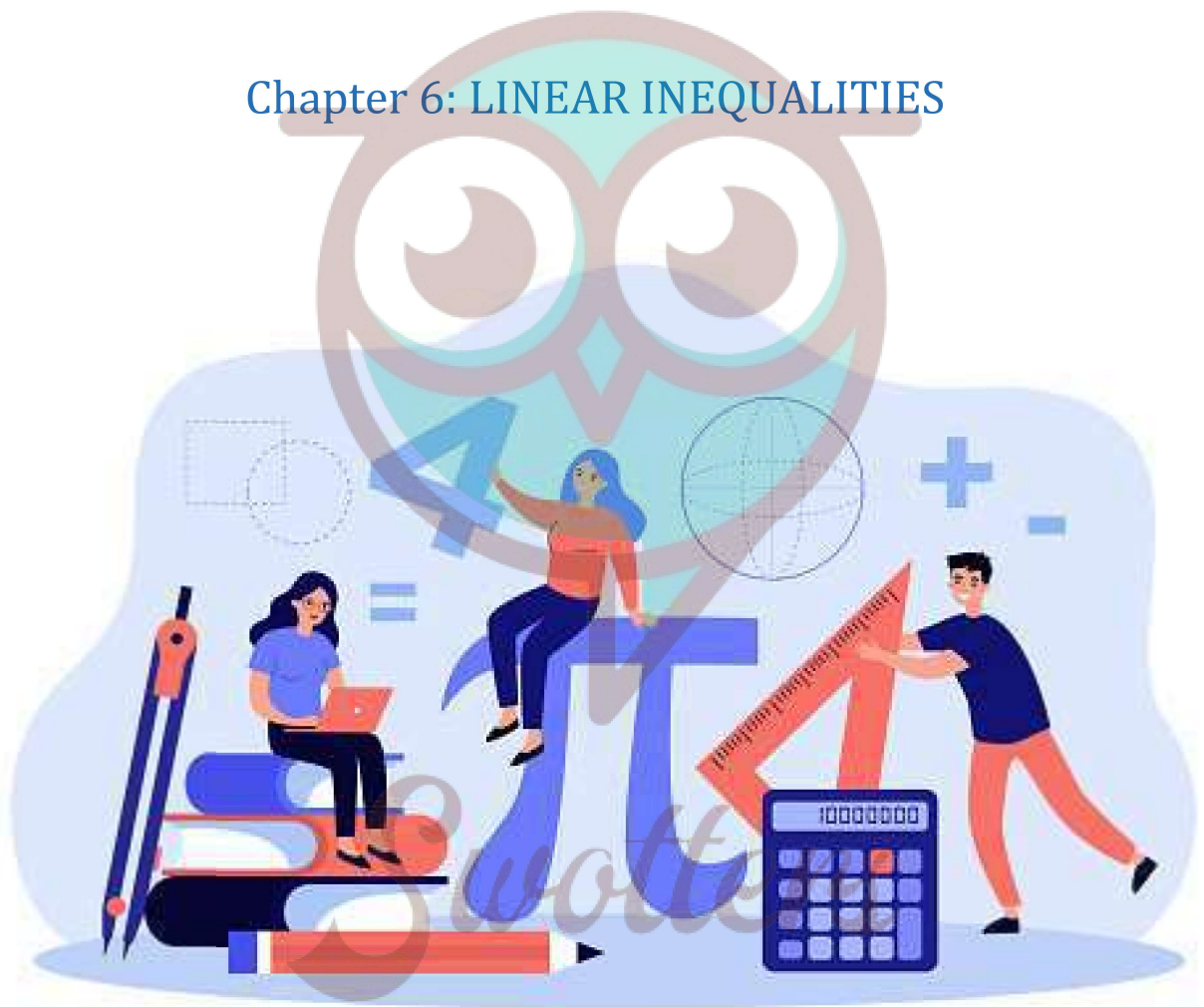


# MATHEMATICS

## Chapter 6: LINEAR INEQUALITIES



## Important Questions

### Multiple Choice questions-

Question 1. If  $-2 < 2x - 1 < 2$  then the value of  $x$  lies in the interval

- (a)  $(1/2, 3/2)$
- (b)  $(-1/2, 3/2)$
- (c)  $(3/2, 1/2)$
- (d)  $(3/2, -1/2)$

Question 2. If  $x^2 < -4$  then the value of  $x$  is

- (a)  $(-2, 2)$
- (b)  $(2, \infty)$
- (c)  $(-2, \infty)$
- (d) No solution

Question 3. If  $|x| < -5$  then the value of  $x$  lies in the interval

- (a)  $(-\infty, -5)$
- (b)  $(\infty, 5)$
- (c)  $(-5, \infty)$
- (d) No Solution

