Understanding **Math**

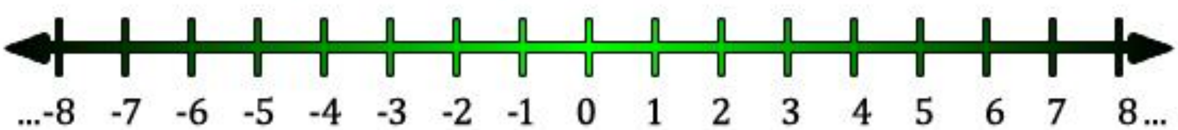
Concept: Solving Absolute Value Equations

Name:

Warm Up

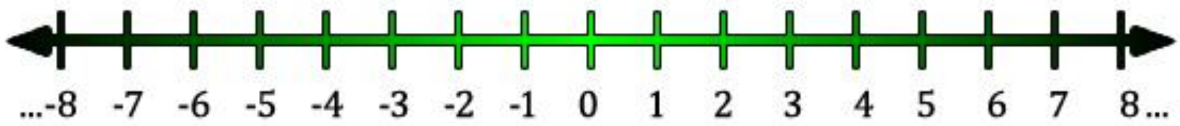
1. Determine what values of x make each inequality true. *Graph each answer.*

(a) $9x - 2 \le 7x + 8$



Remember: *If you multiply or divide both sides by a negative quantity, the inequality sign must be* __________________.

(b) $2x - 3 < 5x - 9$



COMPUTER COMPONENT

Instructions: Select the computer program *Understanding Equations* (Neufeld)
Follow the instructions to the Main Menu.
Select *Solving Absolute Value Equations* from the Main Menu.

Work through all sections of this topic **in order**:

- *Absolute Value... What is it?*
- *Absolute Value Equations in 1 Variable*
- *Absolute Value Inequalities in 1 Variable*
- *Absolute Value Equations in 2 Variable*
- *Practice Questions*

Additional Required Materials: Pencil Crayons

As you work through the computer exercises, make your notes in the **NOTES** section of this page.

When you reach the end of the section *Practice Questions* on the computer, move on to the **OFF COMPUTER EXERCISES** below.

NOTES:

The absolute value measures the ___________________________ a number is away from the origin (________________) on the number line.

Distance is always a ___________________ number.
Absolute value is always a ____________________ number.

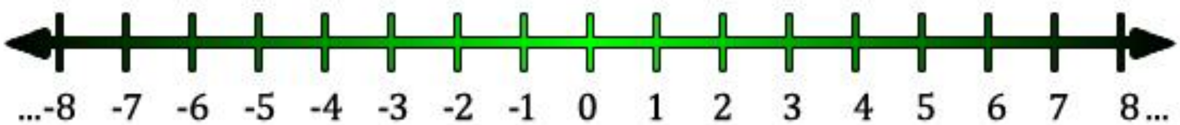
If you have | x | you can have two solutions for x:

If x $\geq$ 0, then | x | = _________

If x < 0, then | x | = _________

Example:

What two numbers have an absolute value of 6? Show your answer on the number line.



Practice:

(a) | x | = 4

Then Case 1: x $\geq$ 0 then | x | = _____________

Case 2: x < 0 then | x | = _____________

(b) $| x + 4 | = 8$

Then Case 1: $x+4 \geq 0$ then $| x + 4 | =$ _______________

Case 2: $x+4 < 0$ then $| x + 4 | =$ _____________

Recall, if $(2x – 6) < 0$, then $| 2x – 6 | = - (2x -6)$

Solving an equation with absolute value in it, requires you must examine ______________ cases. Use the definition of absolute value to set up the two equations. The resulting linear equation is then solved. Finally you must _________________ to see if the __________________ makes the ___________________ true.

