Lesson 2.5 - Absolute Value Equations Name __*Answer Key*__ Period ____

Remember the Jelly Bean Challenge from Lesson 1.1.???

Mr. Wright judges the annual Jelly Bean Challenge at the summer fair. Every year, he encourages the citizens in his town to guess the number of jelly beans in a jar. He keeps a record of everyone's guesses and the number of jelly beans that each person's guess was off by.

1. What is the independent quantity? *each person's guess*

2. What is the dependent quantity? *how many each guess is off by*

The correct number of jelly beans is 250. Complete the table below and graph your information. (<u>Label both axes on your graph.</u>)
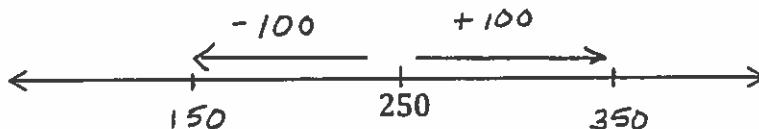
Person's Guess	How many they are "off" by.
x	f(x)
50	200
100	150
150	100
200	50
250	0
300	50
320	70
400	150
450	200

$|250 - 50|$

$|250 - 300|$

Person's Guesses
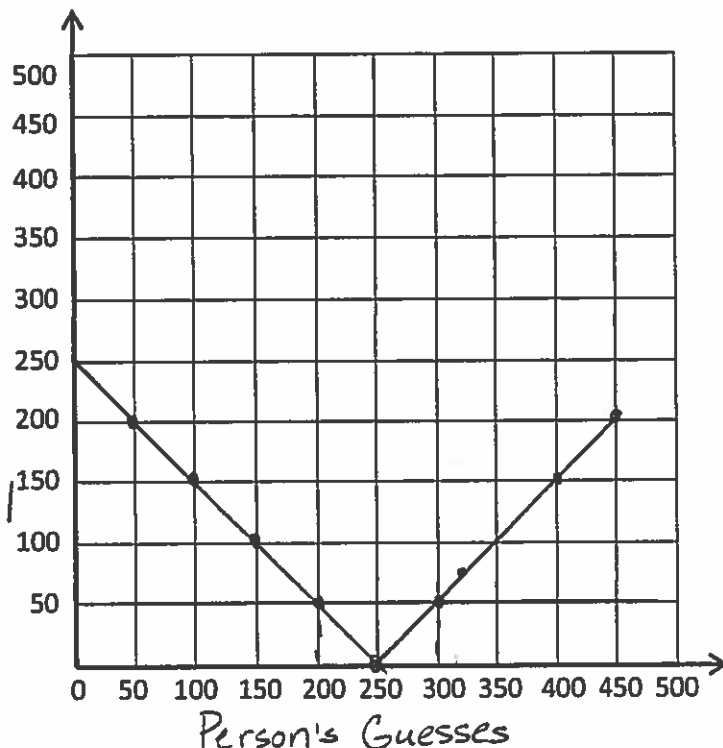
What would the number line look like for a guess that was off by 100 jellybeans? Careful, THINK!

Think about the distance away from 250! (in either direction)

THIS IS ABSOLUTE VALUE!!!!

What is $|5| = ?$ What is $|-5| = ?$ What is $|2 - 5| = ?$ The absolute value is always...

5   5 $|-3| = 3$ positive

The equation for this situation would look like this. $f(x) = |x - 250|$

What if you were given f(x) and asked to find x?

    A. Suppose $f(x) = 50$. Draw a line at $f(x) = 50$ (or $y = 50$).

    The pts-of-intersection are $x = 200$ and $x = 300$

    B. How would you set up the equation and solve it?

$$f(x) = 50 = |x - 250|$$
$$x = 300 \qquad |300 - 250| = |50| = 50 \checkmark$$
$$x = 200 \qquad |200 - 250| = |-50| = 50 \checkmark$$

Solve each absolute value equation.

Two solutions:

3. $|-7 + a| = 5 \qquad |5| = 5 + |-5| = 5$

$|-7 + a| = |5| = 5$

$\boxed{a = 12}$

$|-7 + a| = |-5| = 5$

$\boxed{a = 2}$

4. $\left|\dfrac{v}{7}\right| = 3$

$\left|\dfrac{v}{7}\right| = |3|$

$\boxed{v = 21}$

$\left|\dfrac{v}{7}\right| = |-3|$

$\boxed{v = -21}$

5. $|3 - 2x| = 11$

$|3 - 2x| = |11|$

$3 - 2x = 11$

$-2x = 8$

$\boxed{x = -4}$

$|3 - 2x| = |-11|$

$3 - 2x = -11$

$-2x = -14$

$\boxed{x = 7}$

6. $|8m - 7| = 9$

$|8m - 7| = |9|$

$8m - 7 = 9$

$8m = 16$

$\boxed{m = 2}$

$|8m - 7| = |-9|$

$8m - 7 = -9$

$8m = -2$

$m = \dfrac{-2}{8}$

$\boxed{m = \dfrac{-1}{4}}$

7. $7|8 + x| = 28$

Get the absolute value by itself.

$\dfrac{7|8 + x|}{7} = \dfrac{28}{7}$

$|8 + x| = 4$

$|8 + x| = |4| \qquad |8 + x| = |-4|$

$8 + x = 4 \qquad\qquad 8 + x = -4$

$\boxed{x = -4} \qquad\qquad \boxed{x = -12}$

8. $-5 + \left|\dfrac{x}{5}\right| = -4$

$\underline{+5 \qquad\qquad +5}$

$\left|\dfrac{x}{5}\right| = 1$

$\left|\dfrac{x}{5}\right| = |1| \qquad \left|\dfrac{x}{5}\right| = |-1|$

$\dfrac{x}{5} = 1 \qquad\qquad \dfrac{x}{5} = -1$

$\boxed{x = 5} \qquad\qquad \boxed{x = -5}$