Absolute Value Discovery

Mark off a length of tape (masking or painters) on the floor around 5 feet long. Do this for each group.

One student from each group should be chosen to use their foot as a unit of measurement. Each group should go to the tape, marked off for their group on the floor, and measure the distance by stepping heel to toe. Each step is one unit. Estimate the distance by how many footsteps were taken.

Distance of the tape _____

Now the same student will measure the same strip of tape by stepping heel to toe backwards.

Distance of the tape _____

Does the distance change based on the direction the steps were taken?

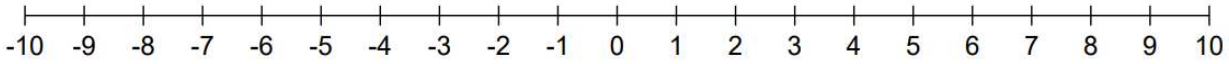
Explain what was discovered by this activity.

_____

_____

_____

Defining Absolute Value



Use the number line to determine each of the following:

1. the distance from 3 to 7 _____

2. the distance from 7 to 3 _____

Does the distance change based on the direction you move? _____

Explain: _____

_____

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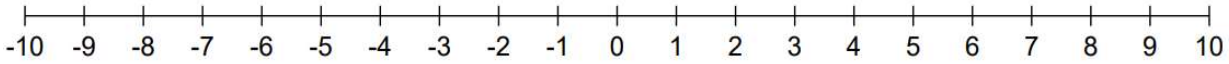


Use the number line to determine each of the following:

3. the distance from –4 to 6 _____

4. the distance from 3 to –2 _____

Explain what you have learned about distances from these examples.

_____

_____

Starting at 0 and moving the same distance you determined from questions 1 & 2,

where could you end up on the number line? _____

Using this discovery write a definition in your own words for absolute value.

_____

_____

_____

Mathematical symbols for absolute value

$|x| = 4$ means the absolute value of a number x is 4

Using your definition from above, write an explanation of the above statement.

_____

_____

_____

Solving absolute value equations

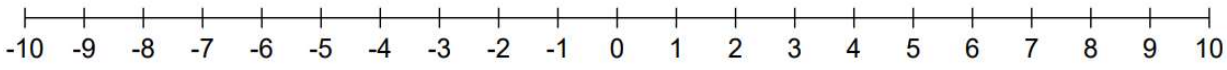
If $|x| = 4$ from previous discoveries, we know we would be moving 4 spaces from 0.

This means we could end up at 4 or –4

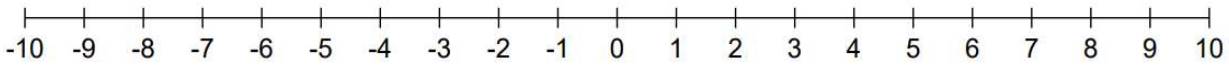
Therefore, if $|x| = 4$ $x = 4$ or $x = -4$ Either one is 4 spaces from 0.

Using this rule or your definition what would be the solutions for x in the following equations and express each problem on a number line?

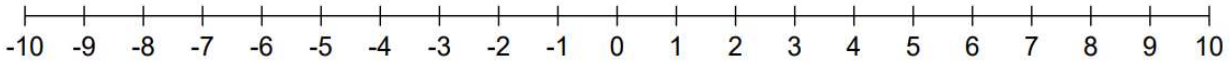
5. $|x| = 7$



6. $|x| = 3$



7. $|x| = -4$



What did you discover about moving a negative distance?

_____

_____

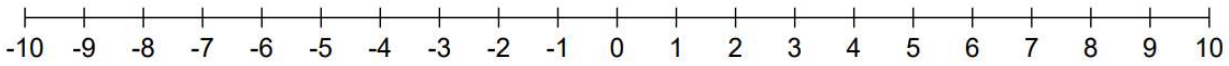
How does that affect your decisions when solving an absolute value equation equal to a negative number?

_____

_____

Now you will discover how to apply this concept if the value inside the bars was more than just an x.

1. Choose a number on the number line.
2. Choose a distance to move in both directions from your chosen number.
3. Draw segments to each of those numbers.



What were the two solutions? _____

You learned earlier that an absolute value cannot equal a negative number because it is a distance. But keep in mind you are moving in either a positive or negative direction to reach your two solutions.

Write an absolute value equation that would match the segment you just drew on the number line. Keep in mind that absolute value is equal to a distance. Think about satisfying the |positive| and |negative| values.

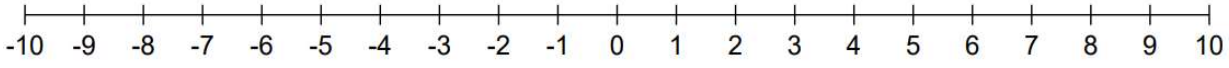
_____

8. If $|x + 4| = 5$ explain in words how you would solve this equation?

_____

_____

What would this look like on a number line?

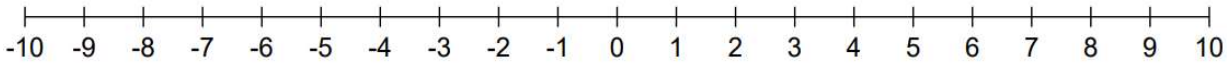


9. If $|x - 4| = 5$ explain in words how you would solve this equation?

_____

_____

What would this look like on a number line?



10. Using the same idea, create two absolute value equations that equal 6.

Show your work for each of the following:

11. $| x + 3 | = 9$

12. $| x - 2 | = 11$

Write an explanation of your thinking process for solving one of the equations above.

_____

_____

_____

_____

More advanced absolute value equations.
13. $4|x + 2| - 2 = 14$

- When solving an equation in the form $3x - 2 = 13$, the first step is to begin to isolate the variable by adding or subtracting the constant to both sides.

What do you think the first step in solving this equation should be?

_____

_____

Show the step here.
$4|x + 2| - 2 = 14$

- Your equation is now $3x = 15$. The next step is to divide by the coefficient (number in front) of the variable.

What do you think the second step in solving this equation should be?

_____

_____

Show the step here.

$4|x + 2| = 16$

Now the equation should be similar to problems 11 and 12. Finish solving the equation here.

$|x + 2| = 4$

Repeat the process to solve the following equations.

13. $2|x – 7| + 6 = 20$

14. $–3|2x – 5| + 3 = –21$