NCERT solutions for class 11 maths chapter 6 linear inequalities

Question:1(i) Solve $24x < 100$, when

x *i* s a natural number.

Answer:

Given : $24x < 100$

$\Rightarrow 24x < 100$

Divide by 24 from both sides

$$\Rightarrow \quad \frac{24}{24}x < \frac{100}{24}$$

$$\Rightarrow \quad x < \frac{25}{6}$$

$$\Rightarrow \quad x < 4.167$$

x *i* s a natural number which is less than 4.167.

Hence, values of x can be $\{1, 2, 3, 4\}$

Question:1(ii) Solve $24x < 100$, when

x is an integer.

Answer:

Given : $24x < 100$

$\Rightarrow 24x < 100$

Divide by 24 from both sides

$\Rightarrow \quad \frac{24}{24}x < \frac{100}{24}$

$\Rightarrow \quad x < \frac{25}{6}$

$\Rightarrow \quad x < 4.167$

x *i* s are integers which are less than 4.167.

Hence, values of x can be $\{.........-3,-2,-1,0,1,2,3,4\}$

Question:2(i) Solve $-12x > 30$, when

x is a natural number.

Answer:

Given : $-12x > 30$

$\Rightarrow -12x > 30$

Divide by -12 from both side

$\Rightarrow \quad \frac{-12}{-12}x < \frac{30}{-12}$

$\Rightarrow \quad x < \frac{30}{-12}$

$\Rightarrow \quad x < -2.5$

x *i* s a natural number which is less than - 2.5.

Hence, the values of x do not exist for given inequality.

Question:2(ii) Solve $-12x > 30$, when

x is an integer.

Answer:

Given : $-12x > 30$

$\Rightarrow -12x > 30$

Divide by -12 from both side

$$\Rightarrow \quad \frac{-12}{-12}x < \frac{30}{-12}$$

$$\Rightarrow \quad x < \frac{30}{-12}$$

$$\Rightarrow \quad x < -2.5$$

x are integers less than - 2.5 .

Hence, values of x can be $\{............, -6, -5, -4, -3\}$

Question:3(i) Solve $5x - 3 < 7$, when

x is an integer.

Answer:

Given : $5x - 3 < 7$

$\Rightarrow 5x - 3 < 7$

$\Rightarrow \quad 5x < 10$

Divide by 5 from both sides

$\Rightarrow \quad \frac{5}{5}x < \frac{10}{5}$

$\Rightarrow \quad x < 2$

x *are* integers less than 2

Hence, values of x can be $\{\ldots\ldots\ldots -3, -2 -1, 0, 1, \}$

Question:3(ii) Solve $5x - 3 < 7$, when

x is a real number.

Answer:

Given : $5x - 3 < 7$

$\Rightarrow 5x - 3 < 7$

$\Rightarrow \quad 5x < 10$

Divide by 5 from both sides

$\Rightarrow \quad \frac{5}{5}x < \frac{10}{5}$

$\Rightarrow \quad x < 2$

x *are* real numbers less than 2

i.e. $x \in (-\infty, 2)$

Question:4(i) Solve $3x+8>2$, when

x is an integer.

Answer:

Given : $3x+8>2$

$\Rightarrow 3x+8>2$

$\Rightarrow \quad 3x>-6$

Divide by 3 from both sides

$\Rightarrow \quad \frac{3}{3}x>\frac{-6}{3}$

$\Rightarrow \quad x>-2$

x *are* integers greater than -2

Hence, the values of x can be $\{-1,0,1,2,3,4..............\}$.

Question:4(ii) Solve $3x+8>2$, when) x is a real number.

Answer:

Given : $3x+8>2$

$\Rightarrow 3x+8>2$

$\Rightarrow \quad 3x>-6$

Divide by 3 from both side

$\Rightarrow \quad \frac{3}{3}x > \frac{-6}{3}$

$\Rightarrow \quad x > -2$

x *are* real numbers greater than -2

Hence , values of x can be as $x \in (-2, \infty)$

Question:5 Solve the inequality for real x . $4x + 3 < 5x + 7$

Answer:

Given : $4x + 3 < 5x + 7$

$\Rightarrow 4x + 3 < 5x + 7$

$\Rightarrow \quad 4x - 5x < 7 - 3$

$\Rightarrow \quad x > -4$

x *are* real numbers greater than -4.

Hence, values of x can be as $x \in (-4, \infty)$

Question:6 Solve the inequality for real x $3x - 7 > 5x - 1$

Answer:

Given : $3x - 7 > 5x - 1$

$\Rightarrow 3x - 7 > 5x - 1$

$\Rightarrow \quad -2x > 6$

$\Rightarrow \quad x < \frac{6}{-2}$

$\Rightarrow \quad x < -3$

x *are* real numbers less than -3.

Hence, values of x can be $x \in (-\infty, -3)$

Question:7 Solve the inequality for real x . $3(x-1) \leq 2(x-3)$

Answer:

Given : $3(x-1) \leq 2(x-3)$

$\Rightarrow 3(x-1) \leq 2(x-3)$

$\Rightarrow \quad 3x - 3 \leq 2x - 6$

$\Rightarrow \quad 3x - 2x \leq -6 + 3$

$\Rightarrow \quad x \leq -3$

x *are* real numbers less than equal to -3

Hence , values of x can be as , $x \in (-\infty, -3]$

Question:8 Solve the inequality for real x $3(2-x) \geq 2(1-x)$

Answer:

Given : $3(2-x) \geq 2(1-x)$

$\Rightarrow 3(2-x) \geq 2(1-x)$

$\Rightarrow \quad 6-3x \geq 2-2x$

$\Rightarrow \quad 6-2 \geq 3x-2x$

$\Rightarrow \quad 4 \geq x$

x *are* real numbers less than equal to 4

Hence, values of x can be as $x \in (-\infty, 4]$

Question:9 Solve the inequality for real x $x+\frac{x}{2}+\frac{x}{3}<11$

Answer:

Given : $x+\frac{x}{2}+\frac{x}{3}<11$

$\Rightarrow x+\frac{x}{2}+\frac{x}{3}<11$

$\Rightarrow \quad x(1+\frac{1}{2}+\frac{1}{3})<11$

$\Rightarrow \quad x(\frac{11}{6})<11$

$\Rightarrow \quad 11x<11 \times 6$

$\Rightarrow \quad x<6$

x *are* real numbers less than 6

Hence, values of x can be as $x \in (-\infty, 6)$

Question:10 Solve the inequality for real x . $\frac{x}{3} > \frac{x}{2} + 1$

Answer:

Given : $\frac{x}{3} > \frac{x}{2} + 1$

$\Rightarrow \frac{x}{3} > \frac{x}{2} + 1$

$\Rightarrow \quad \frac{x}{3} - \frac{x}{2} > 1$

$\Rightarrow \quad x(\frac{1}{3} - \frac{1}{2}) > 1$

$\Rightarrow \quad x(-\frac{1}{6}) > 1$

$\Rightarrow \quad -x > 6$

$\Rightarrow \quad x < -6$

x *are* real numbers less than -6

Hence, values of x can be as $x \in (-\infty, -6)$

Question:11 Solve the inequality for real x $\frac{3(x-2)}{5} \leq \frac{5(2-x)}{3}$

Answer:

Given : $\frac{3(x-2)}{5} \leq \frac{5(2-x)}{3}$

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

$\Rightarrow \quad 9(x-2) \leq 25(2-x)$

$\Rightarrow \quad 9x-18 \leq 50-25x$

$\Rightarrow \quad 9x+25x \leq 50+18$

$\Rightarrow \quad 34x \leq 68$

$\Rightarrow \quad x \leq 2$

x *are* real numbers less than equal to 2.

Hence, values of x can be as $x \in (-\infty, 2]$

Question:12 Solve the inequality for real x $\frac{1}{2}\left(\frac{3x}{5}+4\right) \geq \frac{1}{3}(x-6)$

Answer:

Given : $\frac{1}{2}\left(\frac{3x}{5}+4\right) \geq \frac{1}{3}(x-6)$

$\Rightarrow \frac{1}{2}\left(\frac{3x}{5}+4\right) \geq \frac{1}{3}(x-6)$

$\Rightarrow \quad 3\left(\frac{3x}{5}+4\right) \geq 2(x-6)$

$\Rightarrow \quad \frac{9x}{5}+12 \geq 2x-12$

$\Rightarrow \quad 12+12 \geq 2x-\frac{9x}{5}$

$\Rightarrow \quad 24 \geq \frac{x}{5}$

$\Rightarrow \quad 120 \geq x$

x *are* real numbers less than equal to 120.

Hence, values of x can be as $x \in (-\infty, 120]$.