Question 4. The graph of the inequations  $x \leq 0$ ,  $y \leq 0$ , and  $2x + y + 6 \geq 0$  is

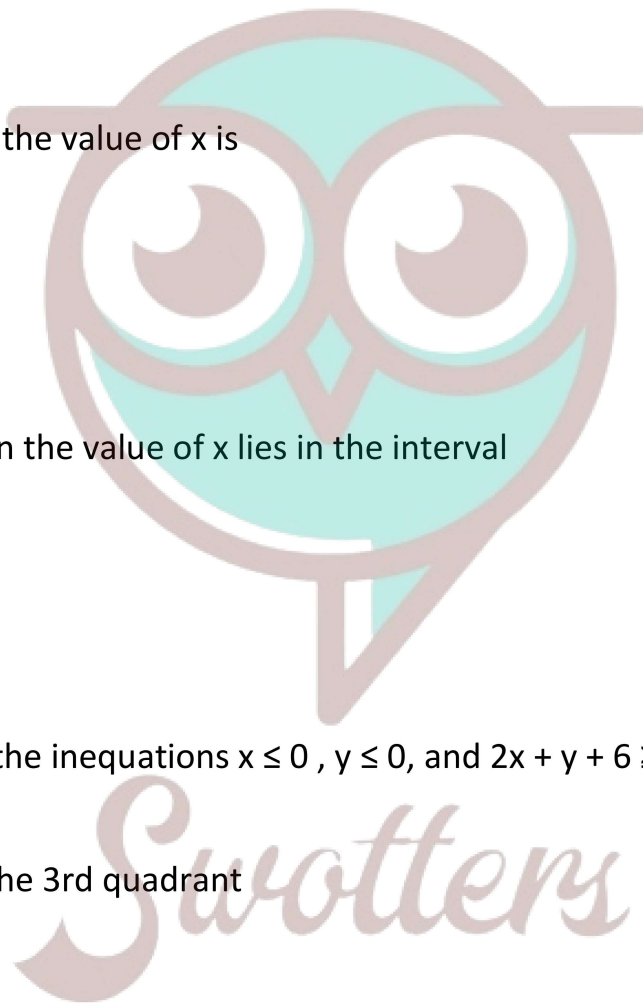
- (a) exterior of a triangle
- (b) a triangular region in the 3rd quadrant
- (c) in the 1st quadrant
- (d) none of these

Question 5. The graph of the inequalities  $x \geq 0$ ,  $y \geq 0$ ,  $2x + y + 6 \leq 0$  is

- (a) a square
- (b) a triangle
- (c)  $\{ \}$
- (d) none of these

Question 6. Solve:  $2x + 1 > 3$

- (a)  $[-1, \infty]$



- (b)  $(1, \infty)$
- (c)  $(\infty, \infty)$
- (d)  $(\infty, 1)$

Question 7. The solution of the inequality  $3(x - 2)/5 \geq 5(2 - x)/3$  is

- (a)  $x \in (2, \infty)$
- (b)  $x \in [-2, \infty)$
- (c)  $x \in [\infty, 2)$
- (d)  $x \in [2, \infty)$

Question 8. Solve:  $1 \leq |x - 1| \leq 3$

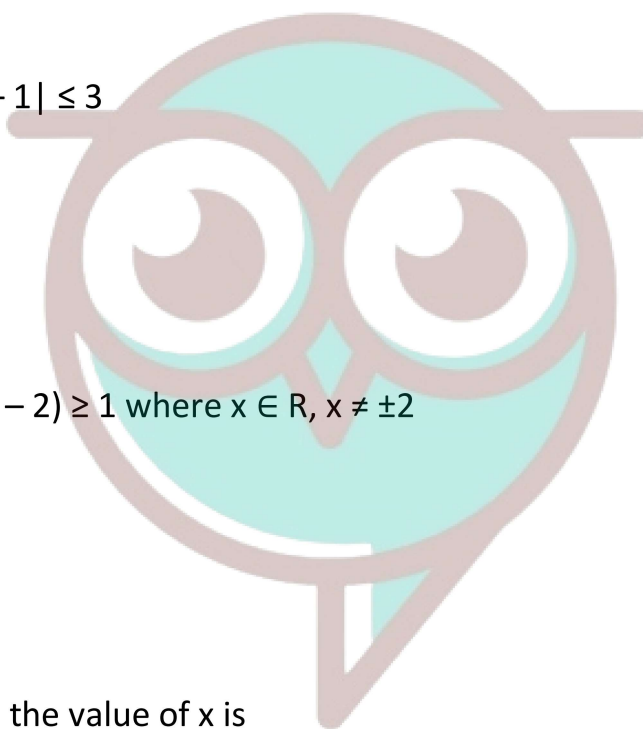
- (a)  $[-2, 0]$
- (b)  $[2, 4]$
- (c)  $[-2, 0] \cup [2, 4]$
- (d) None of these

