6. LINEAR INEQUALITIES
SYNOPSIS

Solving Linear Inequalities

- Many simple inequalities can be solved by adding, subtracting, multiplying or dividing both sides until you are left with the variable on its own.
- But these things will change direction of the inequality:
  - Multiplying or dividing both sides by a negative number
  - Swapping left and right hand sides
- Don't multiply or divide by a variable (unless you know it is always positive or always negative)

Negative Values

When we multiply or divide by a negative number we must reverse the inequality.

How to Graph a Linear Inequality

First, graph the "equals" line, then shade in the correct area.

There are three steps:

- Rearrange the equation so as to find "y" for corresponding x
- Draw the line (make it a solid line for ≤ or ≥, and a dashed line for < or >)
- Verify the inequality for the origin
- If inequality satisfies the origin , then shaded the region in which origin belongs to it otherwise shade the other side.

How to Graph 2 or more linear inequalities

- Repeat the same instructions for each inequality one by one
- Find out the common region which satisfies for all given lines or inequalities.

SECTION A(1marks each

VSA

1. Solve $3x + 2 > 8$
2. Solve the inequality $3(4 - y) \geq 9$
3. Solve $5x - 3 < 3x + 1$ when x is an integer.
4. Solve the inequality $3 \leq -6 - 5x < 12$
5. Solve the following inequalities for real x, $3(2 - x) \geq 2(1-x)$

SECTION B (2marks each)

6. Solve $\frac{2x-1}{3} \leq \frac{3x-2}{4} - \frac{2-x}{5}$ for $x \in R$
7. Solve $\frac{x}{4} > \frac{5x-2}{3} - \frac{7x-3}{5}$ and graph the solution set on the number line.
8. A number p is multiplied by 3, and then 10 is added to the result; the final answer is less than 31.Find the value of p.

9. The longest side of a triangle is 3 times the shortest side and the third side is 2cm shorter than the longest side .If the perimeter of the triangle is at least 61cm , find the minimum length of the shortest side.
10. Find al pairs of consecutive odd positive integers, both of which are larger than 10 such that sum is less than 40.
11. Solve the following system of linear inequalities and represent the solution set on the number line.
    i. $2(x+1) \leq x+5$ and $3(x+2) > 2-x$
    ii. $5(2x - 7) - 3(2x +3) \leq 0$ and $2x+19 \leq 6x + 47$
12. Solve $-3 \leq 4 - \frac{7}{2}x \leq 18$

SECTION C (4 marks each)

13. Solve the following system of inequalities $2(2x + 3) - 10 < 6(x - 2)$ and $\frac{2x-3}{4} + 6 \geq 4 + \frac{4x}{3}$
14. Solve the inequality $-3x + 2y \geq -6$ graphically
15. Solve the inequality $2y + x \geq 0$ graphically
16. An electrician can be paid under two schemes as given below:
    Scheme I : Rs 500 and Rs 70 per hour Scheme II : Rs 120 per hour
    If the job takes x hours, for what value of x does the scheme I give the electrician better wages?
17. A solution of 12% boric acid is added with 30% boric acid solution to it.
    The resulting mixture is to be more than 15 % but less than 18 % boric acid. If we have 600 liters of 12% solution, how many liters of 30% solution will be required?

SECTION D (6 marks)

18. How many liters of water will have to be added to 1125 liters of the 45% solution of acid so that the resulting mixture will contain more than 25% but less that 30% acid content?

19. Use a graphical method to solve the system of equations and inequalities:
    $y = -3x + 2$, $y > x - 2$
20. Solve the following system linear inequalities graphically:
    $x-2y \leq 3$, $3x + 4y > 12$, $x \geq 0$, $y \geq 1$

21. Solve the following system linear inequalities graphically:
$2x + y \leq 24$, $x + y < 11$, $2x + 5y \leq 40$, $x > 0$ and $y \geq 0$

SCORING KEY

Question no	**Answer**
1	X >2
2	1≥ y
3	X< 2
4	(0,4]
5	(- infinity , 2)
6	x≤ 2 i2 (- infinity , 2]
7	X<4
8	P<7
9	Ans: x ≥ 9
10	10 <x < 19 pairs are 11,13 or 13,15 or 15,17 or 17,19
11	i. (-1 , 3] ii. [-7,11]
12	[-4,2]
13	X > 4 and x≤ 1.3 therefore no common solution
14	Graph
15	Graph
16	x ≤ 10
17	120 < x < 300 liters.
18	562.5 < x < 900
19	Graph
20	Graph
21	Graph