LINEAR INEQUALITIES

☑ **Inequality :** Two real numbers or two algebraic expressions related by the symbol '<','>','≤' or '≥' from an inequality

☑ **Types of inequalities :**
1. **Numerical inequalities :** $3 < 5$, $7 > 5$
2. **literal inequalities :** $x < 5$, $x \geq 3$
3. **double inequalities :** $2 < y \leq 4$
4. **strict inequalities :** $ax + by < 0$, $ax + by > 0$
5. **slack inequalities :** $ax + by \geq c$
6. **linear inequalities :** $ax + b \leq 0$
7. **quadratic inequalities :** $ax^2 + bx + c \leq 0$

☑ **Solution Set :** The values of x which makes an inequality a true statement are called solutions of inequality and the set of solution is called solution set.

☑ **While solving linear equations, we followed the following rules :**

Rule 1 : Equal numbers may be added (or subtracted from) both sides of an equation.

**Rule 2 :** Both sides of an equation may be multiplied (or divided) by the same non-zero number.

☑ **We state following rules for solving an inequality :**

Rule 1 : Equal numbers may be added to (or subtracted from) both sides of an inequality without affecting the sign of inequality.

Rule 2 : Both sides of an inequality can be multiplied (or divided) by the same positive number. But when both sides are multiplied or divided by a negative number, then the sign of inequality is reversed.

☑ **Graphical Solution of Linear inequalities in Two variables :**

Graph of inequalities will be one of the half plane (called solution region) and represented by shading in the corresponding half plane.
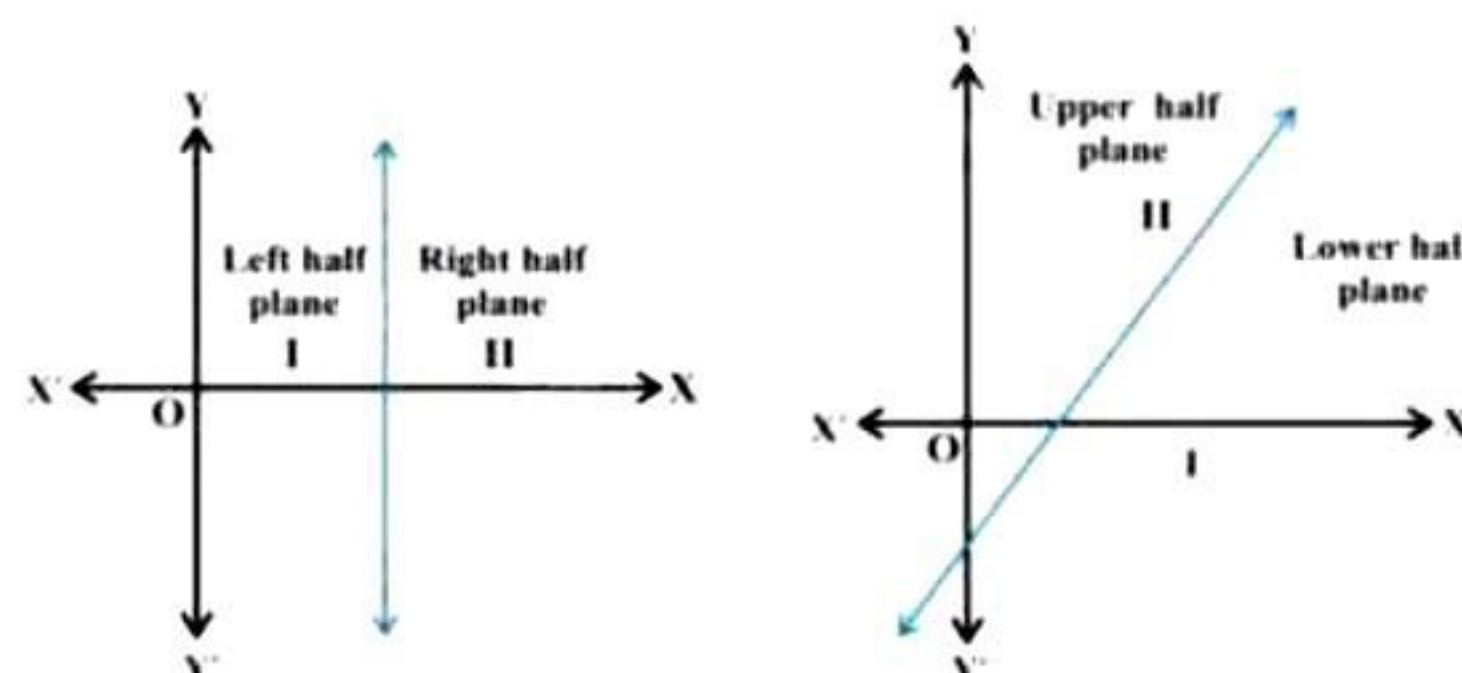
📍 **Note :**
1. The region containing all the solutions of an inequality is called the solution region.
2. In order to identify the half plane represented by an inequality, it is just sufficient to take any point (a,b) (not online) and check whether it satisfies the inequality or not. If it satisfies, then the inequality represents the half plane and shade the region which contains the point, otherwise, the inequality represents that half plane which does not contain the point within it. For convenience the point $(0,0)$ is preferred.
3. If an inequality is of the type $ax + by \geq c$ or $ax + by \leq c$, then the points on the line $ax + by = c$ are also included in the solution region. So draw a dark line in the solution region.
4. If an inequality is of the form $ax + by < c$ or $ax + by < c$, then the points on the line $ax + by = c$ are not to be included in the solution region. So draw a broken or dotted line in the solution region.

📍 **Note :**
1. To represent $x < a$ (or $x > a$) on a number line, put a circle on the number a and dark line to the left (or right) of the number a.
2. To represent $x \leq a$ (or $x \geq a$) on a number line, put a dark circle on the number a and dark line to the left (or right) of the number x.
3. The solution region of a system of inequalities in the region which satisfies all the given inequalities in the system simultaneously.