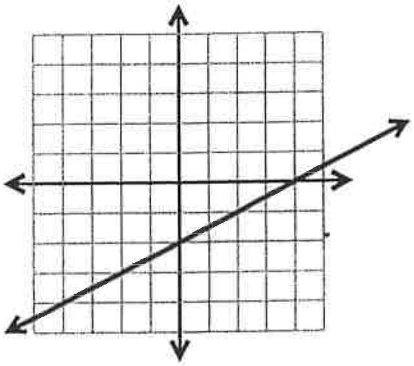
Functions	Not Functions
	
	
	
 Trino, Greg, Darius (x, y) = (boy's name, hair color)	 Matt, Norman, Julius (x, y) = (hair color, boy's name)

Day 1: Graphing Equations of Lines & Function Notation

SLOPE INTERCEPT FORM OF A LINE:______________________

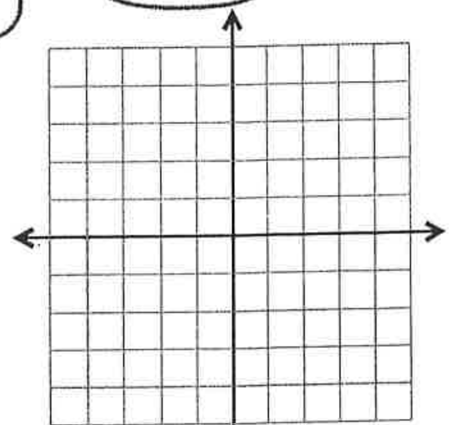
What is the equation of the line in the graph displayed below:



Slope:____ Y-Intercept:____

Equation:______________

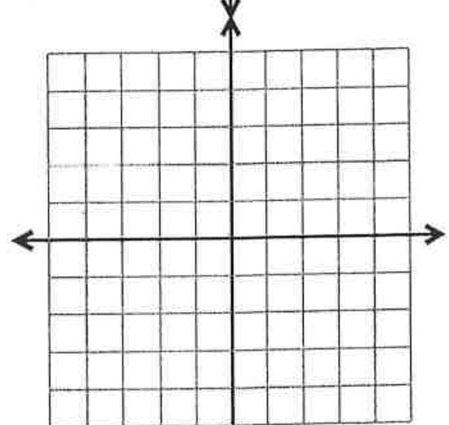
Write the slope as a fraction & y-intercept as a point!



Let's graph the equation

Slope:_____ Y-Intercept:______

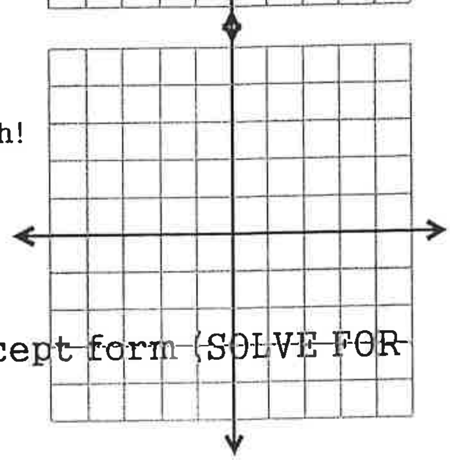
Domain:_______________ Range:________________



Let's graph the equation .

Slope:_____ Y-Intercept:______

Domain:_______________ Range:________________



Let's graph the equation .

Remember it MUST be in slope intercept form in order to graph!

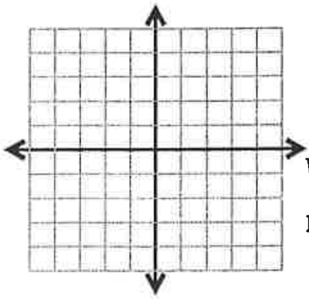
Slope:_____ Y-Intercept:______

Domain:_______________ Range:________________

Let's practice putting equations in slope-intercept form (SOLVE FOR Y!!). Then state the slope and y-intercept.

Slope:____ Y-Intercept:____	Slope:____ Y-Intercept:____	Slope:____ Y-Intercept:____

Graph a Vertical line

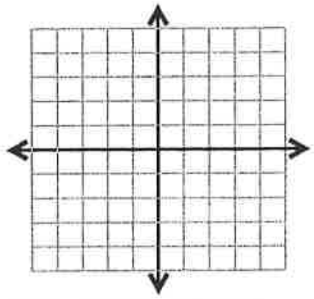


Find 3 points on your line:

WHAT DO YOU SEE?

