

**NCERT Miscellaneous Solution****Question 1:**

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

Answer

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

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

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

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

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

Answer

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

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

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

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

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

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

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

**Question 3:**

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

Answer

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

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

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

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

$$\Rightarrow 1 \geq \frac{x}{2} \geq -2$$

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

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

**Question 4:**

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

Answer

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

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

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

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

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

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

**Question 5:**

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

Answer

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

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

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

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

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

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

**Question 6:**

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

Answer

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

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

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

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

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

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

**Question 7:**

Solve the inequalities and represent the solution graphically on number line:  $5x + 1 > -24$ ,  $5x - 1 < 24$

Answer

$$5x + 1 > -24$$

$$\Rightarrow 5x > -25$$

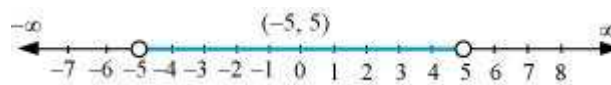
$$\Rightarrow x > -5 \dots (1)$$

$$5x - 1 < 24$$

$$\Rightarrow 5x < 25$$

$$\Rightarrow x < 5 \dots (2)$$

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 inequalities and represent the solution graphically on number line:  $2(x - 1) < x + 5$ ,  $3(x + 2) > 2 - x$

Answer

$$2(x - 1) < x + 5$$

$$\Rightarrow 2x - 2 < x + 5$$

$$\Rightarrow 2x - x < 5 + 2$$

$$\Rightarrow x < 7 \dots (1)$$

$$3(x + 2) > 2 - x$$

$$\Rightarrow 3x + 6 > 2 - x$$

$$\Rightarrow 3x + x > 2 - 6$$

$$\Rightarrow 4x > -4$$

$$\Rightarrow x > -1 \dots (2)$$

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:

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

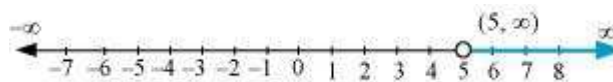
Answer:

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

$$\Rightarrow x > -5 \dots (1)$$

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

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:

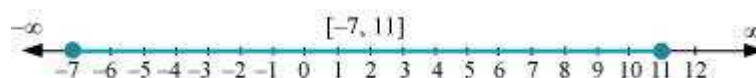
Solve the inequalities and represent the solution graphically on number line:  $5(2x - 7) - 3(2x + 3) \leq 0$ ,  $2x + 19 \leq 6x + 47$

Answer

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

$$\begin{aligned}
 2x + 19 &\leq 6x + 47 \\
 \Rightarrow 19 - 47 &\leq 6x - 2x \\
 \Rightarrow -28 &\leq 4x \\
 \Rightarrow -7 &\leq x \dots (2)
 \end{aligned}$$

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



**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

Since the solution is to be kept between 68°F and 77°F,

$$68 < F < 77$$

Putting  $F = \frac{9}{5}C + 32$ , we obtain

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

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

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

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

$$\Rightarrow 20 < C < 25$$

Thus, 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

Let  $x$  litres of 2% boric acid solution is required to be added.

Then, total mixture =  $(x + 640)$  litres

This resulting mixture is to be more than 4% but less than 6% boric acid.

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

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

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

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

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

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

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

$$\Rightarrow 2560 > 2x$$

$$\Rightarrow 1280 > x$$

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

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

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

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

$$\Rightarrow 1280 < 4x$$

$$\Rightarrow 320 < x$$

$$\therefore 320 < x < 1280$$

Thus, 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.

### 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

Let  $x$  litres of water is required to be added.

Then, 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.

$$\therefore 30\% \text{ of } (1125 + x) > 45\% \text{ of } 1125$$

$$\text{And, } 25\% \text{ of } (1125 + x) < 45\% \text{ of } 1125$$

$$30\% \text{ of } (1125 + x) > 45\% \text{ of } 1125$$

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

$$\Rightarrow 30(1125+x) > 45 \times 1125$$

$$\Rightarrow 30 \times 1125 + 30x > 45 \times 1125$$

$$\Rightarrow 30x > 45 \times 1125 - 30 \times 1125$$

$$\Rightarrow 30x > (45-30) \times 1125$$

$$\Rightarrow x > \frac{15 \times 1125}{30} = 562.5$$

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

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

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

$$\Rightarrow 25 \times 1125 + 25x < 45 \times 1125$$

$$\Rightarrow 25x < 45 \times 1125 - 25 \times 1125$$

$$\Rightarrow 25x < (45-25) \times 1125$$

$$\Rightarrow x < \frac{20 \times 1125}{25} = 900$$

$\therefore 562.5 < x < 900$

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

It is given that for a group of 12 years old children,  $80 \leq IQ \leq 140$  ... (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



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

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

$$\Rightarrow 9.6 \leq MA \leq 16.8$$

Thus, the range of mental age of the group of 12 years old children is  $9.6 \leq MA \leq 16.8$ .