Practice:

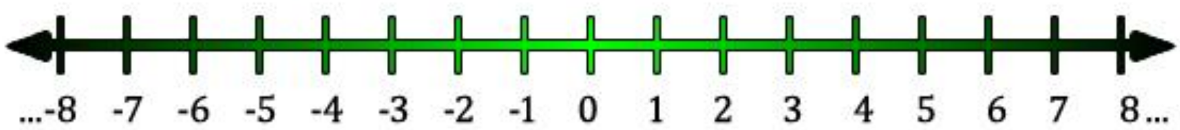
$| x + 4 | = 8$

Case 1	Case 2
$x+4 \geq 0$ then $\| x + 4 \| =$ _____________	$x+4 < 0$ then $\| x + 4 \| =$ _____________
Rewrite the equation:	Rewrite the equation:
______________ = 8	______________ = 8
Solve the linear equation:	Solve the linear equation:
______________ = 8	______________ = 8
x = _____	____ x = _____
	x = _____
Check: Substitute x = ____ into (1)	Check: Substitute x = _____ into (1)
L.S. $\| x + 4 \| = \|$ _____ + 4$\|$	L.S. $\| x + 4 \| = \|$ _____ + 4$\|$
= _____	= _____
R. S = 8 Does it check?	R. S = 8 Does it check?

