

CBSE Class-11 Mathematics
NCERT Solutions
Chapter - 6 Linear Inequalities
Miscellaneous Exercise

Solve the inequalities:

1. $2 \leq 3x - 4 \leq 5$

Ans. Given: $2 \leq 3x - 4 \leq 5$

$$\Rightarrow 2 + 4 \leq 3x \leq 5 + 4$$

$$\Rightarrow 6 \leq 3x \leq 9$$

$$\Rightarrow 2 \leq x \leq 3$$

Solution : [2,3]

2. $6 \leq -3(2x - 4) < 12$

Ans. Given: $6 \leq -3(2x - 4) < 12$

$$\Rightarrow \frac{6}{-3} \leq (2x - 4) < \frac{12}{-3}$$

$$\Rightarrow -2 \geq (2x - 4) > -4$$

$$\Rightarrow 2 \geq 2x > 0$$

$$\Rightarrow 1 \geq x > 0$$

Solution: (0,1]

3. $-3 \leq 4 - \frac{7x}{2} \leq 18$

Ans. Given: $-3 \leq 4 - \frac{7x}{2} \leq 18$

$$\Rightarrow -7 \leq -\frac{7x}{2} \leq 14$$

$$\Rightarrow -14 \leq -7x \leq 28$$

$$\Rightarrow 2 \geq x \geq -4$$

$$\Rightarrow -4 \leq x \leq 2$$

Solution: $[-4, 2]$

4. $-15 < \frac{3(x-2)}{5} \leq 0$

Ans. Given: $-15 < \frac{3(x-2)}{5} \leq 0$

$$\Rightarrow -75 < 3(x-2) \leq 0$$

$$\Rightarrow -25 < (x-2) \leq 0$$

$$\Rightarrow -23 < x \leq 2$$

Solution : $(-23, 2]$

5. $-12 < 4 - \frac{3x}{-5} \leq 2$

Ans. Given: $-12 < 4 - \frac{3x}{-5} \leq 2$

$$\Rightarrow -16 < \frac{-3x}{-5} \leq -2$$

$$\Rightarrow -16 < \frac{3x}{5} \leq -2$$

$$\Rightarrow -80 < 3x \leq -10$$

$$\Rightarrow \frac{-80}{3} < x \leq \frac{-10}{3}$$

Solution : $(-\frac{80}{3}, -\frac{10}{3}]$

6. $7 \leq \frac{(3x+11)}{2} \leq 11$

Ans. Given: $7 \leq \frac{(3x+11)}{2} \leq 11$

$$\Rightarrow 14 \leq 3x+11 \leq 22$$

$$\Rightarrow 3 \leq 3x \leq 11$$

$$\Rightarrow 1 \leq x \leq \frac{11}{3}$$

Solution : $[1, \frac{11}{3}]$

Solve the inequalities in Exercises 7 to 10 and represent the solution graphically on number line:

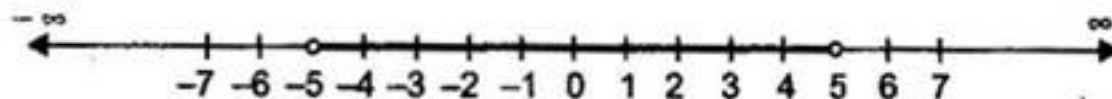
7. $5x+1 > -24, 5x-1 < 24$

Ans. Given: $5x+1 > -24$ and $5x-1 < 24$

$$\Rightarrow 5x > -25 \text{ and } 5x < 25$$

$$\Rightarrow x > -5 \text{ and } x < 5$$

$x = (-5, 5)$



8. $2(x-1) < x+5, 3(x+2) > 2-x$

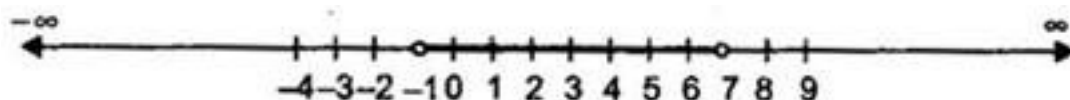
Ans. Given: $2(x-1) < x+5$ and $3(x+2) > 2-x$

$$\Rightarrow 2x-2 < x+5 \text{ and } 3x+6 > 2-x$$

$$\Rightarrow 2x-x < 5+2 \text{ and } 3x+x > 2-6$$

$$\Rightarrow x < 7 \text{ and } x > -1$$

$x = (-1, 7)$



9. $3x-7 > 2(x-6), 6-x > 11-2x$

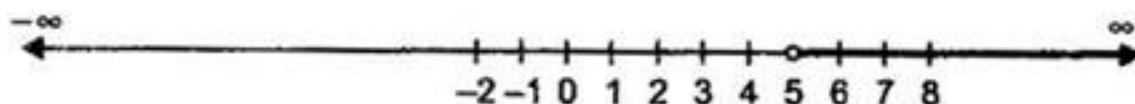
Ans. Given: $3x-7 > 2(x-6)$ and $6-x > 11-2x$