Question:13 Solve the inequality for real x $2(2x+3)-10<6(x-2)$

Answer:

Given : $2(2x+3)-10<6(x-2)$

$\Rightarrow 2(2x+3)-10<6(x-2)$

$\Rightarrow \quad 4x+6-10<6x-12$

$\Rightarrow \quad 6-10+12<6x-4x$

$\Rightarrow \quad 8<2x$

$\Rightarrow \quad 4<x$

x *are* real numbers greater than 4

Hence , values of x can be as $x \in (4, \infty)$

Question:14 Solve the inequality for real x $37-(3x+5) \geq 9x-8(x-3)$

Answer:

Given : $37-(3x+5) \geq 9x-8(x-3)$

$\Rightarrow 37-(3x+5) \geq 9x-8(x-3)$

$\Rightarrow \quad 37 - 3x - 5 \geq 9x - 8x + 24$

$\Rightarrow \quad 32 - 3x \geq x + 24$

$\Rightarrow \quad 32 - 24 \geq x + 3x$

$\Rightarrow \quad 8 \geq 4x$

$\Rightarrow \quad 2 \geq x$

x *are* real numbers less than equal to 2.

Hence , values of x can be as $x \in (-\infty, 2]$

Question:15 Solve the inequality for real x $\frac{x}{4} < \frac{(5x-2)}{3} - \frac{(7x-3)}{5}$

Answer:

Given : $\frac{x}{4} < \frac{(5x-2)}{3} - \frac{(7x-3)}{5}$

$\Rightarrow \frac{x}{4} < \frac{(5x-2)}{3} - \frac{(7x-3)}{5}$

$\Rightarrow \quad 15x < 20(5x-2) - 12(7x-3)$

$\Rightarrow \quad 15x < 100x - 40 - 84x + 36$

$\Rightarrow \quad 15x < 16x - 4$

$\Rightarrow \quad 4 < x$

x *are* real numbers greater than 4.

Hence, values of x can be as $x \in (4, \infty)$

Question:16 Solve the inequality for real x $\frac{(2x-1)}{3} \geq \frac{3x-2}{4} - \frac{(2-x)}{5}$

Answer:

Given : $\frac{(2x-1)}{3} \geq \frac{3x-2}{4} - \frac{(2-x)}{5}$

$\Rightarrow \frac{(2x-1)}{3} \geq \frac{3x-2}{4} - \frac{(2-x)}{5}$

$\Rightarrow \quad 20(2x-1) \geq 15(3x-2) - 12(2-x)$

$\Rightarrow \quad 40x - 20 \geq 45x - 30 - 24 + 12x$

$\Rightarrow \quad 30 + 24 - 20 \geq 45x - 40x + 12x$

$\Rightarrow \quad 34 \geq 17x$

$\Rightarrow \quad 2 \geq x$

x *are* real numbers less than equal 2.

Hence, values of x can be as $x \in (-\infty, 2]$.

Question:17 Solve the inequality and show the graph of the solution on number line $3x - 2 < 2x + 1$

Answer:

Given : $3x - 2 < 2x + 1$

$\Rightarrow 3x - 2 < 2x + 1$

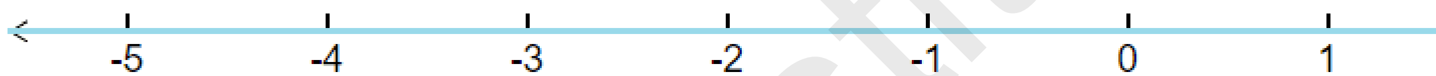
$\Rightarrow \quad 3x - 2x < 2 + 1$

$\Rightarrow \quad x < 3$

x *are* real numbers less than 3

Hence, values of x can be as $x \in (-\infty, 3)$

The graphical representation of solutions of the given inequality is as :



Question:18 Solve the inequality and show the graph of the solution on number line $5x - 3 \geq 3x - 5$

Answer:

Given : $5x - 3 \geq 3x - 5$

$\Rightarrow 5x - 3 \geq 3x - 5$

$\Rightarrow \quad 5x - 3x \geq 3 - 5$

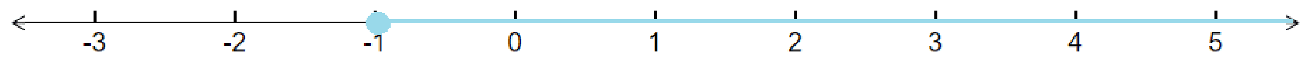
$\Rightarrow \quad 2x \geq -2$

$\Rightarrow \quad x \geq -1$

x *are real* numbers greater than equal to -1.

Hence, values of x can be as $x \in [-1, \infty)$

The graphical representation of solutions of the given inequality is as :



Question:19 Solve the inequality and show the graph of the solution on number line $3(1-x)<2(x+4)$

Answer:

Given : $3(1-x)<2(x+4)$

$\Rightarrow 3(1-x)<2(x+4)$

$\Rightarrow \quad 3-3x<2x+8$

$\Rightarrow \quad 3-8<2x+3x$

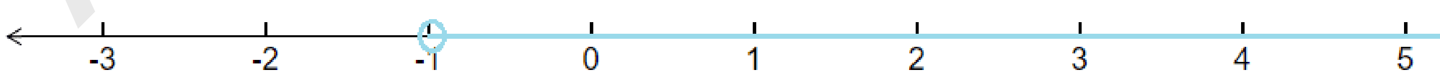
$\Rightarrow \quad -5<5x$

$\Rightarrow \quad -1<x$

x *are* real numbers greater than -1

Hence, values of x can be as $x \in (-1, \infty)$

The graphical representation of solutions of given inequality is as :



Question:20 Solve the inequality and show the graph of the solution on number line $\frac{x}{2} \geq \frac{(5x-2)}{3} - \frac{(7x-3)}{5}$

Answer:

Given : $\frac{x}{2} \geq \frac{(5x-2)}{3} - \frac{(7x-3)}{5}$

$\Rightarrow \frac{x}{2} \geq \frac{(5x-2)}{3} - \frac{(7x-3)}{5}$

$\Rightarrow \quad 15x \geq 10(5x-2) - 6(7x-3)$

$\Rightarrow \quad 15x \geq 50x - 20 - 42x + 18$

$\Rightarrow \quad 15x + 42x - 50x \geq 18 - 20$

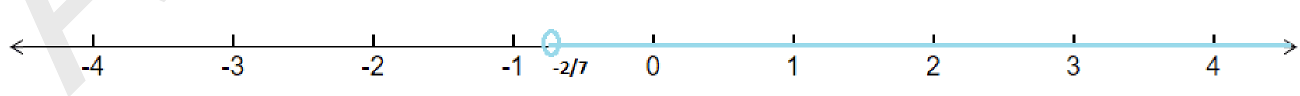
$\Rightarrow \quad 7x \geq -2$

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

x *are* real numbers greater than equal to $= \frac{-2}{7}$

Hence, values of x can be as $x \in (-\frac{2}{7}, \infty)$

The graphical representation of solutions of the given inequality is as :



Question:21 Ravi obtained 70 and 75 marks in first two unit test. Find the minimum marks he should get in the third test to have an average of at least 60 marks.

Answer:

Let x be marks obtained by Ravi in the third test.

The student should have an average of at least 60 marks.

$$\therefore \quad \frac{70+75+x}{3} \geq 60$$

$$145+x \geq 180$$

$$x \geq 180-145$$

$$x \geq 35$$

the student should have minimum marks of 35 to have an average of 60

Question:22 To receive Grade 'A' in a course, one must obtain an average of 90 marks or more in five examinations (each of 100 marks). If Sunita's marks in first four examinations are 87, 92, 94 and 95, find minimum marks that Sunita must obtain in fifth examination to get grade 'A' in the course.

Answer:

Sunita's marks in the first four examinations are 87, 92, 94 and 95.

Let x be marks obtained in the fifth examination.

To receive Grade 'A' in a course, one must obtain an average of 90 marks or more in five examinations.

$$\therefore \quad \frac{87+92+94+95+x}{5} \geq 90$$

$\Rightarrow \quad \frac{368+x}{5} \geq 90$

$\Rightarrow \quad 368+x \geq 450$

$\Rightarrow \quad x \geq 450-368$

$\Rightarrow \quad x \geq 82$

Thus, Sunita must obtain 82 in the fifth examination to get grade 'A' in the course.

Question:23 Find all pairs of consecutive odd positive integers both of which are smaller than 10 such that their sum is more than 11.

Answer:

Let x be smaller of two consecutive odd positive integers. Then the other integer is x+2.

Both integers are smaller than 10.

$\therefore \quad x+2<10$

$\Rightarrow \quad x<10-2$

$\Rightarrow \quad x<8$

Sum of both integers is more than 11.

$\therefore \quad x+(x+2)>11$

$\Rightarrow \quad (2x+2)>11$

$\Rightarrow \quad 2x>11-2$

$\Rightarrow \quad 2x > 9$

$\Rightarrow \quad x > \frac{9}{2}$

$\Rightarrow \quad x > 4.5$

We conclude $x < 8$ and $x > 4.5$ and x is odd integer number.

x can be 5,7.