Equation of your line:

Graph a Horizontal line:



Find 3 points on your line:

WHAT DO YOU SEE?

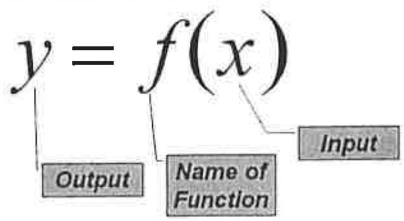
Equation of your line:

Using FUNCTION NOTATION

Output value Input value

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

f of *x* equals 5 times *x* plus 3.



Given f(x) = $x^2 - 2$, find:	Given g(x) = 2x + 7, find:	Given h(x) = $-2x^2 + 7x - 11$, find:
f(5)=	g(4)=	h(2)=
f(−5)=	g(−4)=	h(2a)=
f(0)=	g(a)=	3h(−3)=

A little more of a challenge: Given f(x) = 2x + 1, find −4[f(3) − f(1)].

Math 3 ~ Unit 1 Day 2 & 3 ~ Solving Systems

A system of equations: A set of ______ or more equations.

A __________________ is a set of values for the variables that makes all the equations true.

When the "solution" is ____________ into the linear equations the result will be a ________ statement.

3 Ways to solve a system:

1. ________________
2. ________________
3. ________________

# of Solutions	Type of lines
1	→
0	→
infinite	→

Method 1: Graphing

- Solve each equation for y.
- Enter the first equation into $\mathbf{Y_1}$.
- Enter the second equation into $\mathbf{Y_2}$.
- Use the **INTERSECT** option to find where the two graphs intersect (the answer).

  2nd TRACE (CALC) #5 intersect

  Move spider close to the intersection.

  Hit **ENTER** 3 times.


Let's work an example: $4x - 6y = 12$

$2x + 2y = 6$

Example #2 Application: There are 25 bikes and trikes at the park. The bikes and trikes have 60 wheels in all. How many bikes and trikes are in the park?

Your try. Solve by graphing. (You can do these by hand or with a calculator!)

4. Pedro can choose between two tennis courts at two university campuses to learn how to play tennis. One campus charges $25 per hour. The other campus charges $20 per hour plus a one –time registration fee of $10. Write a system of equations to represent the cost c for h hours of court use at each campus. Find the number of hours for which the costs are
the same.

Method 2: Algebraically using Elimination

Basic Goal: Add the two equations together so that the x or y is eliminated.

Example #1: $x - 2y = 14$
$x + 3y = 9$

What if the coefficients aren't the same: No Problem! Follow the steps below.
Basic Steps:

1. Arrange equations so variables, equal signs and constants line up vertically.
2. Multiply one or both equations by a value so that one variable in the 1st equation has the opposite coefficient in the other equation.
3. Add the two equations.
4. Solve for the remaining variable.
5. Use the solution from step 4 and substitute into either equation. Solve for the remaining variable.

Example #2: $x - 2y = 12$
$5y = 6x - 23$

Practice with Elimination: Solve using elimination

Application: The Algebra 2 classes took 60 minutes to answer a combination of 20 multiple-choice and extended-response questions. The class took 2 minutes to answer each multiple choice question and 6 minutes to answer each extended-response question.

a. Write a system of equations to model the relationship between the number of multiple choice questions **m** and the the number of extended-response questions **r**.

b. How many of each type of questions was on the test?

Method 3: Substitution

1. Solve one of the equations for either "x =" or "y =".
   This example solves the second equation for "*y* =".
2. Replace the "*y*" value in the first equation by what "*y*" now equals.
3. Solve this new equation for "x".
4. Place this new "x" value into either of the ORIGINAL equations in order to solve for "*y*".
5. CHECK the solution in BOTH Equations!

Example #1 :

Example #2:

Applications with Systems ~ Pick a Method

Suppose that the Greene Cell Phone company charges $50 per month plus 15 cents per minute while the Johnston Cell Phone Company charges no monthly fee but 25 cents per minute. After how many minutes of phone usage would a monthly phone bill be the same from both companies?