OFF COMPUTER EXERCISES

1. The absolute value of a number is 5. What is the original number?

2. Graph $| x | \leq 4$.



3. Solve.

   (a) $| 2x - 6 | = 10$

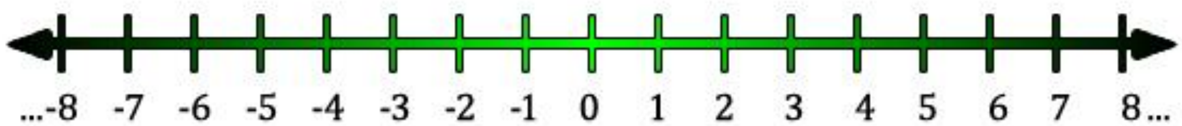
(b) $|x + 4| = 1$

(c) $|x - 2| = 4$

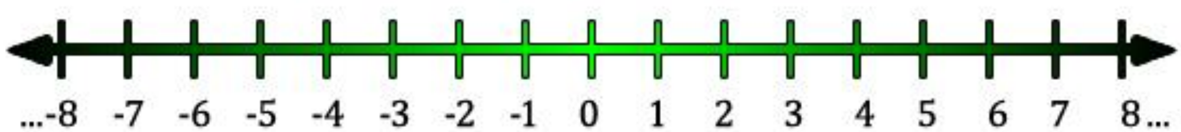
(d) $|3x - 1| = 5$

4. Graph the inequality

(a) $|x| \leq 5$



(b) $|x - 2| < 4$



5. Solve

(a) $|3 - x| \leq 8$

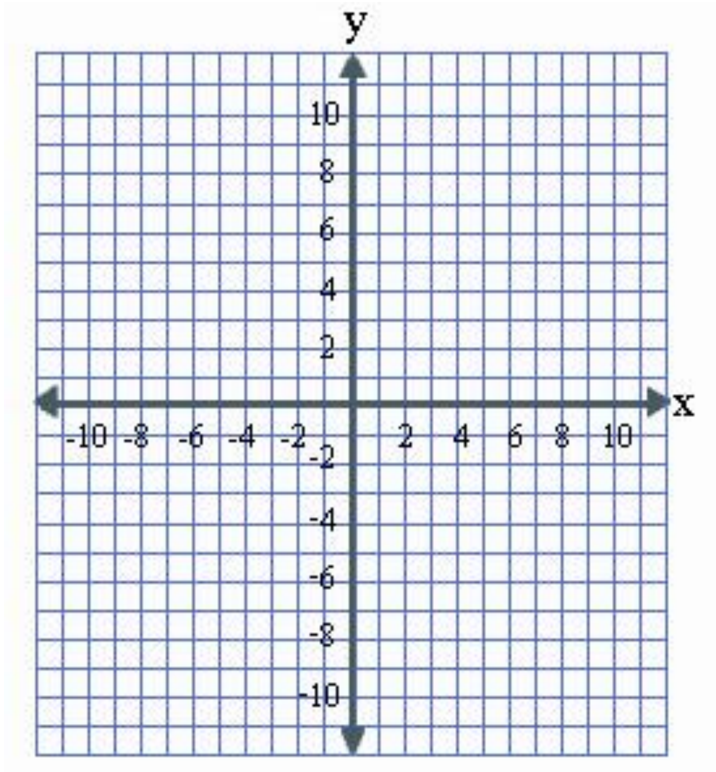
(b) $|x - 2| < 2$

(c) $|5x + 2| > 3$

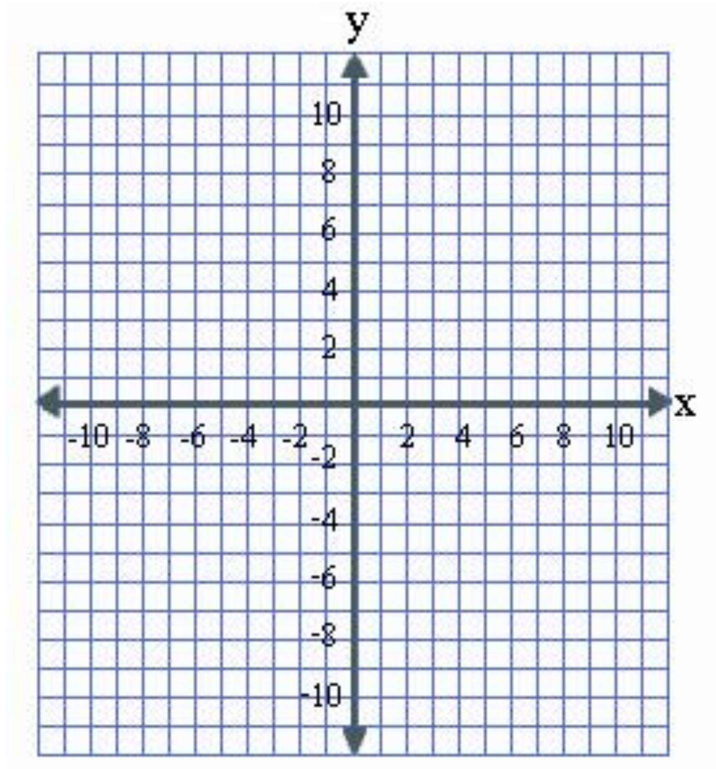
(d) $|5x - 2| \leq 3x + 1$

Graph

(e) $y = |x + 2|$

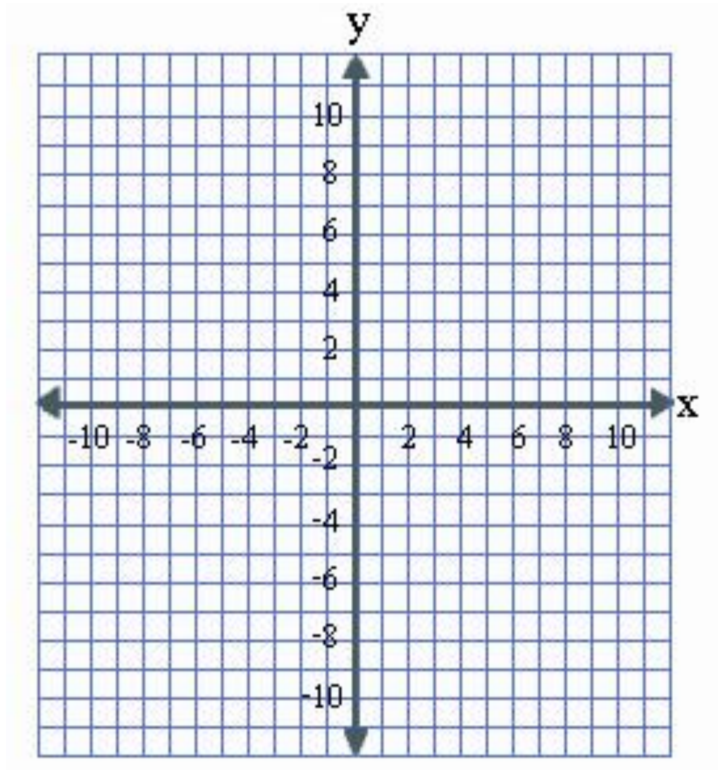


