DEFINITION Absolute Value of a Real Number

The **absolute value of a real number a** is

$$|a| = \begin{cases} a, \text{ if } a > 0 \\ -a, \text{ if } a < 0. \\ 0, \text{ if } a = 0 \end{cases}$$

Evaluate:

(a) $|-4|$ **(b)** $|\pi - 6|$

Properties of Absolute Value

Let a and b be real numbers.

1. $|a| \geq 0$

2. $|-a| = |a|$

3. $|ab| = |a||b|$

4. $\left|\frac{a}{b}\right| = \frac{|a|}{|b|}, b \neq 0$

Distance Formula (Number Line)

Let a and b be real numbers. The **distance between a and b** is

$$|a - b|.$$

Note that $|a - b| = |b - a|$.

Distance Formula (Coordinate Plane)

The **distance d between points $P(x_1, y_1)$ and $Q(x_2, y_2)$** in the coordinate plane is

$$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}.$$

Finding the Distance Between Two Points

Find the distance d between the points $(1, 5)$ and $(6, 2)$.

Midpoint Formula (Number Line)

The **midpoint of the line segment with endpoints a and b** is

$$\frac{a+b}{2}.$$

Finding the Midpoint of a Line Segment

The midpoint of the line segment with endpoints -9 and 3 on a number line is

Midpoint Formula (Coordinate Plane)

The **midpoint of the line segment with endpoints (a, b) and (c, d)** is

$$\left(\frac{a+c}{2}, \frac{b+d}{2}\right).$$

Finding the Midpoint of a Line Segment

The midpoint of the line segment with endpoints $(-5, 2)$ and $(3, 7)$ is