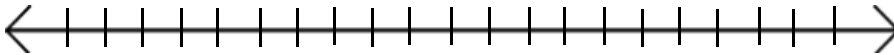


# 1 Absolute Value Equations 2012 Notes.notebook

Do Now:



Sarah lives at 15 Sycamore Drive. Allison lives 8 houses away.  
(Assume the addresses change by a unit of 1.) Draw these houses on a number line.

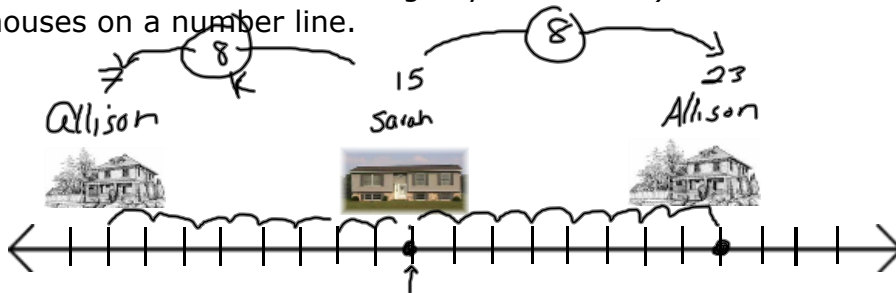


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Do Now:

*distance from  
always positive 0*

Sarah lives at 15 Sycamore Drive. Allison lives 8 houses away.  
(Assume the addresses change by a unit of 1.) Draw these houses on a number line.



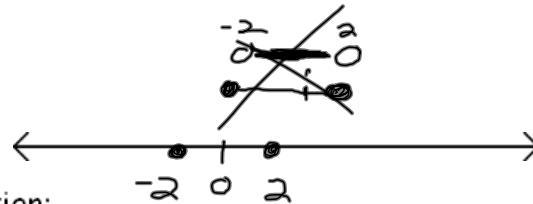
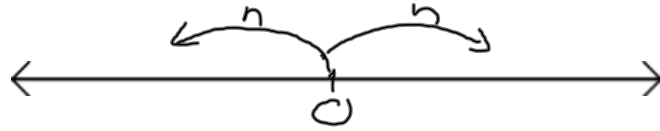
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# Solving Absolute Value Equations

Absolute Value is:

$|n|$  = Absolute value of  $n$

$|n|$  = distance from zero



The Solution Set of an Absolute Value Equation:

$$\begin{array}{l}
 |x| = 2 \\
 |2| = 2 \\
 2 = 2
 \end{array}
 \left\{ \begin{array}{l}
 |-2| = 2 \\
 2 = 2
 \end{array} \right.
 \quad x = 2, -2$$

$$\begin{array}{l}
 \{x \mid x=2, x=-2\} \\
 \{-2, 2\}
 \end{array}$$

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In General  $\downarrow$  *positive*  
 If  $|x|=k$  where  $k>0$   
 then  $x=k$  or  $x=-k$

$$\begin{array}{l}
 |x|=2 \\
 x=2 \quad \vee \quad x=-2
 \end{array}$$

If  $k$  is negative, right there. Why?

$k$  represents distance from zero.

negative distance is simply shenanigans.

There are always two answers to an absolute value equation.

**Steps to Solve Absolute Value Equations**

1. Isolate the Absolute Value
2. Split into 2 equations  $|x| = \pm x$
3. Solve each equation
4. Check for extraneous roots by plugging into the ORIGINAL equation

