

Inequalities

Algebraic Properties

① $a < b \Rightarrow a+c < b+c$

② $a < b \Rightarrow a-c < b-c$

③ $a < b$ and $c > 0 \Rightarrow ac < bc$

④ $a < b$ and $c < 0 \Rightarrow ac > bc$

* ⑤ $a > 0 \Rightarrow \frac{1}{a} > 0$

* ⑥ If 'a' and 'b' both are positive or both are negative , then $a < b \Rightarrow \frac{1}{a} > \frac{1}{b}$

e.g.: $-2 < 1$ $1 < 2$, $-2 < -1$

$$-\frac{1}{2} > 1$$

X

$$1 > \frac{1}{2}$$

$$-\frac{1}{2} > -1$$

Types of Intervals

	Notation	Set description	Type	Picture
	(a, b)	$\{x a < x < b\}$	Open	
	$[a, b]$	$\{x a \leq x \leq b\}$	Closed	
	$[a, b)$	$\{x a \leq x < b\}$	Half-open	
	$(a, b]$	$\{x a < x \leq b\}$	Half-open	
	(a, ∞)	$\{x x > a\}$	Open	
	$[a, \infty)$	$\{x x \geq a\}$	Closed	
	$(-\infty, b)$	$\{x x < b\}$	Open	
	$(-\infty, b]$	$\{x x \leq b\}$	Closed	
	$(-\infty, \infty)$	\mathbb{R} (set of all real numbers)	Both open and closed	

Absolute Value Properties

① $|-a| = |a|$

② $|ab| = |a||b|$

③ $\left| \frac{a}{b} \right| = \frac{|a|}{|b|}$

④ $\sqrt{a^2} = |a|$

⑤ $|a+b| \leq |a| + |b|$ (Triangle Inequality)

↳ Case 1: 'a' and 'b' have same signs

$$|a+b| = |a| + |b|$$

↳ Case 2: 'a' and 'b' have different signs

$$|a+b| < |a| + |b|$$

Absolute Value & Intervals

① $|n| = a \Leftrightarrow n = \pm a$

② $|n| < a \Leftrightarrow -a < n < a$ → This is a positive integer

③ $|n| \leq a \Leftrightarrow -a \leq n \leq a$

④ $|n| > a \Leftrightarrow n > a \text{ or } n < -a$

⑤ $|n| \geq a \Leftrightarrow n \geq a \text{ or } n \leq -a$