

Mathematics

(www.tiwariacademy.com)

(Chapter - 6) (Linear Inequalities)

(Class 11)

Miscellaneous Exercise 6

Question 1:

Solve the following inequality: $2 \leq 3x - 4 \leq 5$.

Answer 1:

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

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

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

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

Therefore, all the real numbers, x , which are greater than or equal to 2 but less than or equal to 3, are the solutions of the given inequality. The solution set for the given inequality is $[2, 3]$.

Question 2:

Solve the following inequality: $6 \leq -3(2x - 4) < 12$.

Answer 2:

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

$$\Rightarrow 2 \leq -(2x - 4) < 4$$

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

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

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

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

Hence, the solution set for the given inequality is $(0, 1]$.

Question 3:

Solve the following inequality: $-3 \leq 4 - \frac{7x}{2} \leq 18$.

Answer 3:

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

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

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

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

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

Hence, the solution set for the given inequality is $[-4, 2]$.

Question 4:

Solve the following inequality: $-15 < \frac{3(x-2)}{5} \leq 0$.

Answer 4:

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

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

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

$$\Rightarrow -25 + 2 < x \leq 2$$

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

Hence, the solution set for the given inequality is $(-23, 2]$.

Question 5:

Solve the following inequality: $-12 < 4 - \frac{3x}{-5} \leq 2$.

Answer 5:

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

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

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

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

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

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

Hence, the solution set for the given inequality is $\left(-\frac{80}{3}, -\frac{10}{3}\right]$.

www.tiwariacademy.com

A Free web support in education

Mathematics

(www.tiwariacademy.com)
(Chapter - 6) (Linear Inequalities)
(Class 11)

Question 6:

Solve the following inequality: $7 \leq \frac{(3x+11)}{2} \leq 11$.

Answer 6:

$$\begin{aligned} 7 \leq \frac{(3x+11)}{2} \leq 11 \\ \Rightarrow 7 \leq \frac{(3x+11)}{2} \leq 11 & \Rightarrow 14 \leq (3x + 11) \leq 22 & \Rightarrow 14 - 11 \leq 3x \leq 22 - 11 \\ \Rightarrow 3 \leq 3x \leq 11 & \Rightarrow 1 \leq x \leq \frac{11}{3} \end{aligned}$$

Hence, the solution set for the given inequality is $\left[1, \frac{11}{3}\right]$.

Question 7:

Solve the following inequalities and represent the solution graphically on number line.

$$5x + 1 > -24, \quad 5x - 1 < 24$$

Answer 7:

$$\begin{aligned} 5x + 1 > -24 & \Rightarrow 5x > -25 & \Rightarrow x > -5 & \dots (1) \\ 5x - 1 < 24 & \Rightarrow 5x < 25 & \Rightarrow x < 5 & \dots (2) \end{aligned}$$

From (1) and (2), it can be concluded that the solution set for the given system of inequalities is $(-5, 5)$. The solution of the given system of inequalities can be represented on number line as



Question 8:

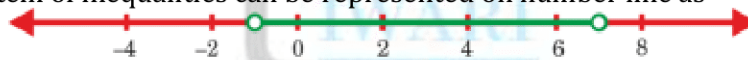
Solve the following inequalities and represent the solution graphically on number line.

$$2(x - 1) < x + 5, \quad 3(x + 2) > 2 - x$$

Answer 8:

$$\begin{aligned} 2(x - 1) < x + 5 & \Rightarrow 2x - 2 < x + 5 & \Rightarrow 2x - x < 5 + 2 & \Rightarrow x < 7 & \dots (1) \\ 3(x + 2) > 2 - x & \Rightarrow 3x + 6 > 2 - x & \Rightarrow 3x + x > 2 - 6 & \Rightarrow 4x > -4 & \Rightarrow x > -1 & \dots (2) \end{aligned}$$

From (1) and (2), it can be concluded that the solution set for the given system of inequalities is $(-1, 7)$. The solution of the given system of inequalities can be represented on number line as



Question 9:

Solve the following inequalities and represent the solution graphically on number line.

$$3x - 7 > 2(x - 6), \quad 6 - x > 11 - 2x$$

Answer 9:

$$\begin{aligned} 3x - 7 > 2(x - 6) & \Rightarrow 3x - 7 > 2x - 12 & \Rightarrow 3x - 2x > -12 + 7 & \Rightarrow x > -5 & \dots (1) \\ 6 - x > 11 - 2x & \Rightarrow -x + 2x > 11 - 6 & \Rightarrow x > 5 & \dots (2) \end{aligned}$$

From (1) and (2), it can be concluded that the solution set for the given system of inequalities is $(5, \infty)$. The solution of the given system of inequalities can be represented on number line as



Question 10:

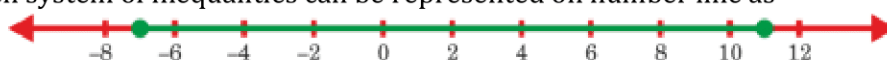
Solve the following inequalities and represent the solution graphically on number line.

