

## INEQUALITIES

Form 5

Vol 1

### Part 1 – Linear Inequalities (MC)

1. C      2. A      3. A      4. D      5. B  
6. D      7. B      8. C      9. C

1. C

$$\therefore \begin{cases} 3a \leq 1+a \\ 1+a \leq 6 \end{cases}$$

$$\therefore \begin{cases} a \leq \frac{1}{2} \\ a \leq 5 \end{cases}$$

$$a \leq \frac{1}{2}$$

$$\therefore \begin{cases} a \leq \frac{1}{2} \\ 3a > 1 \end{cases}$$

$$\therefore \frac{1}{3} < a \leq \frac{1}{2}$$

2. A

$$\therefore \begin{cases} \frac{3x+1}{2} \leq 5+2x \\ 1+5x \leq 8x \end{cases}$$

$$\therefore \begin{cases} 3x+1 \leq 10+4x \\ 1 \leq 3x \end{cases}$$

$$\begin{cases} x \geq -9 \\ x \geq \frac{1}{3} \end{cases}$$

Thus,  $x \geq \frac{1}{3}$

3. A

$$\therefore \begin{cases} 4x+3 > 6x+7 \\ 5x+6 < \frac{8x+9}{2} \end{cases}$$

$$\therefore \begin{cases} 2x < -4 \\ 2x < -3 \end{cases}$$

$$\begin{cases} x < -2 \\ x < -\frac{3}{2} \end{cases}$$

Thus,  $x < -2$ .

4. D

$$\therefore \begin{cases} 2 \leq 3x+2 \\ 3x+2 \leq \frac{6x+5}{3} \end{cases}$$

$$\therefore \begin{cases} x \geq 0 \\ x \leq -\frac{1}{3} \end{cases}$$

Thus, no solution.

5. B

$$\therefore \begin{cases} 2x-1 \geq 5 \\ \frac{1-3x}{4} < 2-x \end{cases}$$

$$\therefore \begin{cases} x \geq 3 \\ x < 7 \end{cases}$$

Thus,  $3 \leq x < 7$  and 3, 4, 5 and 6 satisfy the inequality.

6. D

$$\therefore 0^\circ \leq \theta \leq 180^\circ$$

$$\therefore 0 \leq \sin \theta \leq 1$$

$$0 \leq 3 \sin \theta \leq 3$$

$$0 \leq 4x+5 \leq 3$$

$$-5 \leq 4x \leq -2$$

$$-\frac{5}{4} \leq x \leq -\frac{1}{2}$$

7. B

$$\therefore 90^\circ < \theta < 270^\circ$$

$$\therefore -1 \leq \cos \theta < 0$$

$$-2 \leq 2 \cos \theta < 0$$

$$3 \leq 2 \cos \theta + 5 < 5$$

$$3 \leq 2x - 7 < 5$$

$$10 \leq 2x < 12$$

$$5 \leq x < 6$$

8. C

$$6a - 1 < 0 \text{ or } 12a + 5 > 7$$

$$6a < 1 \text{ or } 12a > 2$$

$$a < \frac{1}{6} \text{ or } a > \frac{1}{5}$$

Thus, any real number except  $\frac{1}{6}$ .

9. C

$$2x \leq -\frac{3x+1}{3} \text{ or } 8x+3 \geq 7$$

$$9x \leq -1 \text{ or } 8x \geq 4$$

$$x \leq -\frac{1}{9} \text{ or } x \geq \frac{1}{2}$$

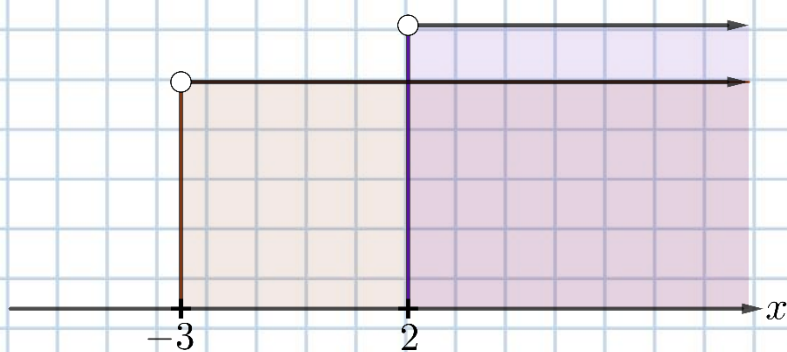
## Part 2 – Short Question and Long Question

5.

$$\therefore \begin{cases} 2-3x < 11 \\ 2x+7 > 11 \end{cases}$$

$$\therefore \begin{cases} x > -3 \\ x > 2 \end{cases}$$

Thus,  $x > 2$ .





6.

$$\therefore \begin{cases} 3x+1 \leq 1-2x \\ 1-2x \leq 6x-13 \end{cases}$$

$$\therefore \begin{cases} x \leq 0 \\ x \geq \frac{7}{4} \end{cases}$$

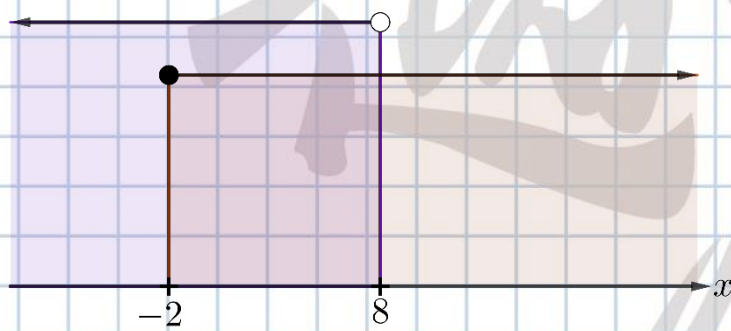
Thus, no real solution.