The two pairs of consecutive odd positive integers are $(5,7) \ and \ (7,9)$.

Question:24 Find all pairs of consecutive even positive integers, both of which are larger than 5 such that their sum is less than 23.

Answer:

Let x be smaller of two consecutive even positive integers. Then the other integer is x+2.

Both integers are larger than 5.

$\therefore \quad x > 5$

Sum of both integers is less than 23.

$\therefore \quad x + (x+2) < 23$

$\Rightarrow \quad (2x+2) < 23$

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

$\Rightarrow \quad 2x < 21$

$\Rightarrow \quad x < \frac{21}{2}$

$\Rightarrow \quad x < 10.5$

We conclude $x < 10.5$ and $x > 5$ and x is even integer number.

x can be 6,8,10.

The pairs of consecutive even positive integers are $(6,8),(8,10),(10,12)$.

Question:25 The longest side of a triangle is 3 times the shortest side and the third side is 2 cm shorter than the longest side. If the perimeter of the triangle is at least 61 cm, find the minimum length of the shortest side.

Answer:

Let the length of the smallest side be x cm.

Then largest side = 3x cm.

Third side = 3x-2 cm.

Given: The perimeter of the triangle is at least 61 cm.

$\therefore \quad x+3x+(3x-2) \geq 61$

$\Rightarrow \quad 7x-2 \geq 61$

$\Rightarrow \quad 7x \geq 61+2$

$\Rightarrow \quad 7x \geq 63$

$\Rightarrow \quad x \geq \frac{63}{7}$

$\Rightarrow \quad x \geq 9$

Minimum length of the shortest side is 9 cm.

Question:26 A man wants to cut three lengths from a single piece of board of length 91cm. The second length is to be 3cm longer than the shortest and the third length is to be twice as long as the shortest. What are the possible lengths of the shortest board if the third piece is to be at least 5cm longer than the second?

[***Hint*** : If x is the length of the shortest board, then x , $(x+3)$ and $2x$ are the lengths of the second and third piece, respectively.
Thus, $x+(x+3)+2x \leq 91$ and $2x \geq (x+3)+5$].

Answer:

Let x is the length of the shortest board,

then $(x+3)$ and $2x$ are the lengths of the second and third piece, respectively.

The man wants to cut three lengths from a single piece of board of length 91cm.

Thus, $x+(x+3)+2x \leq 91$

$4x+3 \leq 91$

$\Rightarrow \quad 4x \leq 91-3$

$\Rightarrow \quad 4x \leq 88$

$\Rightarrow \quad x \leq \frac{88}{4}$

$\Rightarrow \quad x \leq 22$

if the third piece is to be at least 5cm longer than the second, than

$2x \geq (x+3)+5$

$\Rightarrow \quad 2x \geq x+8$

$\Rightarrow \quad 2x - x \geq 8$

$\Rightarrow \quad x \geq 8$

We conclude that $x \geq 8$ and $x \leq 22$.

Thus , $8 \leq x \leq 22$.

Hence, the length of the shortest board is greater than equal to 8 cm and less than equal to 22 cm.

NCERT solutions for class 11 maths chapter 6 linear inequalities- Exercise: 6.2

Question:1 Solve the following inequality graphically in two-dimensional plane:

$x+y<5$

Answer:

Graphical representation of $x+y=5$ is given in the graph below.

The line $x+y=5$ divides plot in two half planes.

Select a point (not on line $x + y = 5$) which lie in one of the half planes, to determine whether the point satisfies the inequality.

Let there be a point $(1, 2)$

We observe

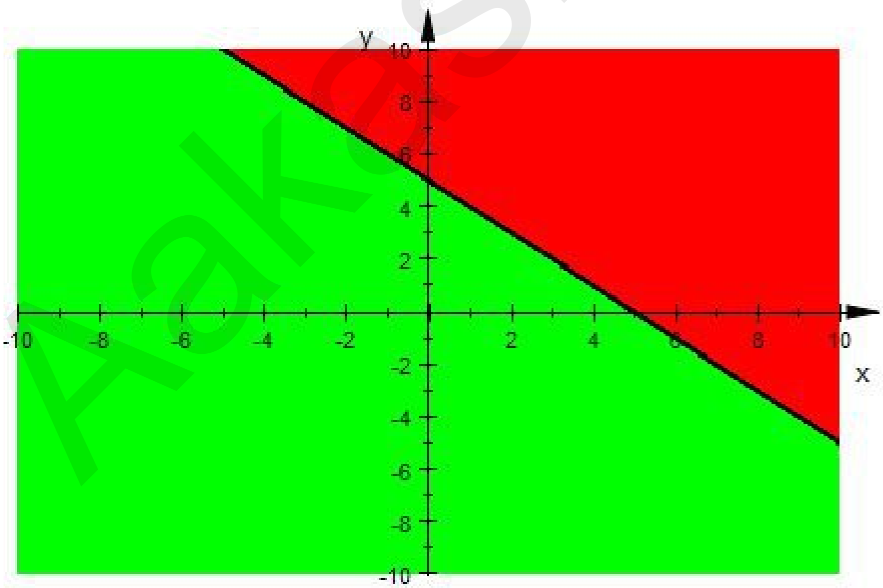
$1 + 2 < 5$ i.e. $3 < 5$, which is true.

Therefore, half plane (above the line) **is not a solution** region of given inequality i.e. $x + y < 5$ **.**

Also, **the point on the line does not satisfy the inequality.**

Thus, the solution to this inequality is half plane below the line $x + y = 5$ excluding points on this line represented by the green part.

This can be represented as follows:



Question:2 Solve the following inequality graphically in two-dimensional plane: $2x+y\geq 6$

Answer:

$2x+y\geq 6$

Graphical representation of $2x+y=6$ is given in the graph below.

The line $2x+y=6$ divides plot in two half-planes.

Select a point (not on the line $2x+y=6$) which lie in one of the half-planes, to determine whether the point satisfies the inequality.

Let there be a point $(3,2)$

We observe

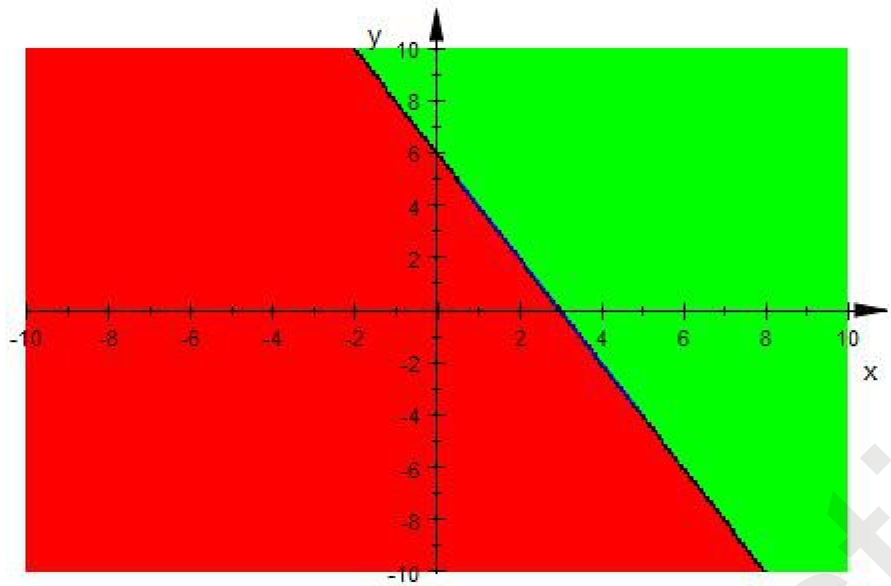
$6+2\geq 6$ i.e. $8\geq 6$, which is true.

Therefore, half plane II is not a solution region of given inequality i.e. $2x+y\geq 6$

Also, the point on the line does satisfy the inequality.

Thus, the solution to this inequality is the half plane I, above the line $2x+y=6$ including points on this line , represented by green colour.

This can be represented as follows:



Question:3 Solve the following inequality graphically in two-dimensional plane: $3x + 4y \leq 12$

Answer:

$3x + 4y \leq 12$

Graphical representation of $3x + 4y = 12$ is given in the graph below.

The line $3x + 4y = 12$ divides plot into two half-planes.

Select a point (not on the line $3x + 4y = 12$) which lie in one of the half-planes, to determine whether the point satisfies the inequality.