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**EXAMPLES**

1.  $|x-10| = 6$

Case 1

$$\begin{array}{r} x-10 = 6 \\ +10 = +10 \\ \hline \end{array}$$

$x = 16$

Check:

$$|16-10| = 6$$

$$|6| = 6$$

$$6 = 6 \checkmark$$

Case 2

$$x-10 = -6$$

$$+10 = +10$$

$x = 4$

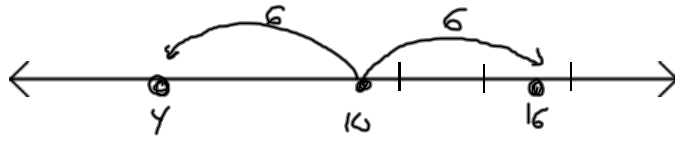
Check:

$$|x-10| = 6$$

$$|4-10| = 6$$

$$|-6| = 6$$

$$6 = 6 \checkmark$$

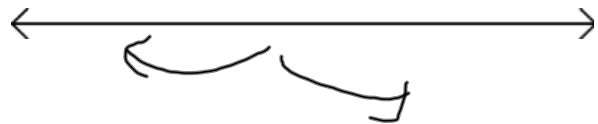


$\{4, 16\}$

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2.  $|4x+6| + 8 = 3$

$$\begin{array}{r} |4x+6| + 8 = 3 \\ -8 = -8 \\ \hline |4x+6| = -5 \end{array}$$



$\{ \} \emptyset$

3.  $|3x+2| = 4x+5$

Case 1

$$\begin{array}{r} 3x+2 = 4x+5 \\ -3x-5 = -3x-5 \\ \hline \end{array}$$

$-3 = 1x$

check

$$|3(-3)+2| = 4(-3)+5$$

$$|-9+2| = -12+5$$

$$|-7| = -7$$

distance

Case 2

$$\begin{array}{r} 3x+2 = -4x-5 \\ +4x-2 = +4x-2 \\ \hline \end{array}$$

$$7x = -7$$

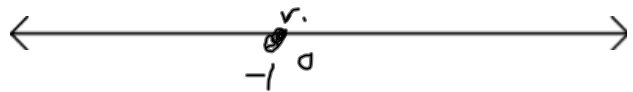
$$x = -1$$

check:

$$|3(-1)+2| = 4(-1)+5$$

$$|-1| = -1$$

$$1 = 1 \checkmark$$



$\{-1\} \checkmark$

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4.  $|2a+1|=a+5$

Case 1  $2a+1=a+5$   
 $a=4$   
 Case 2  $2a+1=-a-5$   
 $3a=-6$   
 $a=-2$   
 Case 1  $|2(4)+1|=4+5$   
 $|9|=9$   
 Case 2  $|2(-2)+1|=-2+5$   
 $|-3|=3$

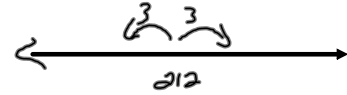
$\{-2, 4\}$

5. The proper brewing temperature for Earl Grey tea is 212 degrees plus or minus 3 degrees. Write and solve an absolute value equation representing the maximum and minimum brewing temperatures for Earl Grey tea.



$|x-212|=3$

Case 1  $x-212=3$   
 $x=215$   
 Case 2  $x-212=-3$   
 $x=209$   
 Check:  $|215-212|=3$   
 $3=3$   
 Check:  $|209-212|=3$   
 $|-3|=3$



