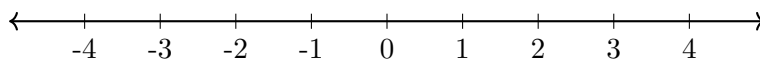


Absolute Values

Geometric Definition of Absolute Value

Definition. What is the absolute value of a number x ?



Piecewise Definition of Absolute Value

Although not critical now, the piecewise definition introduces conditional formulas and previews piecewise functions, which we will see in Week 2.

Definition.

Example. Evaluate $|x|$ using the piecewise definition for $x = 5$ and $x = -7$.

Solving Absolute Value Equations

General Method: To solve $ A = B$
Case 1: If $B < 0$, there is no solution .
Case 2: If $B \geq 0$, split into two cases: $A = B$ or $A = -B$.

Example. Solve $|x - 4| = 5$:

Solving Absolute Value Inequalities

General Method: Absolute Value Inequalities
Case 1: $ A < B$: Rewrite as $-B < A < B$.
Case 2: $ A > B$: Rewrite as $A > B$ or $A < -B$.

Example. Solve $|x - 3| < 4$.

Example. Solve $|2x + 1| > 5$.

Application: Manufacturing

Absolute values are used to define acceptable ranges for product dimensions.

Example. Suppose part needs to be 5 cm long, with a tolerance of ± 0.1 cm. The acceptable range for the length x of the part is:

$$|x - 5| \leq 0.1$$

Inequalities like this ensure consistency in manufacturing industries like automotive, aerospace, and electronics.