(f) $y = 3|x| - 1$



6. Graph the following absolute value equation:

(a) $y = |x|$



Case 1: For $x \geq 0$

$y =$ ________

y-intercept (0 , _____)

Slope of line _________

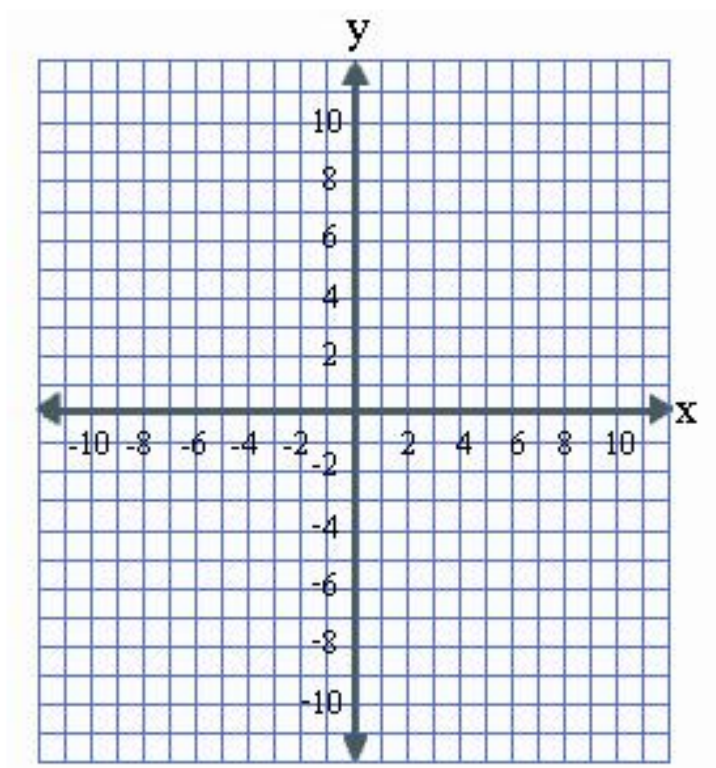
Case 2: For $x < 0$

$y =$ ________

y intercept (0 , _____)

Slope of line _________

(b) $y = |x| + 3$



Case 1: For $x \geq 0$

$y =$ ________

y-intercept (0 , _____)

Slope of line _________

Case 2: For $x < 0$

$y =$ ________

y intercept (0 , _____)

Slope of line _________

(c) $y = |x + 4| + 3$

Case 1: For $x + 4 \geq 0$

$y =$ ________

y-intercept (0 , _____)