Let there be a point $(1, 2)$

We observe

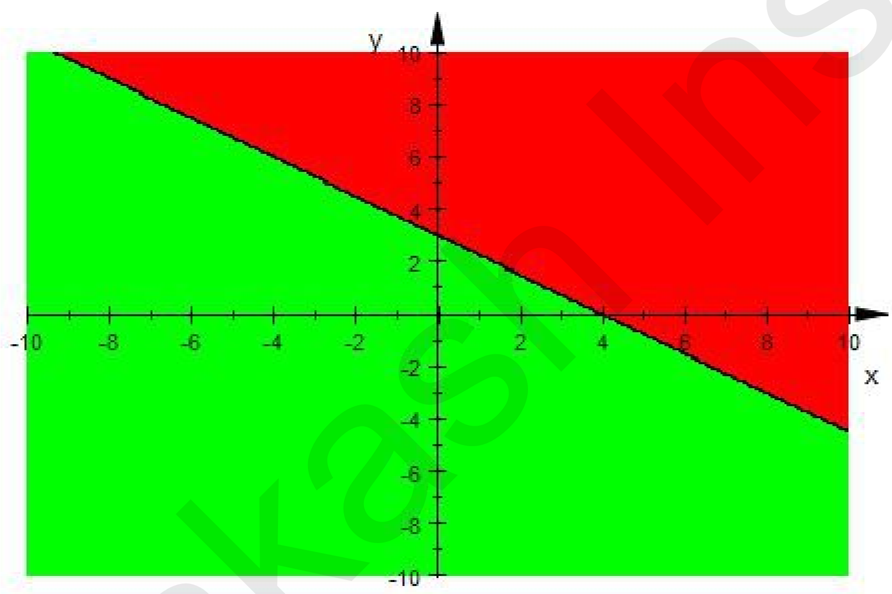
$1+2 \leq 12$ i.e. $3 \leq 12$, which is true.

Therefore, the half plane I(above the line) is not a solution region of given inequality i.e. $3x+4y \leq 12$.

Also, the point on the line does satisfy the inequality.

Thus, the solution to this inequality is half plane II (below the line $3x+4y=12$) including points on this line, represented by green colour.

This can be represented as follows:



Question:4 Solve the following inequality graphically in two-dimensional plane: $y+8 \geq 2x$

Answer:

$y+8 \geq 2x$

Graphical representation of $y+8=2x$ is given in the graph below.

The line $y+8=2x$ divides plot in two half-planes.

Select a point (not on the line $y+8=2x$) which lie in one of the half-planes, to determine whether the point satisfies the inequality.

Let there be a point $(1,2)$

We observe

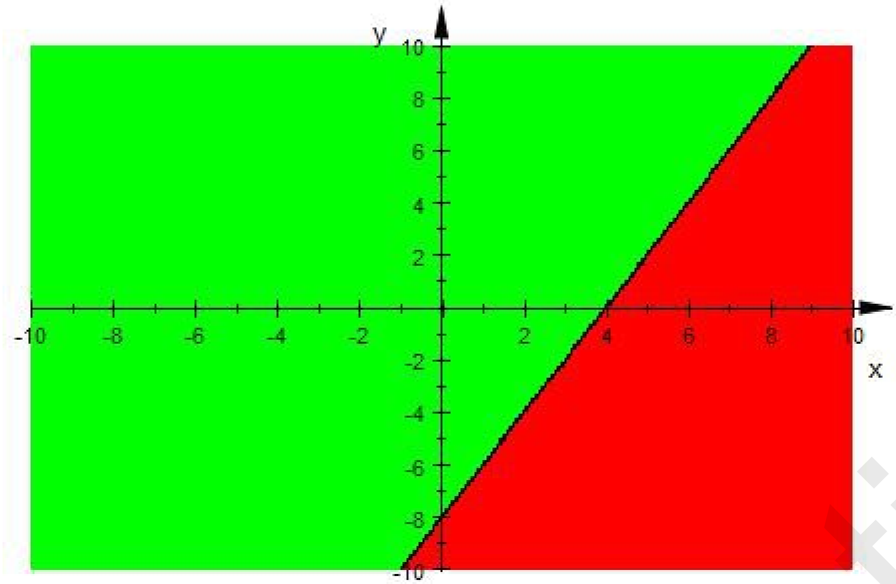
$2+8 \geq 2 \times 1$ i.e. $10 \geq 2$, which is true.

Therefore, half plane II is not solution region of given inequality i.e. $y+8 \geq 2x$.

Also, the point on the line does satisfy the inequality.

Thus, the solution to this inequality is the half plane I including points on this line, represented by green colour.

This can be represented as follows:



Question:5 Solve the following inequality graphically in two-dimensional plane: $x - y \leq 2$

Answer:

$x - y \leq 2$

Graphical representation of $x - y = 2$ is given in the graph below.

The line $x - y = 2$ divides plot in two half planes.

Select a point (not on the line $x - y = 2$) which lie in one of the half-planes, to determine whether the point satisfies the inequality.

Let there be a point $(1, 2)$

We observe

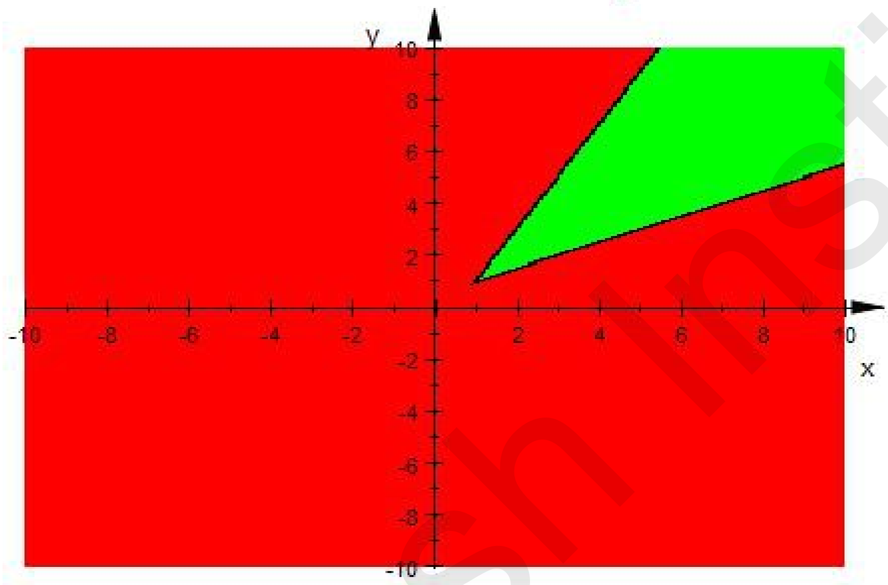
$1 - 2 \leq 2$ i.e. $-1 \leq 2$, which is true.

Therefore, half plane Ii is not solution region of given inequality i.e. $x - y \leq 2$.

Also, the point on the line does satisfy the inequality.

Thus, the solution to this inequality is the half plane I including points on this line, represented by green colour

This can be represented as follows:



Question:6 Solve the following inequality graphically in two-dimensional plane: $2x - 3y > 6$

Answer:

$2x - 3y > 6$

Graphical representation of $2x - 3y = 6$ is given in the graph below.

The line $2x - 3y = 6$ divides plot in two half planes.

Select a point (not on the line $2x-3y=6$)which lie in one of the half-planes, to determine whether the point satisfies the inequality.

Let there be a point $(1,2)$

We observe

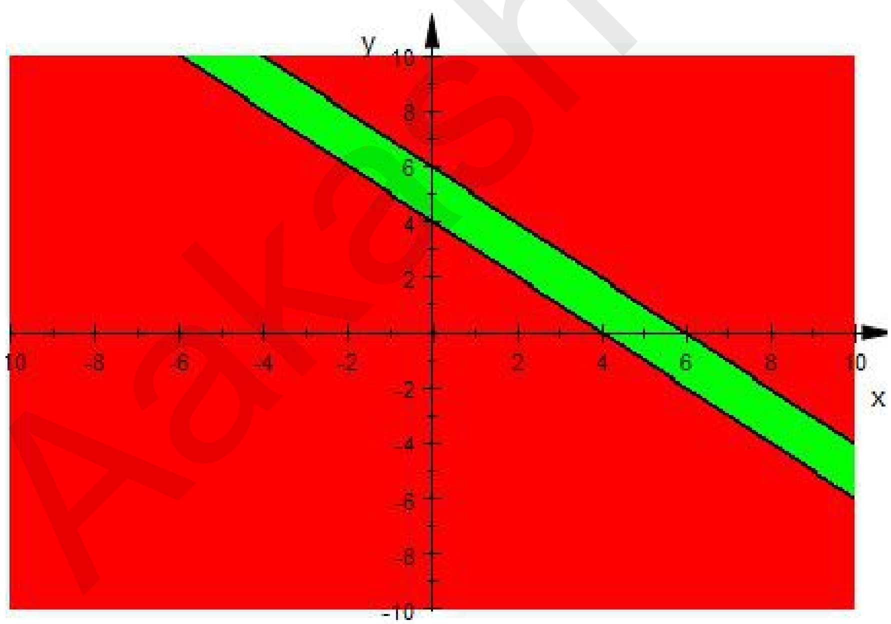
$2-6>6$ i.e. $-4>6$, which is false .

Therefore, half plane I is not solution region of given inequality i.e. $2x-3y>6$.

Also point on line does not satisfy the inequality.