$$\Rightarrow 3x-7 > 2x-12 \text{ and } -x+2x > 11-6$$

$$\Rightarrow 3x-2x > -12+7 \text{ and } x > 5$$

$$\Rightarrow x > -5 \text{ and } x > 5$$

$x = (5, \infty)$



10. $5(2x-7)-3(2x+3) \leq 0, 2x+19 \leq 6x+47$

Ans. Given: $5(2x-7)-3(2x+3) \leq 0$ and $2x+19 \leq 6x+47$

$$\Rightarrow 10x - 35 - 6x - 9 \leq 0 \text{ and } 2x - 6x \leq 47 - 19$$

$$\Rightarrow 10x - 6x \leq 35 + 9 \text{ and } -4x \geq 28$$

$$\Rightarrow 4x \leq 44 \text{ and } x \geq -7$$

$$\Rightarrow x \leq 11 \text{ and } x \geq -7$$

$$x = [-7, 11]$$



11. A solution is to be kept between 68°F and 77°F . What is the range of temperature in degree Celsius (C) if the Celsius / Fahrenheit (F) conversion formula is given by

$$F = \frac{9}{5}C + 32?$$

Ans. Given: $68^\circ\text{F} < F < 77^\circ\text{F}$.

$$\therefore F = \frac{9}{5}C + 32$$

$$\Rightarrow 68^\circ < \frac{9}{5}C + 32 < 77^\circ$$

$$\Rightarrow 36^\circ < \frac{9}{5}C < 45^\circ$$

$$\Rightarrow 180^\circ < 9C < 225^\circ$$

$$\Rightarrow 20^\circ < C < 25^\circ$$

Therefore, the range of temperature between 20°C and 25°C .

12. A solution of 8% boric acid is to be diluted by adding a 2% boric acid solution 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% solution, have many liters of the 2% solution will have to be added?

Ans. Let x litre of 2% boric acid solution be added to 640 litres of 8% boric acid solution. Then,

Total quantity of mixture = $(640 + x)$ litres

And Total boric acid in $(640 + x)$ litres of mixture = $\frac{2x}{100} + \frac{8}{100} \times 640 = \frac{x}{50} + \frac{256}{5}$

According to question,

$$\frac{4}{100}(640 + x) < \frac{x}{50} + \frac{256}{5} < \frac{6}{100}(640 + x)$$

$$\Rightarrow \frac{640 + x}{25} < \frac{x + 2560}{50} < \frac{1920 + 3x}{50}$$

$$\Rightarrow 1280 + 2x < x + 2560 < 1920 + 3x$$

$$\Rightarrow 1280 + 2x < x + 2560 \text{ and } x + 2560 < 1920 + 3x$$

$$\Rightarrow x < 1280 \text{ and } x > 320$$

$$\Rightarrow 320 < x < 1280$$

Therefore 2% boric acid solution must be more than 320 liters but less than 1280 liters.

13. 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 than 30% acid content?

Ans. Let x liters of water to be added to 1125 liters of 45% acid solution.

Then Total quantity of mixture = $(1125 + x)$ liters

According to question,

$$\frac{45}{100} \times 1125 + 0 \times \frac{x}{100} > \frac{25}{100} \times (1125 + x) \text{ and } \frac{45}{100} \times 1125 + 0 \times \frac{x}{100} < \frac{30}{100} \times (1125 + x)$$

$$\Rightarrow \frac{25}{100} \times 100 \leq \frac{2025 \times 100}{(1125 + x)} \leq \frac{30}{100} \times 100$$

$$\Rightarrow 25 \leq \frac{50625}{(1125 + x)} \leq 30$$

$$\Rightarrow 25 \leq \frac{50625}{(1125 + x)} \text{ and } \frac{50625}{1125 + x} \leq 30$$

$$\Rightarrow 28125 + 25x \leq 50625 \text{ and } 50625 \leq 33750 + 30x$$

$$\Rightarrow 25x \leq 22500 \text{ and } 30x \geq 1687.5$$

$$\Rightarrow x \leq 900 \text{ and } x \geq 562.5$$

$$\Rightarrow 562.5 \leq x \leq 900$$

Therefore, minimum 562.5 liters and maximum 900 liters of water need to be added.

14. 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 12 years old children, find the range of their mental age.

Ans. Given: $80 \leq IQ \leq 140$ and $CA = 12$

$$\therefore IQ = \frac{MA}{CA} \times 100$$

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

$$\Rightarrow 960 \leq MA \times 100 \leq 1680$$

$$\Rightarrow 9.60 \leq MA \leq 16.80$$

Therefore, minimum MA is 9.6 and maximum 16.8.