Slope of line _________

Since $x + 4 \geq 0$

$x \geq$ _____

Case 2: For $x + 4 < 0$

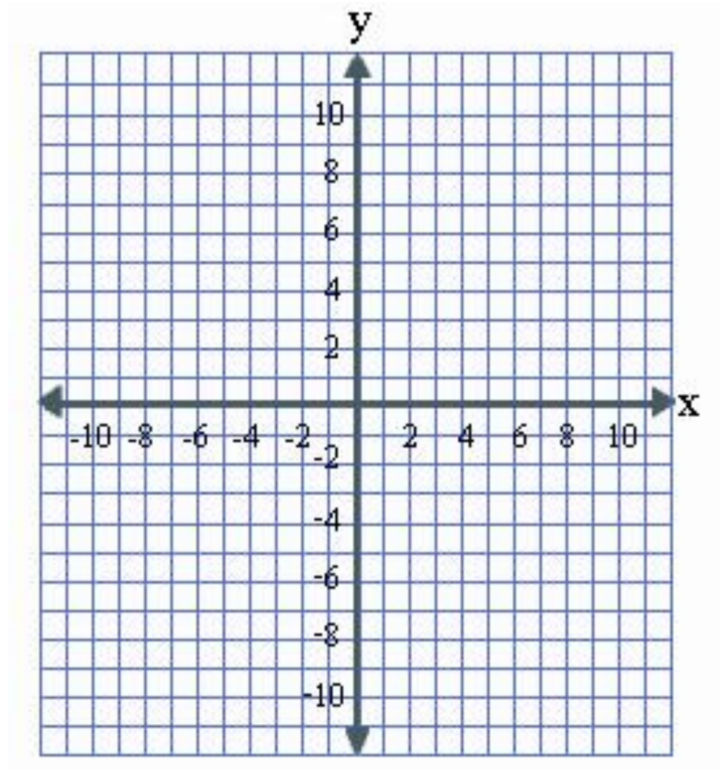
$y =$ ________

y intercept (0 , _____)

Slope of line _________

Since $x + 4 < 0$

$x <$ _____



(d) $y = -|x + 4| + 3$

Case 1: For $x + 4 \geq 0$

$y =$ ________

y-intercept (0 , _____)

Slope of line _________

Since $x + 4 \geq 0$

$x \geq$ _____

Case 2: For $x + 4 < 0$

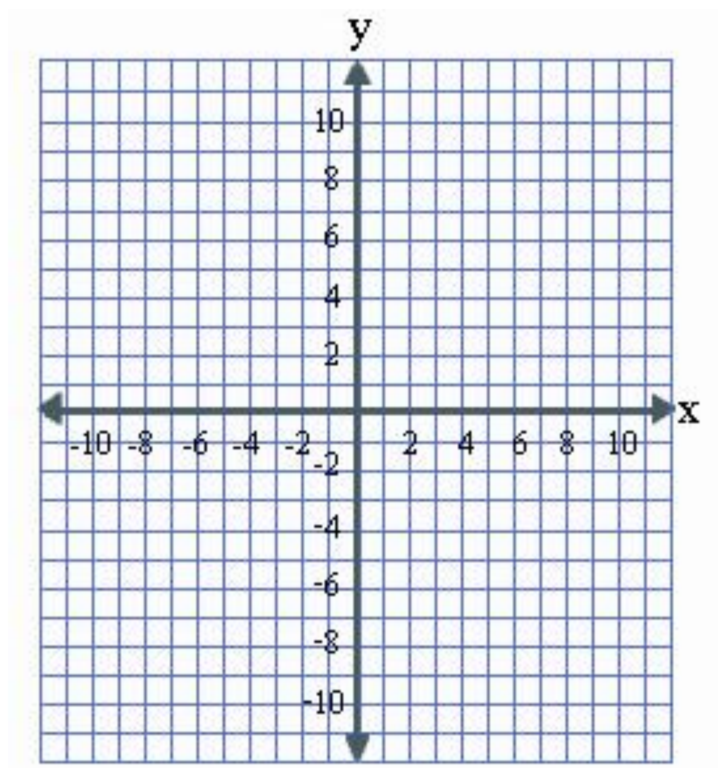
$y =$ ________

y intercept (0 , _____)

Slope of line _________

Since $x + 4 < 0$

$x <$ _____



(e) $y = -5|x + 4| + 3$

Case 1: For $x + 4 \geq 0$

$y =$ ________   y-intercept (0 , _____)