Thus, the solution to this inequality is half plane II excluding points on this line, represented by green colour.

This can be represented as follows:



Question:7 Solve the following inequality graphically in two-dimensional plane: $-3x + 2y \geq -6$

Answer:

$-3x + 2y \geq -6$

Graphical representation of $-3x + 2y = -6$ is given in the graph below.

The line $-3x + 2y = -6$ divides plot in two half planes.

Select a point (not on the line $-3x + 2y = -6$) which lie in one of the half planes, to determine whether the point satisfies the inequality.

Let there be a point $(1, 2)$

We observe

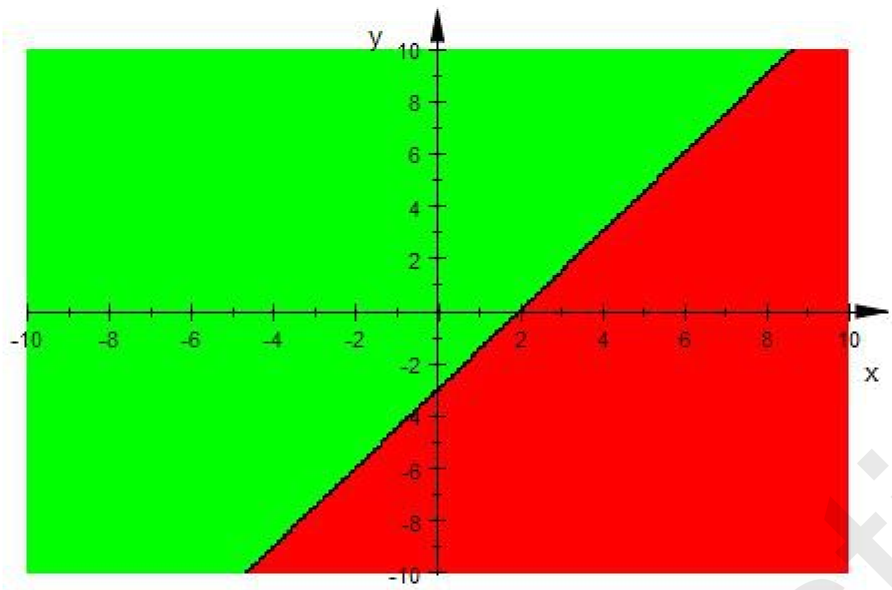
$-3 + 4 \geq -6$ i.e. $1 \geq -6$, which is true.

Therefore, half plane II is not solution region of given inequality i.e. $-3x + 2y \geq -6$.

Also, the point on the line does satisfy the inequality.

Thus, the solution to this inequality is the half plane I including points on this line, represented by green colour

This can be represented as follows:



Question:8 Solve the following inequality graphically in two-dimensional plane: $3y - 5x < 30$

Answer:

$3y - 5x < 30$

Graphical representation of $3y - 5x = 30$ is given in graph below.

The line $3y - 5x = 30$ divides plot in two half planes.

Select a point (not on the line $3y - 5x = 30$) which lie in one of the half plane , to detemine whether the point satisfies the inequality.

Let there be a point $(1, 2)$

We observe

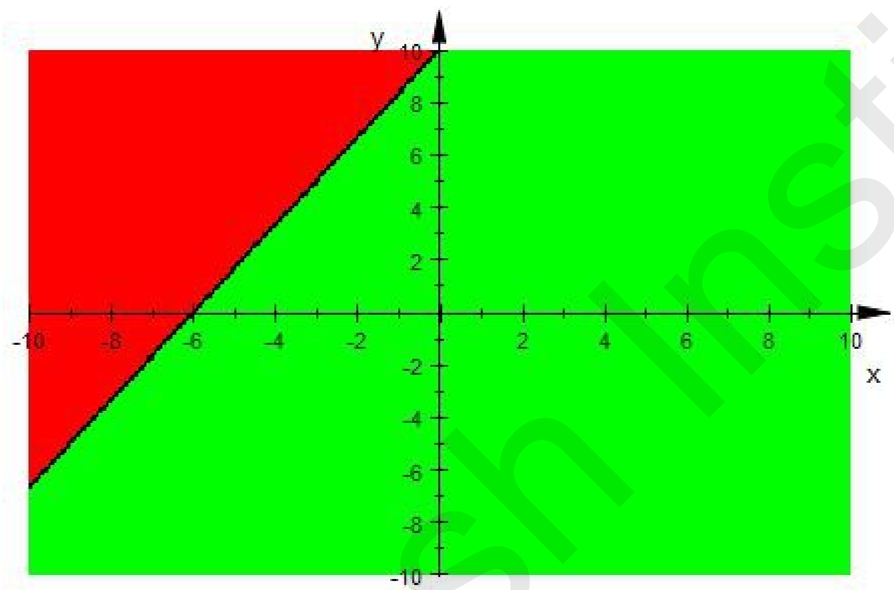
$6 - 5 < 30$ i.e. $1 < 30$, which is true.

Therefore, half plane **II** is not solution region of given inequality i.e. $3y - 5x < 30$ **.**

Also point on the line does not satisfy the inequality.

Thus, solution to this inequality is half plane **I** excluding points on this line, represented by green colour.

This can be represented as follows:



Question:9 Solve the following inequality graphically in two-dimensional plane: $y < -2$

Answer:

$y < -2$

Graphical representation of $y = -2$ is given in graph below.

The line $y < -2$ divides plot in two half planes.

Select a point (not on the line $y < -2$) which lie in one of the half plane , to detemine whether the point satisfies the inequality.

Let there be a point $(1, 2)$

We observe

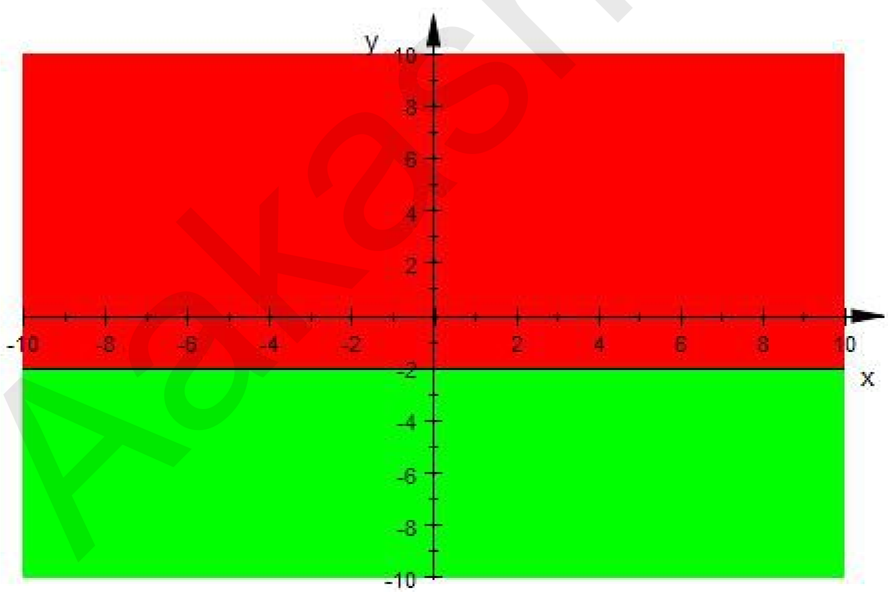
i.e. $2 < -2$, which is false.

Therefore, the half plane I is not a solution region of given inequality i.e. $y < -2$.

Also, **the point on the line does not satisfy the inequality.**

Thus, the solution to this inequality is half plane II excluding points on this line, represented by green colour.

This can be represented as follows:



Question:10 Solve the following inequality graphically in two-dimensional plane: $x > -3$

Answer:

$x > -3$

Graphical representation of $x = -3$ is given in the graph below.

The line $x = -3$ divides plot into two half-planes.

Select a point (not on the line $x = -3$) which lie in one of the half-planes, to determine whether the point satisfies the inequality.

Let there be a point $(1, 2)$

We observe

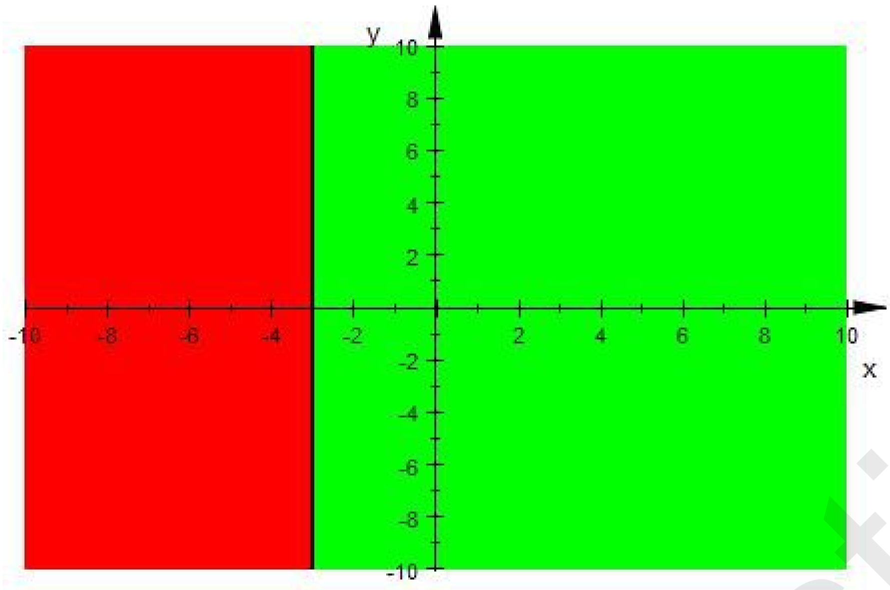
i.e. $1 > -3$, which is true.