Question 9. Solve:  $-1/(|x| - 2) \geq 1$  where  $x \in \mathbb{R}, x \neq \pm 2$

- (a)  $(-2, -1)$
- (b)  $(-2, 2)$
- (c)  $(-2, -1) \cup (1, 2)$
- (d) None of these

Question 10. If  $x^2 < 4$  then the value of x is

- (a)  $(0, 2)$
- (b)  $(-2, 2)$
- (c)  $(-2, 0)$
- (d) None of these



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**Very Short:**

1. Solve  $\frac{3x-4}{2} \geq \frac{x+1}{4} - 1$
2. Solve  $3x + 8 > 2$  when x is a real no.
3. Solve the inequality  $\frac{x}{4} < \frac{(5x-2)}{3} \frac{(7x-3)}{5}$
4. If  $4x > -16$  then  $x \square -4$ .
5. Solve the inequality  $\frac{1}{2} \left( \frac{3x}{5} + 4 \right) \geq \frac{1}{3} (x - 6)$

6. Solution set of the in inequations  $2x - 1 \leq 3$  and  $3x + 1 \geq -5$  is.
7. Solve.  $7x + 3 < 5x + 9$ . Show the graph of the solution on number line.
8. Solve the inequality.  $\frac{2x-1}{3} \geq \frac{3x-2}{4} - \frac{2-x}{5}$
9. Solve  $5x - 3 \leq 3x + 1$  when  $x$  is an integer.
10. Solve  $30x < 200$  when  $x$  is a natural no.

### Short Questions:

1. Solve  $3x - 6 \geq 0$  graphically
2. Ravi obtained 70 and 75 mark in first unit test. Find the minimum marks he should get in the th test to have an average of at least 60 marks.
3. Ravi obtained 70 and 75 mark in first unit test. Find the minimum marks he should get in the th test to have an average of at least 60 marks.
4. A company manufactures cassettes and its cost equation for a week is  $C=300+1.5x$  and its revenue equation is  $R = 2x$ , where  $x$  is the no. of cassettes sold in a week. How many cassettes must be sold by the company to get some profit?
5. The longest side of a  $\Delta$  is 3 times the shortest side and the third side is 2 cm shorter than the longest side. If the perimeter of the  $\Delta$  is at least 61 cm find the minimum length of the shortest side.

### Long Questions:

1. IQ of a person is given by the formula  $IQ = \frac{MA}{CA} \times 100$

Where MA is mental age and CA is chronological age. If  $80 \leq IQ \leq 140$  for a group of 12yr old children, fond the range of their mental age.

2. Solve graphically  $4x + 3y \leq 60$   $y \geq 2x$   $x \geq 3$   $x, y \geq 0$
3. A manufacturer has 600 liter of a 12% sol. Of acid. How many liters of a 30% acid sol. Must be added to it so that acid content in the resulting mixture will be more than 15% but less than 18%.
4. Solve graphically  $x - 2y \leq 3$   $3x + 4y \geq 12$   $x \geq 0$   $y \geq 1$
5. A sol. Of 8% boric acid is to be diluted by adding a 2% boric acid sol. to it. The resulting mixture is to be more than 4% but less than 6% boric acid. If we have 640 liters of the 8% sol. how many liter of the 2% sol. will have to be added.

**Answer Key:**

**MCQ:**

1. (b)  $(-1/2, 3/2)$
2. (d) No solution
3. (d) No Solution
4. (b) a triangular region in the 3rd quadrant
5. (c)  $\{ \}$
6. (b)  $(1, \infty)$
7. (d)  $x \in [2, \infty)$
8. (c)  $[-2, 0] \cup [2, 4]$
9. (c)  $(-2, -1) \cup (1, 2)$
10. (b)  $(-2, 2)$

**Very Short Answer:**

1.

$$\frac{3x-4}{2} \geq \frac{x+1}{4} - \frac{1}{1}$$

$$\frac{3x-4}{2} \geq \frac{x+1-4}{4}$$

$$\frac{3x-4}{2} \geq \frac{x-3}{4}$$

$$2(3x-4) \geq (x-3)$$

$$6x-8 \geq x-3$$

$$x \geq 1$$

2.

$$3x+8 > 2$$

$$3x > 2-8$$

$$3x > -6$$

$$x > -2$$

$$(-2, \infty)$$

3.

$$\frac{x}{4} < \frac{5x-2}{3} - \frac{7x-3}{5}$$



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$$\frac{x}{4} < \frac{5(5x-2) - 3(7x-3)}{15}$$

$$\frac{x}{4} < \frac{4x-1}{15}$$

$$15x < 16x - 4$$

$$-x < -4$$

$$x > 4$$

$$(4, \infty)$$

4.  $x > -4$ .