7.

$$\therefore \begin{cases} 6x+18 \geq 4-x \\ 4-x > 2x-20 \end{cases}$$

$$\therefore \begin{cases} x \geq -2 \\ x < 8 \end{cases}$$

Thus,  $-2 \leq x < 8$



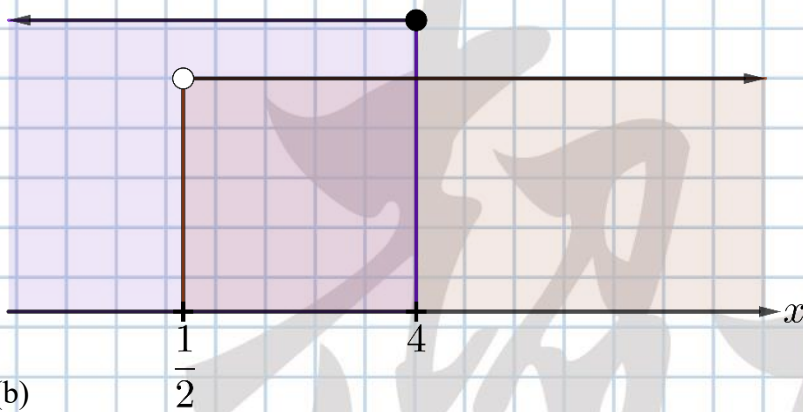
8.

(a)

$$\therefore \begin{cases} 5x \leq 4 + 4x \\ 6x - 4 > 2 - 6x \end{cases}$$

$$\therefore \begin{cases} x \leq 4 \\ x > \frac{1}{2} \end{cases}$$

Thus,  $\frac{1}{2} < x \leq 4$



(b)

The possible values of  $x$  are 1, 2, 3 and 4

11.

$$\therefore 2 - x \leq \frac{3}{7}(x - 2) \text{ or } \frac{3x}{4} \leq 2 - \frac{3x - 5}{2}$$

$$\therefore x \geq 2 \text{ or } x \leq 2$$

Thus, all real solution.

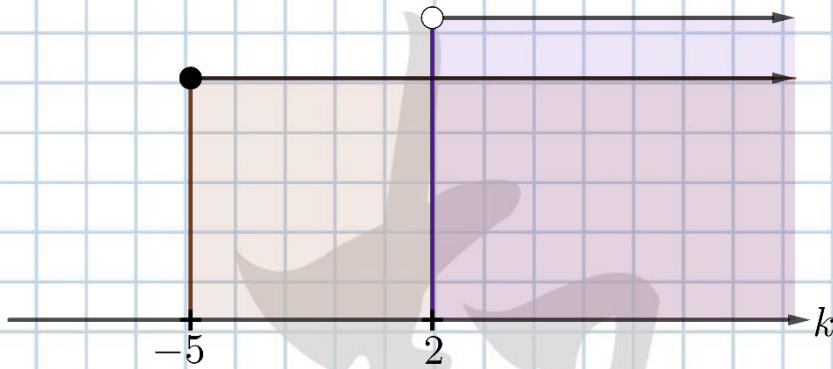
12.

(a)

$$\therefore 10 - 3k < 2(5k - 8) \text{ or } k + 3 \geq \frac{2k}{5}$$

$$\therefore k > 2 \text{ or } k \geq -5$$

Thus,  $k \geq -5$



(b)

The required minimum value of  $k$  which satisfies the compound inequality in (a) is  $-5$ .

13.

(a)

$$\therefore \begin{cases} \frac{3x}{2} - 1 \leq 8 \\ x - 10 < 3x + 6 \end{cases}$$

$$\therefore \begin{cases} x \leq 6 \\ x > -8 \end{cases}$$

Thus,  $-8 < x \leq 6$ .

(b)

From the result of (a),

$$-8 < x \leq 6 \text{ or } \frac{1}{3}(9 - x) < 2(x + 2)$$

$$\therefore -8 < x \leq 6 \text{ or } x > -\frac{3}{7}$$

Thus,  $x > -8$ .



14.

$$\therefore \left\{ 2x+3 < 11 \text{ or } \frac{3x-7}{4} > -1 \right\} \text{ and } x < 10$$

$$\therefore \{x < 4 \text{ or } x > 1\} \text{ and } x < 10$$

Thus,  $x < 10$ .

15.

$$\therefore \left\{ \frac{1}{6}(5x-3) > 2 \text{ or } 1-6x \leq -11 \right\} \text{ or } 3x+2 \leq -7$$

$$\therefore \{x > 3 \text{ or } x \geq 2\} \text{ or } x \leq -3$$

Thus,  $x \leq -3$  or  $x \geq 2$ .

16.

$$\therefore 6(x+2) \leq 2x \text{ and } x < k \text{ are } x \leq -3$$

$$\therefore x \leq -3 \text{ and } x < k \text{ are } x \leq -3$$

Thus,  $k > -3$ .