Therefore, half plane II is not a solution region of given inequality i.e. $x > -3$ **.**

Also, the point on the line does not satisfy the inequality.

Thus, the solution to this inequality is the half plane I excluding points on this line.

This can be represented as follows:



NCERT solutions for class 11 maths chapter 6 linear inequalities-Exercise: 6.3

Question:1 Solve the following system of inequalities graphically:

$x \geq 3,\ y \geq 2$

Answer:

$x \geq 3,\ y \geq 2$

Graphical representation of $x = 3$ and $y = 2$ is given in the graph below.

The line $x = 3$ and $y = 2$ divides plot in four regions i.e.I,II,III,IV.

For $x \geq 3$,

The solution to this inequality is region II and III including points on this line because points on the line also satisfy the inequality.

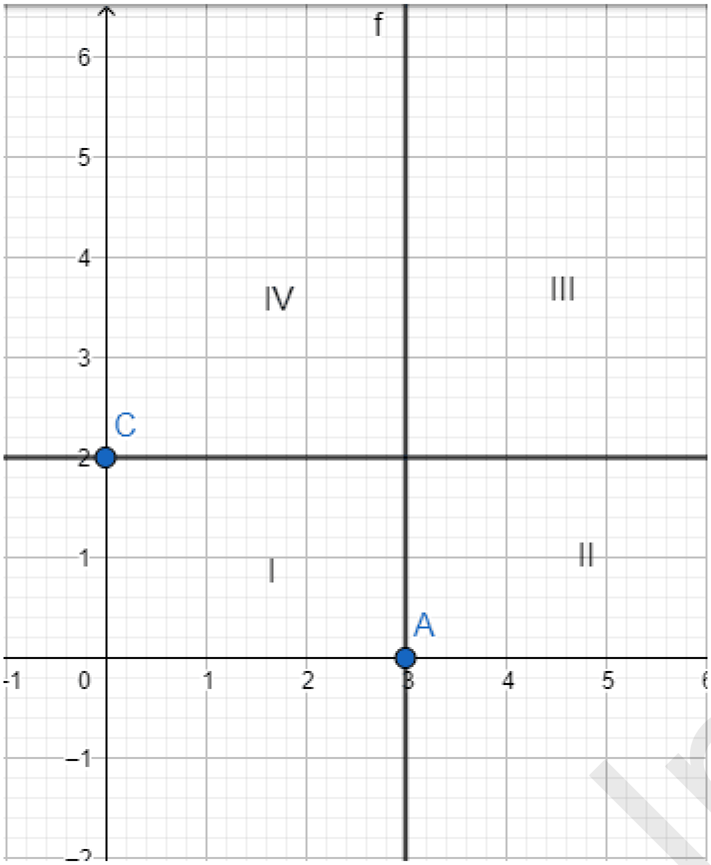
For $y \geq 2$,

The solution to this inequality is region IV and III including points on this line because points on the line also satisfy the inequality.

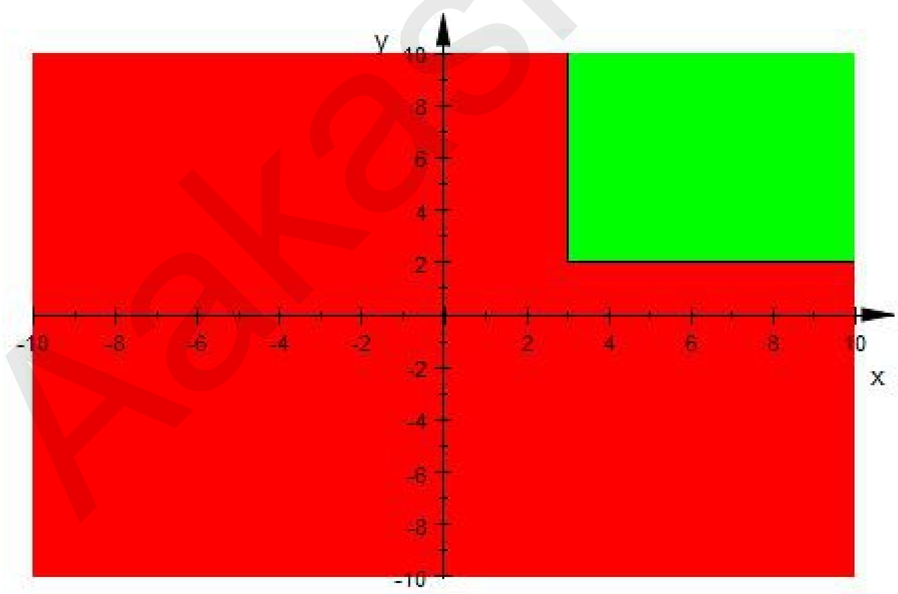
Hence, solution to $x \geq 3,\ y \geq 2$ **is common region of graph i.e. region III.**

Thus, solution of $x \geq 3,\ y \geq 2$ **is region III.**

This can be represented as follows:



The below green colour represents the solution



Question:2 Solve the following system of inequalities graphically: $3x + 2y \leq 12,\ x \geq 1,\ y \geq 2$

Answer:

$3x + 2y \leq 12,\ x \geq 1,\ y \geq 2$

Graphical representation of $x = 1$, $3x + 2y = 12$ and $y = 2$ is given in graph below.

For $x \geq 1$,

The solution to this inequality is region on right hand side of line $(x = 1)$ including points on this line because points on the line also satisfy the inequality.

For $y \geq 2$,

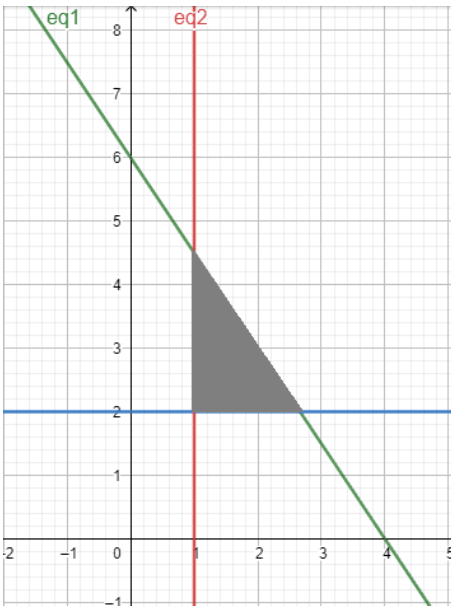
The solution to this inequality is region above the line $(y = 2)$ including points on this line because points on the line also satisfy the inequality.

For $3x + 2y \leq 12$

The solution to this inequality is region below the line $(3x + 2y = 12)$ including points on this line because points on the line also satisfy the inequality.

Hence, solution to these linear inequalities is shaded region as shown in figure including points on the respective lines.

This can be represented as follows:



Question:3 Solve the following system of inequalities graphically: $2x + y \geq 6, 3x + 4y \leq 12$

Answer:

$2x + y \geq 6, 3x + 4y \leq 12$

Graphical representation of $2x + y = 6 \ and \ 3x + 4y = 12$ is given in the graph below.

For $2x + y \geq 6$,

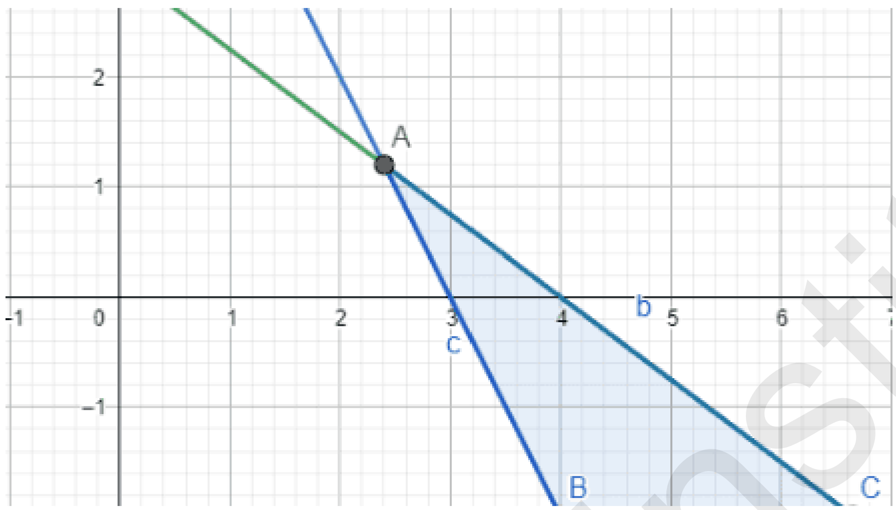
The solution to this inequality is region above line $(2x + y = 6)$ including points on this line because points on the line also satisfy the inequality.