$\{209^\circ\text{F}, 215^\circ\text{F}\}$

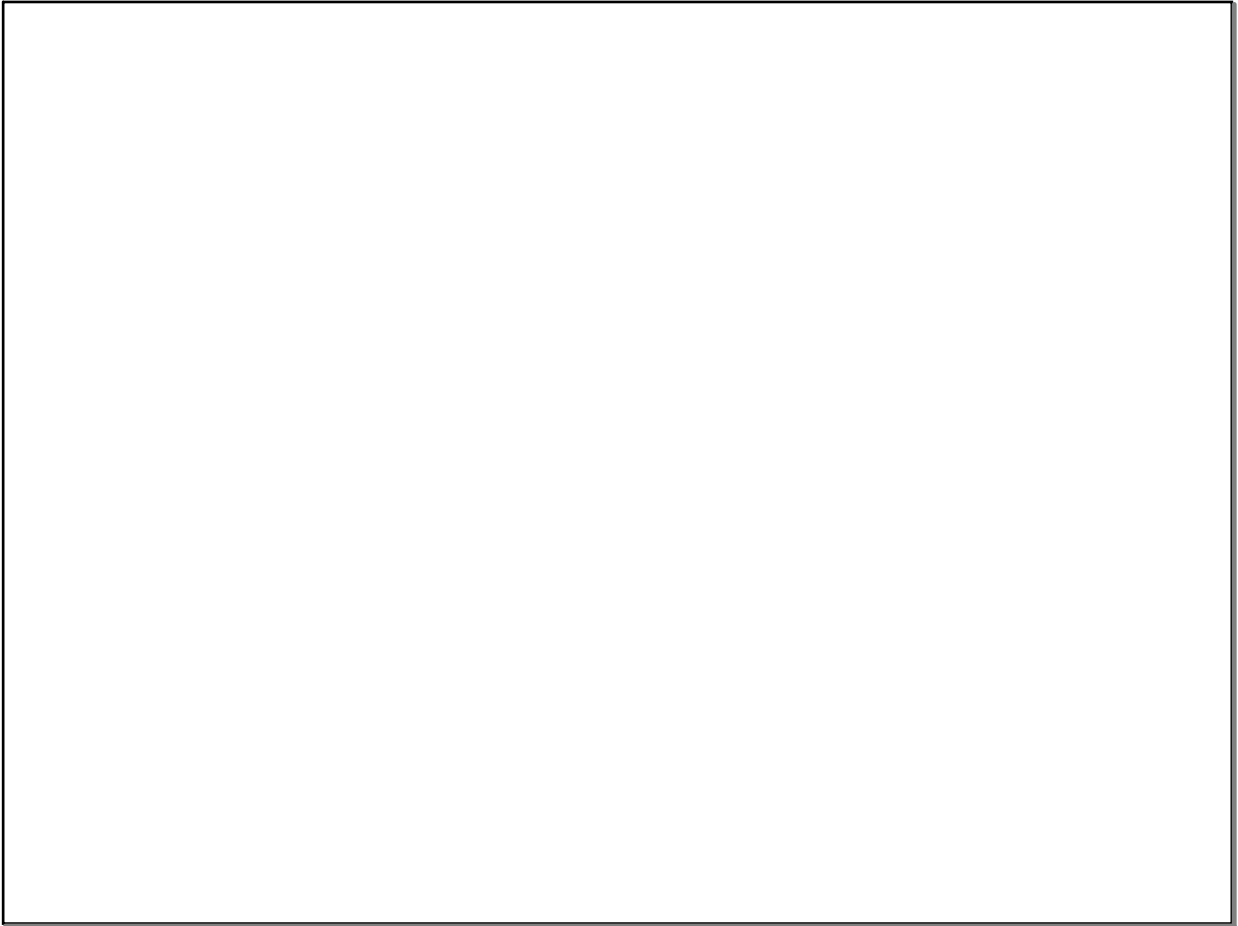
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**PRACTICE**

- 1.  $|x+2|=7$
- 2.  $|3x-1|+5=3$
- 3.  $5|c-2|=30$
- 4.  $|x-2|=2x-3$
- 5.  $|2a+1|=a+5$
- 6.  $|y|=1/2$
- 7.  $|n|=-9$
- 8.  $|2k|=7$
- 9.  $|x+3|=4$
- 10.  $|y-3|=3$
- 11.  $|4-x|=3x$
- 12.  $|2x+5|=x+4$
- 13.  $|y+3|+5=2y$
- 14.  $|5x-3|-4=3$
- 15.  $2+|2x-6|=10$
- 16.  $|8-7y|+9=1$

\*A machine fills Quaker Oatmeal containers with 32 ounces of oatmeal. After the containers are filled, another machine weighs them. If the container's weight differs from the desired 32 ounces by more than 0.5 ounces, the container is rejected. Write an equation that can be used to find the heaviest and lightest acceptable weights for the Quaker oatmeal container. Solve the equation.

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Nov 27-10:08 PM