Slope of line is _________

Since $x + 4 \geq 0$

$x \geq$ ______

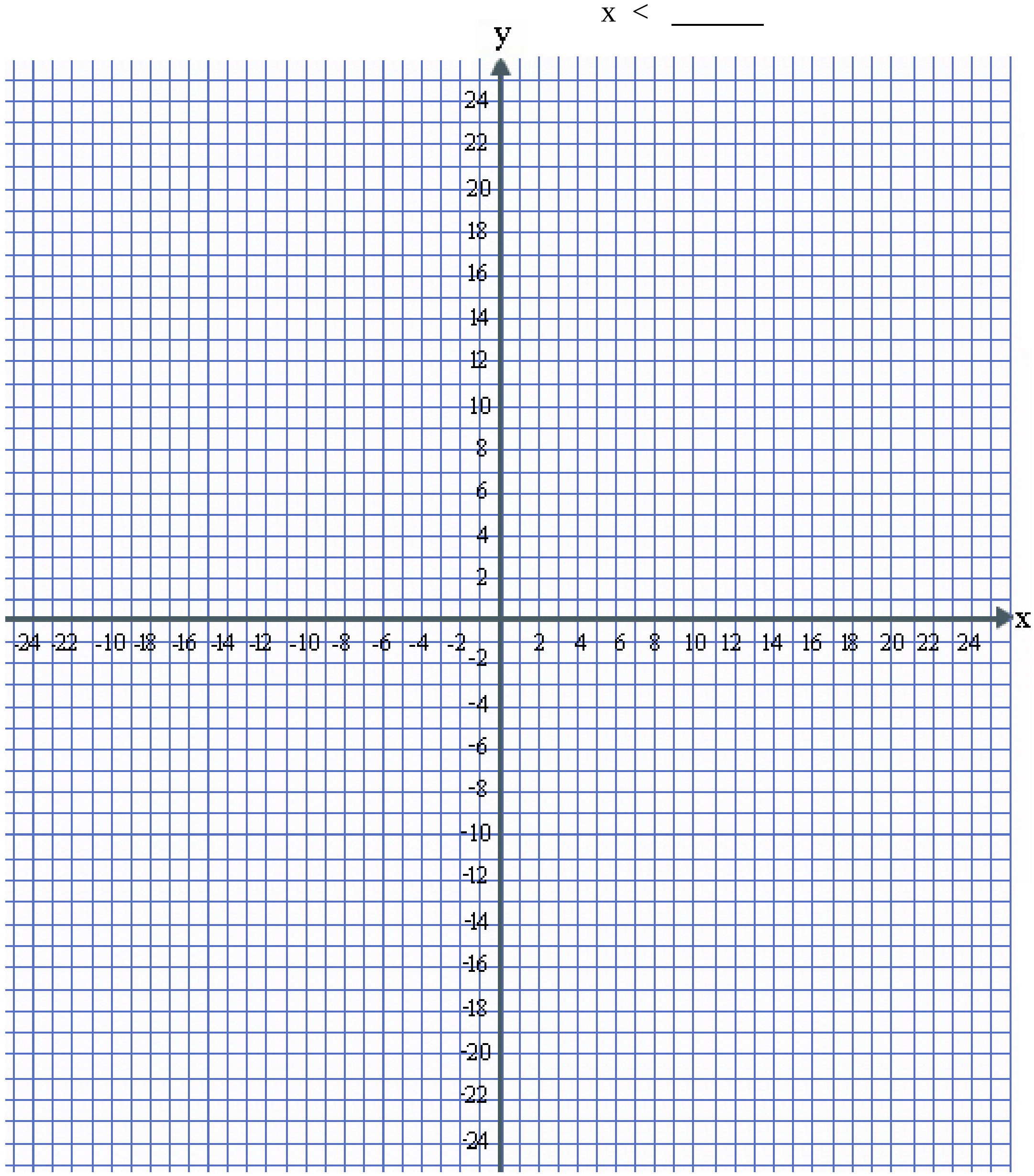
Case 2: For $x + 4 < 0$

$y =$ ________   y intercept (0 , _____)

Slope of line is _________

Since $x + 4 < 0$

$x <$ ______



4. In the above graphs of the absolute value equations, + 3, + 4, "-" and - 5 were added to the equation y = | x |. *What effect did adding these numbers have on the graphs in relationship to their shape and position?*

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