For $3x + 4y \leq 12$,

The solution to this inequality is region below the line $(3x + 4y = 12)$ including points on this line because points on the line also satisfy the inequality.

Hence, the solution to these linear inequalities is the shaded region(ABC) as shown in figure including points on the respective lines.

This can be represented as follows:



Question:4 Solve the following system of inequalities graphically: $x+y \geq 4, 2x-y<0$

Answer:

$x+y \geq 4, 2x-y<0$

Graphical representation of $x+y=4 \; and \; 2x-y=0$ is given in the graph below.

For $x+y \geq 4,$,

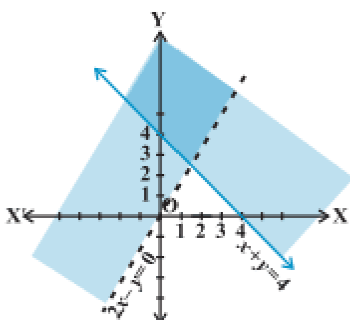
The solution to this inequality is region above line $(x+y=4)$ including points on this line because points on the line also satisfy the inequality.

For $2x-y<0$,

The solution to this inequality is half plane corresponding to the line $(2x-y=0)$ containing point $(1,0)$ excluding points on this line because points on the line does not satisfy the inequality.

Hence, the solution to these linear inequalities is the shaded region as shown in figure including points on line $(x+y=4)$ and excluding points on the line $(2x-y=0)$.

This can be represented as follows:



Question:5 Solve the following system of inequalities graphically: $2x-y>1,\ x-2y<-1$

Answer:

$2x-y>1,\ x-2y<-1$

Graphical representation of $x-2y=-1\ and\ 2x-y=1$ is given in graph below.

For $2x-y>1,$

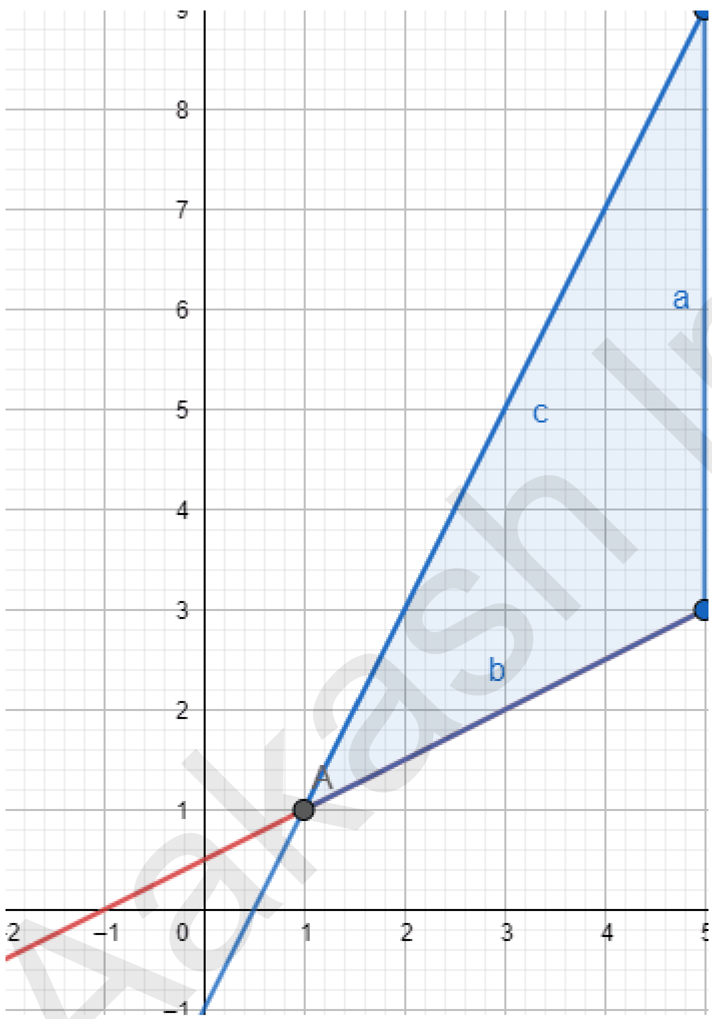
The solution to this inequality is region below line $(2x-y=1)$ excluding points on this line because points on line does not satisfy the inequality.

For $x-2y<-1$,

The solution to this inequality is region above the line $(x-2y=-1)$ excluding points on this line because points on line does not satisfy the inequality.

Hence, solution to these linear inequalities is shaded region as shown in figure **excluding points on the lines.**

This can be represented as follows:



Question:6 Solve the following system of inequalities graphically: $x+y\leq 6, x+y\geq 4$

Answer:

$x + y \leq 6, x + y \geq 4$

Graphical representation of $x + y = 6,\ and\ x + y = 4$ is given in the graph below.

For $x + y \leq 6,$

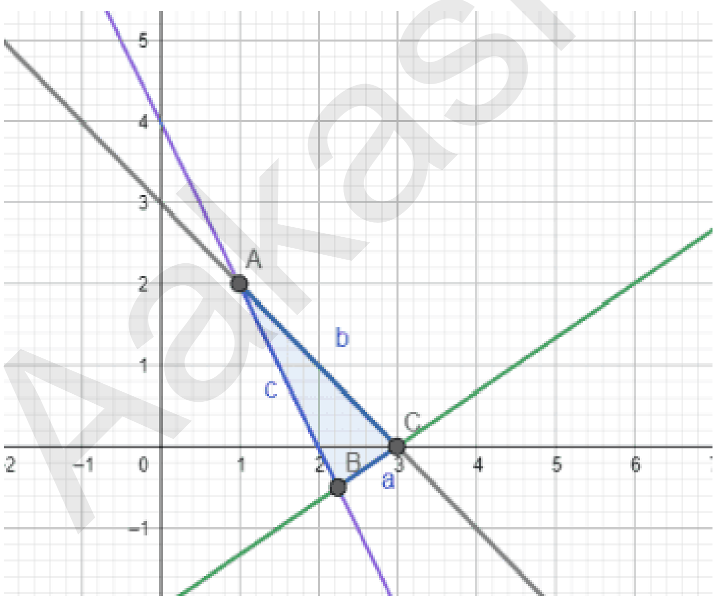
The solution to this inequality is region below line $(x + y = 6)$ **in** cluding points on this line because points on the line also satisfy the inequality.

For $x + y \geq 4$,

The solution to this inequality is region above the line $(x + y = 4)$ including points on this line because points on the line also satisfy the inequality.

Hence, the solution to these linear inequalities is shaded region as shown in figure including points on the lines.

This can be represented as follows:



Question:7 Solve the following system of inequalities graphically: $2x + y \geq 8, x + 2y \geq 10$

Answer:

$2x + y \geq 8, x + 2y \geq 10$

Graphical representation of $2x + y = 8 \; and \; x + 2y = 10$ is given in graph below.

For $2x + y \geq 8,$

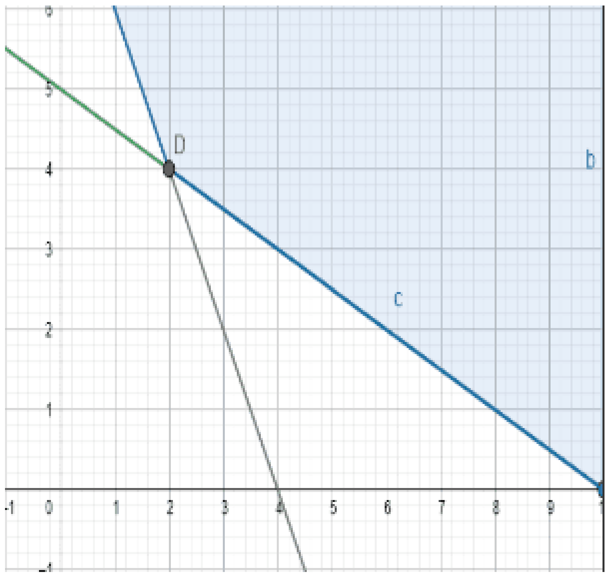
The solution to this inequality is region above line $(2x + y = 8)$ including points on this line because points on line also satisfy the inequality.

For $x + 2y \geq 10$,

The solution to this inequality is region above the line $(x + 2y = 10)$ including points on this line because points on line also satisfy the inequality.

Hence, solution to these linear inequalities is shaded region as shown in figure including points on the lines.

