NCERT Solutions for Class-XI Maths

Chapter-6 Exercise-Miscellaneous

NCERT Math Class 11

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

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

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

$\Rightarrow 6 \le 3x \le 9$

$\Rightarrow 2 \le x \le 3$

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].

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

2. Given inequality $6 \le -3(2x - 4) < 12$

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

Dividing the inequality by 3 we get.

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

Multiplying the inequality by -1.

$\Rightarrow -2 \ge 2x - 4 > -4$ [multiplying the inequality with -1 changes the inequality sign.]

$\Rightarrow -2 + 4 \ge 2x - 4 + 4 > -4 + 4$

$\Rightarrow 2 \ge 2x > 0$

Dividing the inequality by 2

$\Rightarrow 0 < x \le 1$

$\therefore$ all real numbers x greater than 0 but less than or equal to 1 are solution of given equality.

$x \in (0, 1]$

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

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

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

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

$\Rightarrow -2 \le -x \le 4$

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

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

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

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

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

Multiplying the inequality by 5.

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

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

Dividing the inequality by 3 we get

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

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

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

$\Rightarrow -23 < x \leq 2$

$\therefore$ all real numbers x greater than -23 but less than or equal to 2 are solution of given equality.

$x \in (-23, 2]$

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

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 $\left(-\frac{80}{3}, -\frac{10}{3}\right]$.

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

6. Given inequality $7 \le \frac{(3x+11)}{2} \le 11$

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

Multiplying the inequality by 2.

$\Rightarrow 7 \times 2 \le \frac{(3x+11)}{2} \times 2 \le 11 \times 2$

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

$\Rightarrow 14 - 11 \le 3x + 11 - 11 \le 22 - 11$

$\Rightarrow 3 \le 3x \le 11$

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

∴ all real numbers x greater than or equal to -4 but less than or equal to 2 are solution of given equality.

x ϵ [1, 11/3]

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

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

7. $5x+1>-24 \Rightarrow 5x>-25 \Rightarrow x>-5$ ….(1)

$5x-1<24 \Rightarrow 5x<25 \Rightarrow x<5$ ……(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

8. Solve the inequality 2 (x – 1) < x + 5, 3 (x + 2) > 2 – x and represent the solution graphically on number line.

8. Given inequalities 2 (x – 1) < x + 5 and 3 (x + 2) > 2 – x

2 (x – 1) < x + 5

⇒ 2x – 2 < x + 5

⇒ 2x – x < 5 + 2

⇒ x < 7 ……(I)

3 (x + 2) > 2 – x

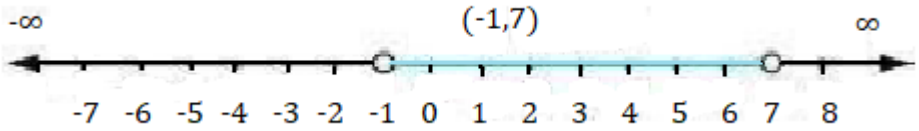
⇒ 3x + 6 > 2 – x

⇒ 3x + x > 2 – 6

⇒ 4x > -4

⇒ x > -1 ……(II)

From (I) and (II) we conclude that solution of given inequalities is (-1, 7).



9. Solve the following inequalities and represent the solution graphically on number line.
$3x-7>2(x-6), 6-x>11-2x$

9.

$3x-7>2(x-6) \Rightarrow 3x-7>2x-12 \Rightarrow 3x-2x>-12+7 \Rightarrow x>-5$ …(1)

$6-x>11-2x \Rightarrow -x+2x>11-6 \Rightarrow x>5$ …(2)

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

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

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

$5(2x-7)-3(2x+3)\leq 0$

$\Rightarrow 10x-35-6x-9\leq 0$

$\Rightarrow 4x-44\leq 0$

$\Rightarrow 4x\leq 44$

$\Rightarrow x\leq 11$ ……(I)

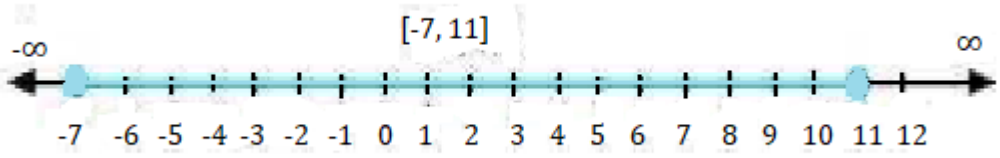
$2x+19\leq 6x+47$

$\Rightarrow 6x-2x\geq 19-47$

$\Rightarrow 4x\geq -28$

$\Rightarrow x\geq -7$ ……(II)

From (I) and (II) we conclude that solution of given inequalities is [-7, 11].



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

11. Since the solution is to be kept between $68^\circ F$ and $77^\circ F$ $\Rightarrow 68 < F < 77$

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 $20^\circ C$ and $25^\circ C$.

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

12. 8% of solution of boric acid = 640 litres

Let x litres of 2% boric acid solution is added

Total mixture = x + 640 litres

The resulting mixture has to be more than 4% but less than 6% boric acid.

∴ 2% of x + 8% of 640 > 4% of (x + 640) and

2% of x + 8% of 640 < 6% of (x + 640)

2% of x + 8% of 640 > 4% of (x + 640)

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

⇒ 2x + 5120 > 4x + 2560

⇒ 5120 – 2560 > 4x – 2x

⇒ 2560 > 2x

⇒ x < 1280 …….(I)

2% of x + 8% of 640 < 6% of (x + 640)

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

⇒ 2x + 5120 < 6x + 3840

⇒ 6x – 2x > 5120 – 3840

⇒ 4x > 1280

⇒ x > 320 …….(II)

From (I) and (II)

320 < x < 1280

⇒ the number of litres of 2% of boric acid solution that has to be added will be more than 320 litres but less than 1280 litres.

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?

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.

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

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

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

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

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

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

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

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

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

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

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.

14. IQ of a person is given by the formula

$\text{IQ} = \frac{\text{MA}}{\text{CA}}\times 100,$,

Where MA is mental age and CA is chronological age. If $80 \le \text{IQ} \le 140$ for a group of 12 years old children, find the range of their mental age.

14. Chronical age = CA = 12 years

IQ for age group of 12 is $80 \le \text{IQ} \le 140$.

Let MA denote Mental Age

$80 \le \text{IQ} \le 140$

Putting $\text{IQ} = \frac{\text{MA}}{\text{CA}}\times 100$

$\Rightarrow 80 \le \frac{\text{MA}}{\text{CA}}\times 100 \le 140$

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

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

$\Rightarrow 9.6 \leq MA \leq 16.8$

$\therefore$ Range of mental age of the group of 12 years old children is

$9.6 \leq MA \leq 16.8$