

Worksheet: Absolute Value Equations & Inequalities

The **absolute value** of a number is its **distance from 0** on a number line. Since distance is never negative, absolute values are always **0 or positive**.

$$|x| = -x$$

$$|x|$$

Distance from 0



Drag the point left or right

Examples

$$|-4.2| = 4.2$$

$$|5| = 5$$

$$|-5| = 5$$

$$|0| = 0$$

Solving Absolute Value Equations

If $|x| = a$

then there are **two possible solutions** (when $a > 0$):

$$x = a \quad \text{or} \quad x = -a$$

Example 1:

Solve: $|x| = 7$

Solutions:

$$x = 7 \quad \text{or} \quad x = -7$$

Example 2:

Solve: $|x - 3| = 5$

Write two equations:

$$x - 3 = 5 \quad \text{Or} \quad x - 3 = -5$$

Solve: $x = 8 \quad \text{Or} \quad x = -2$

Answer: $x = 8 \text{ or } x = -2$

Example 3:

$$|x - 2| < 6$$

Write as a compound inequality:

$$-6 < x - 2 < 6$$

Add 2 to all parts.

$$-4 < x < 8$$

Solving Absolute Value Inequalities

Less Than ($<$)

If $|x| < 4$

Then $-4 < x < 4$

Less Than or Equal To ($\leq$)

If $|x| \leq 6$

Then $-6 \leq x \leq 6$

Greater Than ($>$)

If $|x| > 3$

Then $x < -3$
or $x > 3$

Greater Than or Equal To ($\geq$)

If $|x| \geq 5$

Then $x \leq -5$
or $x \geq 5$

Part A – Evaluate Absolute Value - Find each value.

1. $|8| = \square$

2. $|-12| = \square$

3. $|0| = \square$

4. $|15| = \square$

5. $|-27| = \square$

6. $|9 - 14| = \square$

7. $|4 - 10| = \square$

8. $|-18 + 6| = \square$

Part B – Solve Absolute Value Equations

9. $|x| = 9$

$$x = \square \text{ or } x = \square$$

10. $|x| = 15$

$$x = \square \text{ or } x = \square$$

11. $|x - 4| = 6$

$$x = \square \text{ or } x = \square$$

$$x = \square \text{ or } x = \square$$

12. $|x + 5| = 8$

$$x = \square \text{ or } x = \square$$

14. $|x - 7| = 2$

$$x = \square \text{ or } x = \square$$

16. $|3x| = 18$

$$x = \square \text{ or } x = \square$$

13. $|2x| = 10$

$$x = \square \text{ or } x = \square$$

15. $|x + 3| = 11$

Part C – Solve Absolute Value Inequalities - Write the solution as a compound inequality or two inequalities using **<**, **>**, **≥**, or **≤**

17. $|x| < 8$

$$-8 \square x \square 8$$

21. $|x - 2| < 4$

$$-2 \square x \square 6$$

18. $|x| \leq 5$

$$-5 \square x \square 5$$

22. $|x + 3| \leq 7$

$$-10 \square x \square 4$$

19. $|x| > 6$

$$x \square -6 \text{ or } x \square 6$$

23. $|x - 5| > 2$

$$x \square 3 \text{ or } x \square 7$$

20. $|x| \geq 10$

$$x \square -10 \text{ or } x \square 10$$

24. $|x + 1| \geq 6$

$$x \square -7 \text{ or } x \square 5$$