5.

$$\frac{1}{2} \left( \frac{3x}{5} + 4 \right) \geq \frac{1}{3} (x - 6)$$

$$\frac{3x}{10} + 2 \geq \frac{x}{3} - 2$$

$$\frac{3x}{10} - \frac{x}{3} \geq -4$$

$$\frac{9x - 10x}{30} \geq -4$$

$$\frac{-x}{30} \geq -4$$

$$-x \geq -120$$

$$x \leq 120$$

$$(-\infty, 120]$$

6.

$$2x - 1 \leq 3, \quad 3x + 1 \geq -5$$

$$\Rightarrow 2x \leq 4, \quad 3x \geq -6$$

$$\Rightarrow x \leq 2, \quad x \geq -2$$

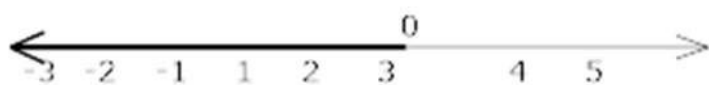
$$\Rightarrow -2 \leq x \leq 2$$

7.

$$7x + 3 < 5x + 9$$

$$2x < 6$$

$$x < 3$$



8.



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$$\frac{2x-1}{3} \geq \frac{5(3x-2)-4(2-x)}{20}$$

$$20(2x-1) \geq 3(19x-18)$$

$$40x-20 \geq 57x-54$$

$$-17x \geq -34$$

$$x \leq 2$$

$$(-\infty, 2]$$

9.

$$5x-3 \leq 3x+1$$

$$5x-3x \leq 4$$

$$2x \leq 4$$

$$x \leq 2$$

$$\{\dots, -3, -2, -1, 0, 1, 2\}$$

10.

$$30x < 200$$

$$x < \frac{200}{30}$$

$$x < \frac{20}{3}$$

Solution set of the inequality  $\{1, 2, 3, 4, 5, 6\}$



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**Short Answer:**

1.

$$3x-6 \geq 0 \dots (i)$$

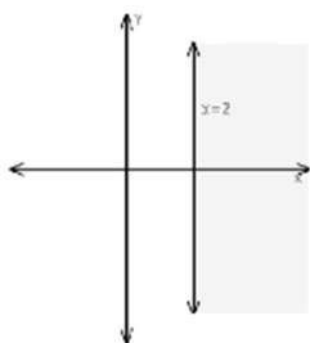
$$3x-6=0$$

$$x=2$$

Put (0,0) in eq. (i)

$$0-6 \geq 0$$

$0 > 6$  false.



**2.**

Let Ravi secure  $x$  marks in third test

$$\text{ATQ } \frac{70 + 75 + x}{3} \geq 60$$

$$x \geq 135$$

**3.**

Let  $x$  and  $x+2$  be consecutive odd natural no.

$$\text{ATQ } x > 10 \dots\dots (i)$$

$$(x) + (x+2) < 40$$

$$x < 19 \dots\dots (ii)$$

From (i) and (ii)