Jake's Surf Shop rents surfboards for $6.00 plus $3.00 per hour. Rita's rents them for $9.00 plus $2.50 per hour.

- After how many hours of surfing will the rental fee be the same for both surf shops?
- You only want to surf for 2 hours; which Surf Shop should you go to?

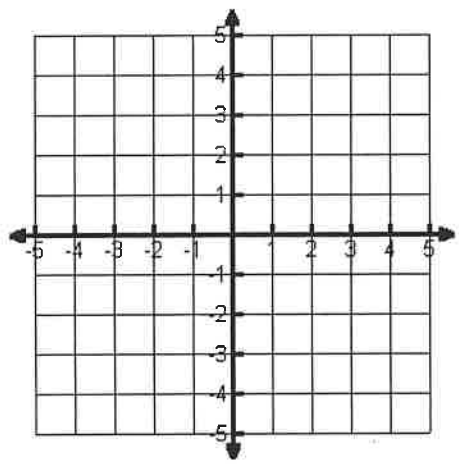
Day 3 Graphing Systems of Inequalities

Graphing an Inequality

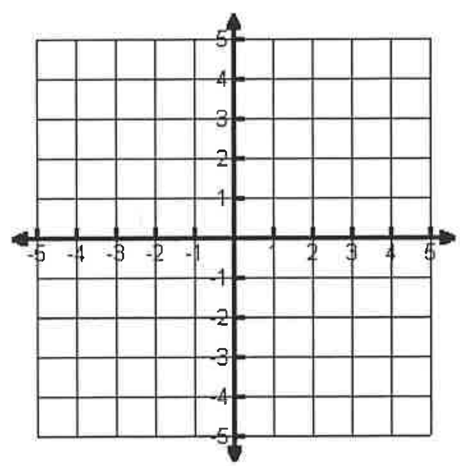
1. Solve the inequality for *y* (if necessary). Graph each inequality on the same set of axes.
2. Graph the inequality as if it contained an = sign.
3. Draw the line solid if the inequality is   or
4. Draw the line dashed if the inequality is $<$ or $>$
5. Pick a point not on the line to use as a test point. The point (0,0) is a good test point if it is not on the line.
6. If the point makes the inequality true, shade that side of the line. If the point does not make the inequality true, shade the opposite side of the line.
7. The area where the shading overlaps is the solution to the system of inequalities.

PRACTICE:

Ex:

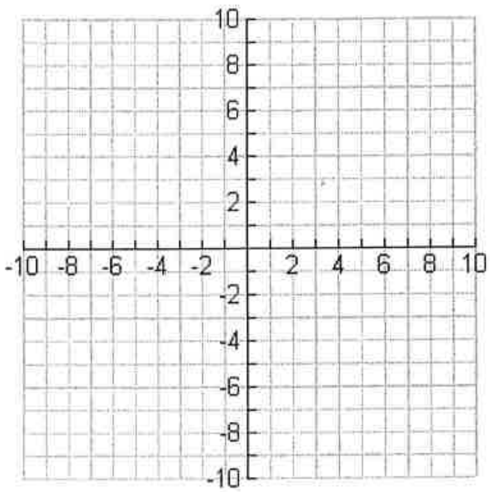


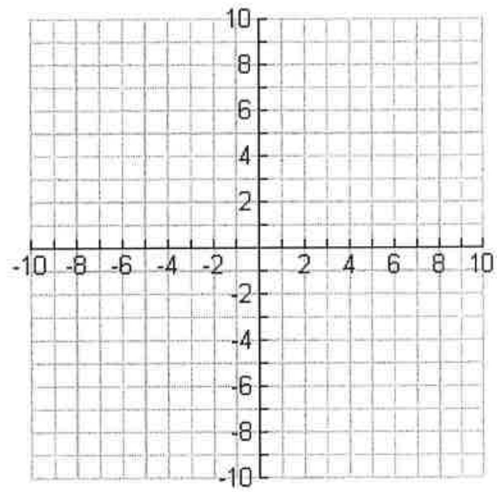
Ex:

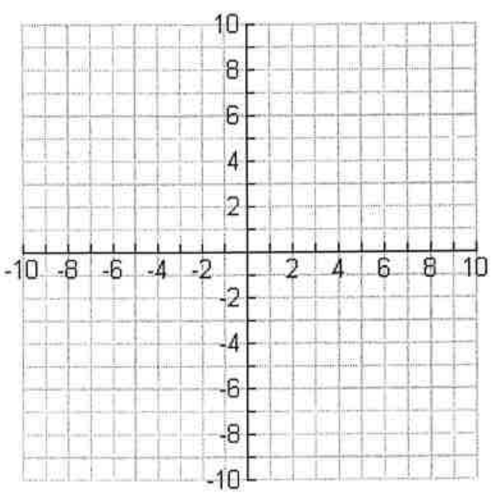


Graph the following inequalities on graph paper.

Used colored pencils to shade.







4) **Katie works part-time at the Fallbrook Riding Stable. She makes $5 an hour for exercising horses and $10 an hour for cleaning stalls. Because Katie is a full-time student, she cannot work more than 12 hours per week. Graph two inequalities that illustrate how many hours Katie needs to work at each job if she plans to earn not less than $90 per week.**

Write a system of inequalities to model the given scenario.

Use your graphing calculator, to find a possible solution.

Unit 1 Day 4 ~ Absolute Value Functions

Absolute value variable equations are written as:

- $f(x) = |mx + b| + c$
- Graph looks like a right side up or upside down ___________
  - Opens up if the coefficient in front of the absolute value symbols is _____________.

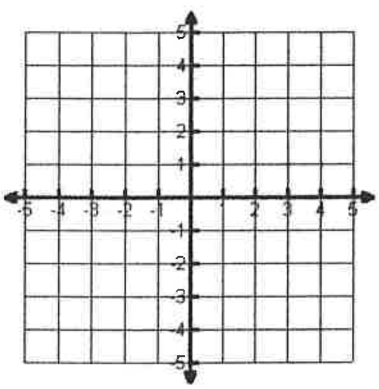
    $f(x) = 4|x + 2| + 3$ opens up

  - Opens down if the coefficient in front of the absolute value symbols is _____________.

    $f(x) = -4|x + 2| + 3$ opens down

- The vertex of the graph will be . You can use your calculator to find it!!

Let's start with $f(x) = |x|$ and graph the equation. This is called the parent function.

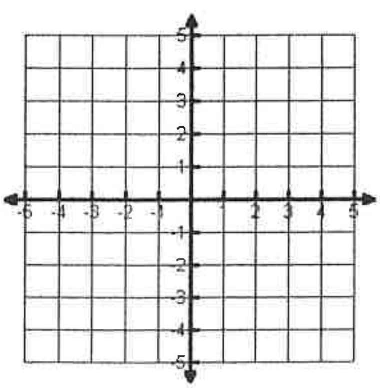


What's the vertex? (__,__)

Does it open up or down? ___

Domain:________________ Range:__________________

You try $f(x) = |x + 2|$. How is it different from the parent graph? ___________________



What's the vertex? (__,__)

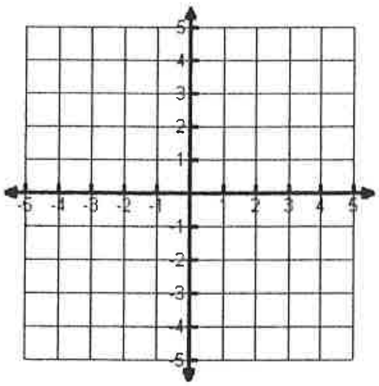
Does it open up or down? ___

Domain:________________ Range:__________________

Now

f(x) = |x| + 2. How is it different from the parent graph?

What's the vertex? (__,__)



Does it open up or down? ____

Domain:________________ Range:__________________

Vertical Transformations:

A constant added outside the absolute value symbol shifts the graph UP that many units.

f(x) = |x| + 5 moves the parent graph ________________

A constant subtracted outside the absolute value symbol shifts the graph DOWN that many units.

f(x) = |x| - 3 moves the parent graph ________________

Horizontal Transformations:

A constant added inside the absolute value symbols shifts the graph LEFT horizontally.

f(x) = |x + 2| moves the parent graph ______________________

A constant subtracted inside the absolute value symbols shifts the graph RIGHT horizontally.

f(x) = |x - 2| moves the parent graph ______________________

Reflection over the x-axis:

If you have a ________________ in front of the absolute value, the graph will be reflected, or _______________, over the x-axis.

f(x) = -| x | moves the parent graph ______________________

Vertical Stretch/Compression:

$C \cdot f(x)$, where C is a real number > 0

If $C > 1$, then f(x) has a vertical _________ by a factor of C units.

