

5 LINEAR INEQUALITIES

1 SAQ [4 M]

CONCEPTS & FORMULAS

- 1) **Inequalities:** The math symbols are $<$, $>$, $\leq$, $\geq$, $\neq$ are known as inequalities.

They are read as less than ($<$), greater than ($>$), less than or equal to ($\leq$), greater than or equal to ($\geq$) and not equal to ($\neq$).

Ex 1: $1 < 2$, $3 > 2$; $2 \leq 4$, $3 \geq 2$; $7 \neq 8$, $9 \neq -9$

Ex 2: $-1 < 2$, $-2 \leq 2$, $0 \leq 2$; ; (Negative numbers are always less than positive numbers)
 $1 \geq -2$, $2 \geq -10$ (Positive numbers are always greater than negative numbers.)

Ex 3: $-1 > -2$, $-3 > -5$, $-4 \geq -8$; $-6 \geq -16$,.... (Smaller negative number by magnitude is greater than a bigger negative numbers.)

- 2) **Linear Inequalities:**

Algebraic expressions of degree 1 related by the symbols $<$, $>$, $\leq$, $\geq$ form linear inequalities.

Ex 1: $x > 0$ (Positive), $x \geq 0$ (non-negative), $x < 0$ (negative); $x > 5$, $y \leq 5$, $x \neq 0$, $ax + b \geq 0$,....

Ex 2: $2x + 3y \geq 4$, $x - y < 1$, $ax + by > c$, $x \leq y$, $3a + 2b \leq 0$; $-8 \leq (5x - 3) < 7$...

Non-Ex: $x^2 - 1 > 0$; $\sqrt{x} \geq 0$; $ax^2 + bx + c > 0$,...

- 3) **Solving Linear Inequalities:**

To solve linear inequalities we can use similar steps as we use in linear equations

- Change the sign of the value after **Transposition**(shifting the value to the other side of the inequality). (or) Add or subtract the same value from both sides.

Ex: $2x + 3 > 6 \Rightarrow 2x > 6 - 3 \Rightarrow 2x > 3$; (or) $2x + 3 > 6 \Rightarrow 2x + 3 - 3 > 6 - 3 \Rightarrow 2x > 3$

- While **cross multiplying/cancelling/ multiplying/ dividing** by a

(i) **Positive value**, the **sign will not change**.(ii) **Negative value**, the **sign gets reversed**.

Ex 1: $5 > 3 \Rightarrow 5(2) > 3(2)$ as $10 > 6$; $3 > 2 \Rightarrow \frac{3}{5} > \frac{2}{5}$; $\cancel{2}x > \cancel{2} \Rightarrow x > 1$

Ex 2: $3 > 2 \Rightarrow 3(-1) < 2(-1)$; $-8 < -6 \Rightarrow (-8)(-2) > (-6)(-2) \Rightarrow 16 > 12$; $-x > 0 \Rightarrow x < 0$

- 4) **Graphing Linear Inequalities:**

- To represent $x < a$ on the number line put a small open circle (o denotes not included) at the number a and **thick the line to the left side** of a.



- To represent $x > a$ on the number line put a small dark circle (• denotes included) at the number a and **thick the line to the right side** of a.



- 5) The solution of a **pair of linear inequalities** is the **intersection region** which satisfies both the given inequalities.

Tip Top Chit Bits

- a is positive $\Leftrightarrow a > 0$; a is negative $\Leftrightarrow a < 0$; 0 is neither positive nor negative number
- $x < a \Rightarrow x \in (-\infty, a)$; $x > b \Rightarrow x \in (b, \infty)$ • **Atleast (min.):** $\geq$ • **Atmost (max.):** $\leq$

