

Absolute Value Equations

9th Grade

One equation, two cases — because distance works in both directions.

An absolute value equation splits into two cases: the inside equals the positive value, or the negative of it.

$$|x| = a \rightarrow x = a \text{ or } x = -a$$

$$|x| = 5$$

$$x = 5 \text{ or } -5$$

Both are 5 units from zero.

$$|x - 3| = 7$$

$$x = 10 \text{ or } -4$$

$$x - 3 = 7 \text{ or } x - 3 = -7$$

$$|x| = -2$$

no solution

Distance can never be negative.

$$|2x + 1| = 9$$

$$x = 4 \text{ or } -5$$

Solve both cases separately.

THE COMMON MISTAKE

× $|x - 3| = 7 \rightarrow x = 10 \text{ only}$

✓ $x = 10 \text{ or } x = -4$

Both 10 and -4 are exactly 7 away from 3.

Isolate the absolute value first. Only then split into cases.