6.5 Solving and Graphing Absolute Value Equations

The equation $|ax + b| = c$ where $c \geq 0$ (positive)
is equivalent to the statement:

$ax + b = c$ OR $ax + b = -c$

http://www.youtube.com/watch?feature=player_embedded&v=u6zDpUL5RkU

Example: $|3| = 3$ and $|-3| = 3$

so, if $|x| = 3$ then $x = 3$ or -3

I. Solve
Get absolute value by itself, make a disjunction, solve

1) $|r-7| = 9$

$|-9| = 9 \quad |9| = 9$

$r - 7 = -9 \quad r - 7 = 9$
$+7 +7 \quad +7 +7$
$\boxed{r = -2} \quad \boxed{r = 16}$

$|-2-7| = 9 \quad |16-7| = 9$
$|-9| = 9 \quad |9| = 9$

2) $2|x| + 4.1 = 18.9$
$-4.1 -4.1$
$\dfrac{2|x|}{2} = \dfrac{14.8}{2}$
$|x| = 7.4$
$\boxed{x = 7.4, -7.4}$

I. Solve
Continued

$|-3| = 3$
$|3| = 3$

3) $4|m + 9| - 5 = 19$
$+5 +5$
$\dfrac{4|m+9|}{4} = \dfrac{24}{4}$
$|m+9| = 6$

$m + 9 = 6 \qquad m + 9 = -6$
$-9 -9 \qquad -9 -9$
$\boxed{m = -3} \qquad \boxed{m = -15}$

4) $2|p - 5| + 4 = 2$
$-4 -4$
$\dfrac{2|p-5|}{2} = \dfrac{-2}{2}$
$\boxed{|p-5| = -1} \leftarrow$
$\boxed{\text{No Solution}}$

I. Solve
Continued

5) $1/3\,|2c - 5| + 3 = 7$
$-3 -3$
$3\left(\dfrac{1}{3}|2c-5|\right) = (4)\,3$
$|2c-5| = 12$

$2c - 5 = 12 \qquad 2c - 5 = -12$
$\boxed{c = 8.5,\ 8\tfrac{1}{2}} \qquad \boxed{c = -3.5,\ -3\tfrac{1}{2}}$
$\dfrac{17}{2} \qquad\qquad \dfrac{-7}{2}$

II. Absolute deviation:
absolute deviation = $|x - \text{given value}|$

6) The absolute deviation of x from 7.6 is 5.2. What are the values of x that satisfy this requirement?

$5.2 = |x - 7.6|$

$5.2 = x - 7.6$
$\boxed{12.8 = x}$

$-5.2 = x - 7.6$
$\boxed{2.4 = x}$

II. Absolute deviation
Continued

7) Five times the absolute deviation of 2x from -9 is 15. (Write and solve)

$2x + 9 = 3 \qquad 2x + 9 = -3$
$\boxed{x = -3} \qquad \boxed{x = -6}$

$\dfrac{5|2x+9|}{5} = \dfrac{15}{5}$

$|2x+9| = 3$

II. Absolute deviation
Continued

8) A cheerleading squad is preparing a dance program for a competition. The program must last 4 minutes with an absolute deviation of 5 seconds. Write and solve an absolute value equation to find the least and greatest possible times (in seconds) that the program can last.

Between 4:05 and 3:55