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

Answer 10:

$$\begin{aligned} 5(2x - 7) - 3(2x + 3) \leq 0 & \Rightarrow 10x - 35 - 6x - 9 \leq 0 & \Rightarrow 4x - 44 \leq 0 & \Rightarrow 4x \leq 44 & \Rightarrow x \leq 11 & \dots (1) \\ 2x + 19 \leq 6x + 47 & \Rightarrow 19 - 47 \leq 6x - 2x & \Rightarrow -28 \leq 4x & \Rightarrow -7 \leq x & \dots (2) \end{aligned}$$

From (1) and (2), it can be concluded that the solution set for the given system of inequalities is $[-7, 11]$. The solution of the given system of inequalities can be represented on number line as



Mathematics

(www.tiwariacademy.com)

(Chapter - 6) (Linear Inequalities)

(Class 11)

Question 11:

A solution is to be kept between 68° F and 77° F. What is the range in temperature in degree Celsius (C) if the Celsius / Fahrenheit (F) conversion formula is given by $F = \frac{9}{5}C + 32$?

Answer 11:

Since the solution is to be kept between 68°F and 77°F $\Rightarrow 68 < F < 77$

Putting the value of F, we have

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

$$\Rightarrow 68 - 32 < \frac{9}{5}C < 77 - 32$$

$$\Rightarrow 36 \times 5 < 9C < 45 \times 5$$

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

$$\Rightarrow 20 < C < 25$$

Hence, the required range of temperature in degree Celsius is between 20°C and 25°C.

Question 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 litres of the 8% solution, how many litres of the 2% solution will have to be added?

Answer 12:

Let x litres of 2% boric acid solution is required to be added. Then, the total mixture = (x + 640) litres

This resulting mixture is to be more than 4% boric acid.

$$\therefore 2\% x + 8\% \text{ of } 640 > 4\% \text{ of } (x + 640)$$

$$\Rightarrow 2\%x + 8\% \text{ of } 640 > 4\% \text{ of } (x + 640)$$

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

$$\Rightarrow 2x + 5120 > 4x + 2560$$

$$\Rightarrow 5120 - 2560 > 4x - 2x$$

$$\Rightarrow 5120 - 2560 > 2x$$

$$\Rightarrow 2560 > 2x$$

$$\Rightarrow 1280 > x \quad \dots (1)$$

This resulting mixture is to be less than 6% boric acid.

$$\therefore 2\% x + 8\% \text{ of } 640 < 6\% \text{ of } (x + 640)$$

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

$$\Rightarrow 2x + 5120 < 6x + 3840$$

$$\Rightarrow 5120 - 3840 < 6x - 2x$$

$$\Rightarrow 1280 < 4x$$

$$\Rightarrow 320 < x$$

$$\therefore 320 < x < 1280 \quad \dots (2)$$

Hence, from (1) and (2), the number of litres of 2% of boric acid solution that is to be added will have to be more than 320 litres but less than 1280 litres.

Mathematics

(www.tiwariacademy.com)

(Chapter - 6) (Linear Inequalities)

(Class 11)

Question 13:

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

Answer 13:

Let x litres of water is required to be added. Then, the total mixture = $(x + 1125)$ litres

It is evident that the amount of acid contained in the resulting mixture is 45% of 1125 litres.

This resulting mixture will contain more than 25% but less than 30% acid content.

$\therefore 25\%$ of $(1125 + x) < 45\%$ of $1125 < 30\%$ of $(1125 + x)$

$$\Rightarrow \frac{25}{100}(1125 + x) < \frac{45}{100} \times 1125 < \frac{30}{100}(1125 + x)$$

$$\Rightarrow 25(1125 + x) < 45 \times 1125 < 30(1125 + x)$$

$$\Rightarrow 5(1125 + x) < 9 \times 1125 < 6(1125 + x)$$

$$\Rightarrow 5625 + 5x < 10125 < 6750 + 6x$$

$$\Rightarrow 5x < 10125 - 5625 < 6750 - 5625 + 6x$$

$$\Rightarrow 5x < 4500 < 1125 + 6x$$

$$\Rightarrow 5x < 4500 \text{ and } 4500 < 1125 + 6x$$

$$\Rightarrow x < 900 \text{ and } 3375 < 6x$$

$$\Rightarrow x < 900 \text{ and } 562.5 < x$$

Thus, the required number of litres of water that is to be added will have to be more than 562.5 but less than 900.

Question 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.

Answer 14:

It is given that for a group of 12 years old children,

$$80 \leq IQ \leq 140 \quad \dots (i)$$

For a group of 12 years old children, CA = 12 years

$$IQ = \frac{MA}{12} \times 100$$

Putting this value of IQ in (i), we obtain

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

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

$$\Rightarrow \frac{960}{100} \leq MA \leq \frac{1680}{100}$$

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

Thus, the range of mental age of the group of 12 years old children is $9.60 \leq MA \leq 16.80$.