LESSON MAKER PRO

Distance From Center

Write and solve absolute value equations by using distance.

HIGH SCHOOL · MA.912.AR.4.1

MA.912.AR.4.1 "Given a mathematical or real-world context, write and solve one-variable absolute value equations."

NAME _____ DATE _____

TWO DISTANCE DIRECTIONS

An equation of the form |x - a| = b means that x is b units away from a on a number line. When b is positive, solve two equations: x - a = b and x - a = -b. When b is negative, there is no solution.

WORKED EXAMPLE

The number line marks the two values of x that solve |x - 11| = 5. Use the figure to solve the equation.

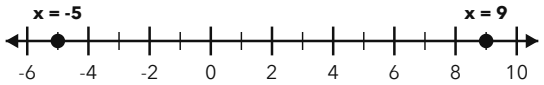


1. Set x - 11 = 5 or x - 11 = -5.
2. Add 11 to both equations.
3. x = 16 or x = 6.

Answer: x = 6 or x = 16

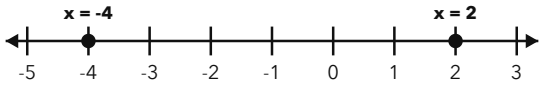
PRACTICE 6 problems

1 The number line marks all values of x that are 7 units from 2. Write and solve the absolute value equation represented.



ANSWER _____

2 The number line marks all values of x that are 3 units from -1. Write and solve the absolute value equation represented.



ANSWER _____

3 Solve |4x - 2| = 10.

ANSWER _____

4 Solve |2x + 9| = 1.

ANSWER _____

5 Solve |x/7 - 2| = 3.

ANSWER _____

6 Solve |x - 8| = -1.

ANSWER _____

APPLY IT Show your work

1 The recommended top speed for a school e-bike program is 18 mph. During a test, a bike's speed x was exactly 4 mph away from the recommendation. Write and solve an absolute value equation to find the possible speeds.

WORK SPACE

ANSWER _____

2 A student is editing a podcast. One segment has a length of x seconds, and its length differs from 45 seconds by 12 seconds. Write and solve an absolute value equation to find the possible segment lengths.

WORK SPACE

ANSWER _____

CHALLENGE One step up

Solve $|3x - 8| = |x + 4|$. Explain why you must consider two cases.

WORK SPACE AND ANSWER

ANSWER KEY

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	The number line marks all values of x that are 7 units from 2. Write and solve the absolute value equation represented.	**|x - 2| = 7; x = -5 or x = 9**
2	The number line marks all values of x that are 3 units from -1. Write and solve the absolute value equation represented.	**|x + 1| = 3; x = -4 or x = 2**
3	Solve |4x - 2| = 10.	**x = -2 or x = 3**
4	Solve |2x + 9| = 1.	**x = -5 or x = -4**
5	Solve |x/7 - 2| = 3.	**x = -7 or x = 35**
6	Solve |x - 8| = -1.	**no solution**

PART 2 · APPLY IT

1. **\|x - 18\| = 4; x = 14 or x = 22** The speed is 4 units from 18, so use \|x - 18\| = 4. Solve x - 18 = 4 and x - 18 = -4.
2. **\|x - 45\| = 12; x = 33 or x = 57** The segment length is 12 units from 45, so use \|x - 45\| = 12. Solve x - 45 = 12 and x - 45 = -12.

CHALLENGE

x = 1 or x = 6. The expressions inside the absolute value signs can be equal, or they can be opposites.

Accept solutions in either order. Accept equivalent equation forms, such as \|2 - x\| = 7 for problem 1, because absolute value gives the same distance.