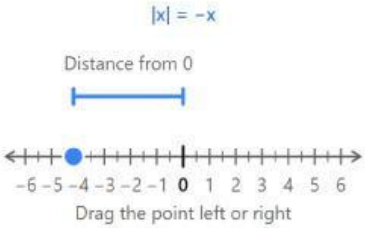
Worksheet: Absolute Value Equations & Inequalities

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**.

$$|x|$$



Examples

$$|5| = 5$$

$$|-5| = 5$$

$$|0| = 0$$

$$|-4.2| = 4.2$$

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:

$x - 3 = 5$ Or $x - 3 = -5$

Solve: $x = 8$ Or $x = -2$

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

Example 3:

$$|x - 2| < 6$$

Write as a compound inequality:

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

Add 2 to all parts. $\boxed{-4 < x < 8}$

Solving Absolute Value Inequalities

Less Than (<)

If $|x| < 4$

Then $-4 < x < 4$

Less Than or Equal To (≤)

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 (≥)

If $|x| \geq 5$

Then $x \leq -5$

or $x \geq 5$

Part A – Evaluate Absolute Value - Find each value.

1. $|8|$ = ☐
2. $|-12|$ = ☐
3. $|0|$ = ☐
4. $|15|$ = ☐
5. $|-27|$ = ☐
6. $|9 - 14|$ = ☐
7. $|4 - 10|$ = ☐
8. $|-18 + 6|$ = ☐

Part B – Solve Absolute Value Equations

9. $|x| = 9$

$x =$ ☐ or $x =$ ☐

10. $|x| = 15$

$x =$ ☐ or $x =$ ☐

11. $|x - 4| = 6$

$x =$ ☐ or $x =$ ☐

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$x = \square$ or $x = \square$

12. $|x+5| = 8$

$x = \square$ or $x = \square$

13. $|2x| = 10$

$x = \square$ or $x = \square$

14. $|x-7| = 2$

$x = \square$ or $x = \square$

15. $|x+3| = 11$

16. $|3x| = 18$

$x = \square$ or $x = \square$

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

17. $|x| < 8$

$-8 \square x \square 8$

18. $|x| \leq 5$

$-5 \square x \square 5$

19. $|x| > 6$

$x \square -6$ or $x \square 6$

20. $|x| \geq 10$

$x \square -10$ or $x \square 10$

21. $|x-2| < 4$

$-2 \square x \square 6$

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

$-10 \square x \square 4$

23. $|x-5| > 2$

$x \square 3$ or $x \square 7$

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

$x \square -7$ or $x \square 5$

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