If $0 < C < 1$, then f(x) has a vertical __________ by a factor of C units.

f(x) = 2|x| How does this compare to the parent?__________________

f(x) = 0.5|x| How does this compare to the parent?_________________

Quick Recap:

In what way would the graph of y = |x| move according to the following equations? Be specific.

1. $y = 4|x + 3| - 5$

2. $y = -|x - 2| + 7$

Application:

A rainstorm begins as a drizzle, builds up to a heavy rain, and then drops back to a drizzle. The rate r (in inches per hour) at which it rains is given by the functionamd t represents time in hours.

Graph the function.

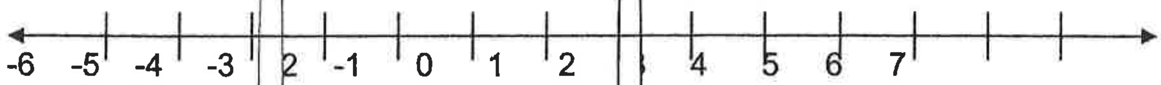
How long does it rain?

When does it rain the hardest?

What is the rate of the rain after 30 minutes?

Absolute Value Functions

Absolute Value is the distance a number is from zero on the number line.



Ex: |-4| = 4 |6| = 6

Solving Absolute Value Equations

Absolute Value Equations usually have 2 answers. This is because to get rid of the absolute value bars we have to rewrite the equation as two separate linear equations.

Ex: $|x - 3| = 27$ Rewrite the equation as 2 different equations.

$x - 3 = 27$ and $x - 3 = -27$ *Think about which numbers have an absolute value of 27.*

The steps to solve an absolute value equation are:

1. **Isolate the absolute value first**
2. **Rewrite the equation as two separate linear equations**
3. **Solve each equation individually to get the two answers**

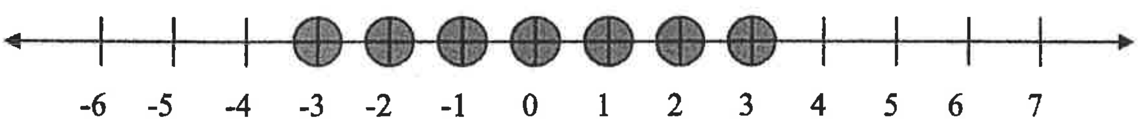
Ex: $|2x + 3| = 15$ $2|x - 7| = 16$

Absolute Value Inequalities

Ex: If $|x| \leq 3$ that means that its distance from zero is less than 3 spaces.
What number(s) is exactly three spaces from zero?

What are other numbers that are less than 3 spaces away from zero?

Plot this on a number line:



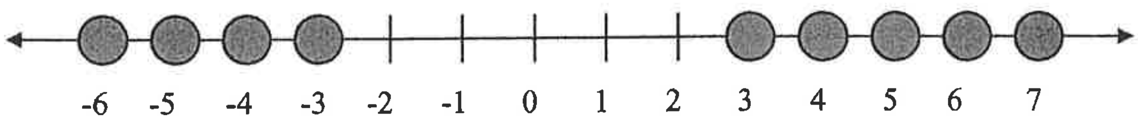
Where do all these numbers seem to lay?

Ex: If $|x| \geq 3$ that means that its distance from zero is more than 3 spaces.

What number(s) is exactly three spaces from zero?

What are other numbers that are more than 3 spaces away from zero?

Plot this on a number line:



Where do these points seem to lie?

We call these two situations compound inequalities. These two types are called ***and*** and ***or*** statements.

And: This is an in-between situation. Your answer would be written **# < *x* < #**

Or : This is the "going out" situation. Your answer would be written ***x* < # or *x* > #**

All absolute value inequalities make an **and** or an **or** statement. We know which by what the sign is.

Less Thand – Less than Absolute values make and statements

Greator – Greater than Absolute values make or statements.

Video Tutorial:
https://www.youtube.com/watch?v=BhFj7Rkyc5E