$$(11,13) (13,15), (15,17) (17,19)$$

**4.**

Profit = revenue – cost

$$R > C \quad [\text{for to get some profit}]$$

$$2x > 300 + 1.5x$$

$$\frac{1}{2}x > 300$$

$$x > 600$$

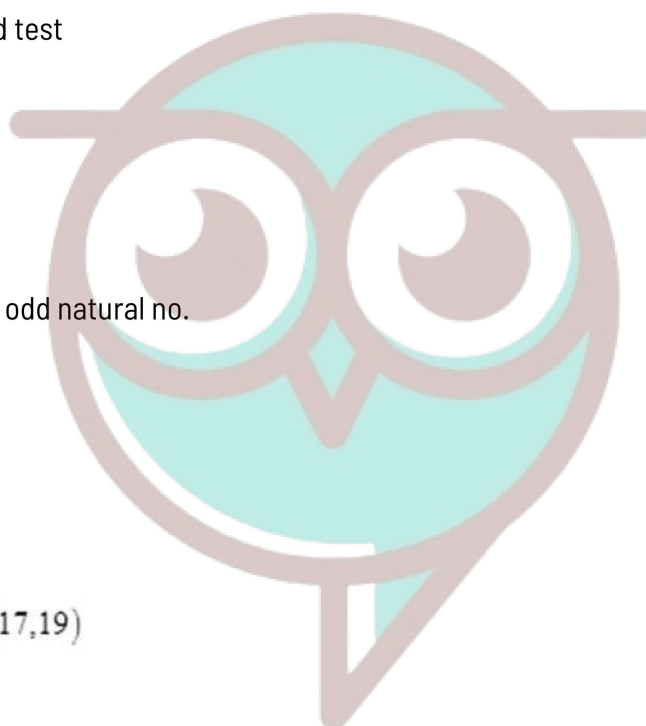
**5.**

Let shortest side be  $x$  cm then the longest side is  $3x$  cm and the third side  $(3x - 2)$  cm.

$$\text{ATQ } (x) + (3x) + (3x - 2) \geq 61$$

$$x \geq 9$$

Length of shortest side is 9 cm.



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**Long Answer:**



1.

$$80 \leq IQ \leq 140 \text{ (Given)}$$

$$80 \leq \frac{MA}{CA} \times 100 \leq 140$$

$$80 \leq \frac{MA}{12} \times 100 \leq 140$$

$$80 \times \frac{12}{100} \leq MA \times \frac{100}{12} \times \frac{12}{100} \leq 140 \times \frac{12}{100}$$

$$\frac{96}{10} \leq MA \leq \frac{168}{10}$$

$$9.6 \leq MA \leq 16.8$$

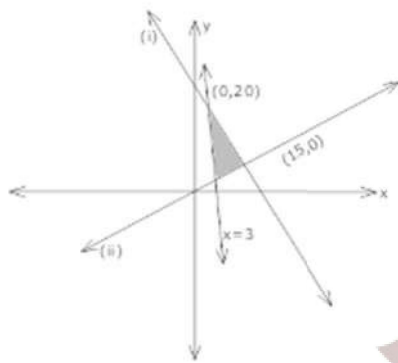
2.  $4x + 3y = 60$

x	0	15
y	20	0

$$y = 2x$$

x	0	20
y	0	40

$$x = 3$$



3.



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Let  $x$  litres of 30% acid sol. Is required to be added.

$$30\%x + 12\% \text{ of } 600 > 15\% \text{ of } (x + 600) \text{ and}$$

$$30\%x + 12\% \text{ of } 600 < 18\% \text{ of } (x + 600)$$

$$\frac{30x}{100} + \frac{12}{100}(600) > \frac{15}{100}(x + 600)$$

$$\frac{30x}{100} + \frac{12}{100}(600) < \frac{18}{100}(x + 600)$$

$$x > 120 \text{ and } x < 300$$

$$\text{i.e. } 120 < x < 300.$$

4.

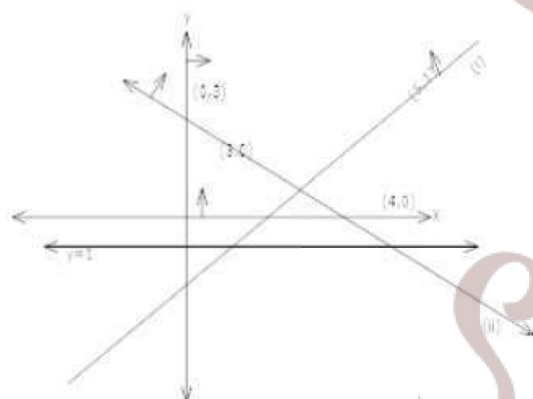
$$x - 2y = 3$$

$x$	<b>3</b>	<b>5</b>
$y$	0	1

$$3x + 4y = 12$$

$x$	<b>0</b>	<b>4</b>
$y$	3	0

$$y = 1$$



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5.

Let  $x$  be added

ATQ 2% of  $x + 8\%$  of 640  $>$  4% of  $(640 + x)$

$$\frac{2x}{100} + \frac{8 \times 640}{100} > \frac{4}{100}(640 + x)$$

$$x < 1280 \dots\dots (i)$$

And 12% of  $x + 8\%$  of 640  $<$  6% of  $(640 + x)$

$$\frac{2x}{100} + \frac{8 \times 640}{100} < \frac{6}{100}(640 + x)$$

$$x > 320 \dots\dots (ii)$$

From (i) and (ii)

$$320 < x < 1280$$



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