This can be represented as follows:



Question:8 Solve the following system of inequalities graphically: $x + y \leq 9, y > x, x \geq 0$

Answer:

$x + y \leq 9, y > x, x \geq 0$

Graphical representation of $x + y = 9, x = y$ and $x = 0$ is given in graph below.

For $x + y \leq 9$,

The solution to this inequality is region below line $(x + y = 9)$ including points on this line because points on line also satisfy the inequality.

For $y > x$,

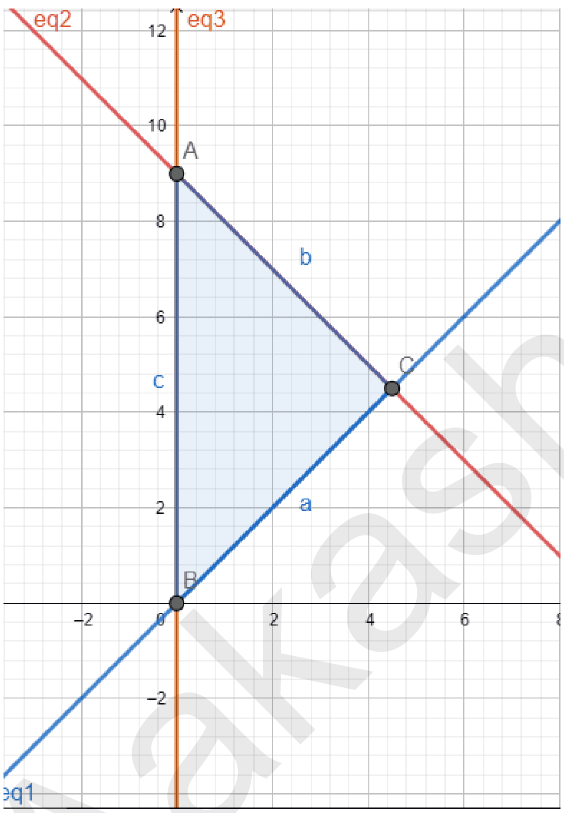
The solution to this inequality represents half plane corresponding to the line $(x = y)$ containing point $(0, 1)$ excluding points on this line because points on line does not satisfy the inequality.

For $x \geq 0$,

The solution to this inequality is region on right hand side of the line $(x = 0)$ including points on this line because points on line also satisfy the inequality.

Hence, solution to these linear inequalities is shaded region as shown in figure.

This can be represented as follows:



Question:9â□□â□□â□□â□□â□□â□□â□□ Solve the following system of inequalities graphically: $5x + 4y \leq 20,\ \ x \geq 1,\ \ y \geq 2$

Answer:

$5x + 4y \le 20,\ x \ge 1,\ y \ge 2$

Graphical representation of $5x + 4y = 20,\ \ x = 1\ and\ y = 2$ is given in graph below.

For $5x + 4y \le 20$, ,

The solution to this inequality is region below the line $(5x + 4y = 20)$ including points on this line because points on line also satisfy the inequality.

For $x \ge 1$, ,

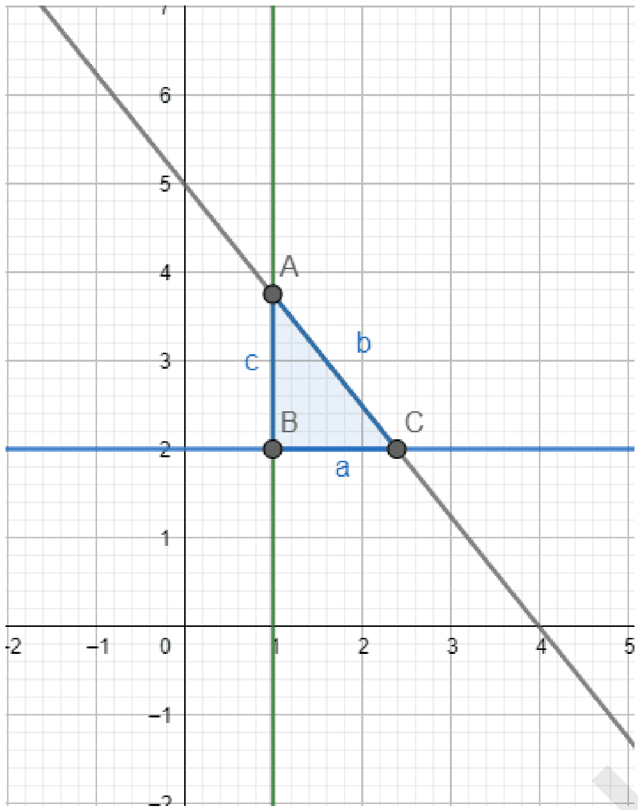
The solution to this inequality is region right hand side of the line $(x = 1)$ including points on this line because points on line also satisfy the inequality.

For $y \ge 2$,

The solution to this inequality is region above the line $(y = 2)$ including points on this line because points on line also satisfy the inequality.

Hence, solution to these linear inequalities is shaded region as shown in figure including points on the respective lines.

This can be represented as follows:



Question:10â□□â□□â□□â□□â□□â□□â□□ Solve the following system of inequalities graphically: $3x+4y\leq 60,\ x+3y\leq 30,\ x\geq 0,\ y\geq 0$

Answer:

$3x+4y\leq 60,\ x+3y\leq 30,\ x\geq 0,\ y\geq 0$

Graphical representation of $3x+4y=60$, $x+3y=30$, $x=0\ and\ y=0$ is given in graph below.

For $3x+4y\leq 60$,

The solution to this inequality is region below the line $(3x+4y=60)$ including points on this line because points on line also satisfy the inequality.

For $x+3y\leq 30$,

The solution to this inequality is region below the line $(x + 3y = 30)$ including points on this line because points on line also satisfy the inequality.

For $x \geq 0,$

The solution to this inequality is region right hand side of the line $(x = 0)$ including points on this line because points on line also satisfy the inequality.

For $y \geq 0,$

The solution to this inequality is region above the line $(y = 0)$ including points on this line because points on line also satisfy the inequality.

Hence, the solution to these linear inequalities is shaded region as shown in figure including points on the respective lines.

This can be represented as follows:

Question:11â□□â□□â□□â□□â□□â□□â□□ Solve the following system of inequalities graphically: $2x + y \geq 4,\ x + y \leq 3,\ 2x - 3y \leq 6$

Answer:

$2x + y \geq 4,\ x + y \leq 3,\ 2x - 3y \leq 6$

Graphical representation of $2x + y = 4$, $x + y = 3$ and $2x - 3y = 6$ is given in graph below.

For $2x + y \geq 4,$,

The solution to this inequality is region above the line $(2x + y = 4)$ including points on this line because points on line also satisfy the inequality.

For $x + y \leq 3,$,

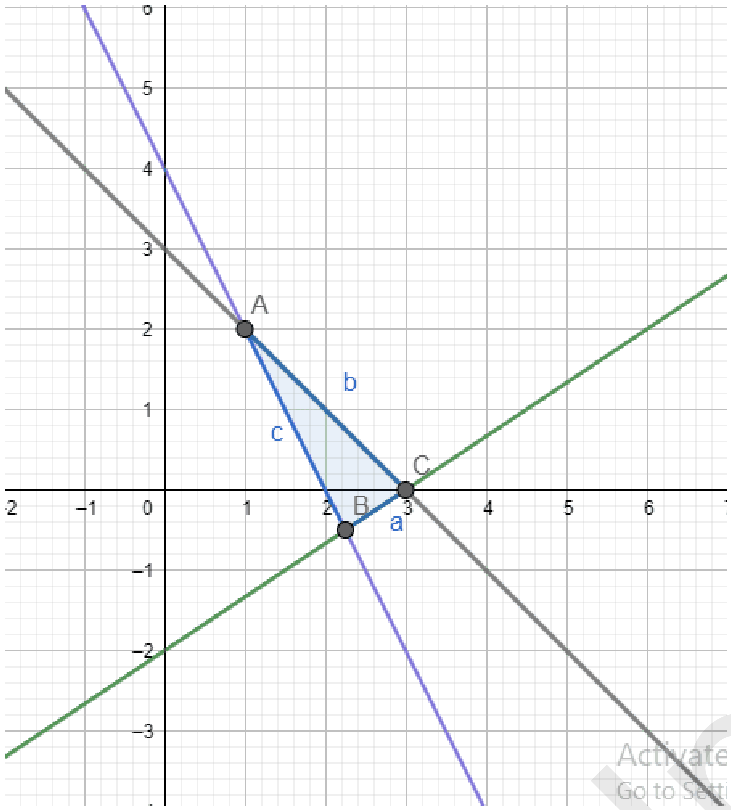
The solution to this inequality is region below the line $(x + y = 3)$ including points on this line because points on line also satisfy the inequality.

For $2x - 3y \leq 6,$

The solution to this inequality is region above the line $(2x - 3y = 6)$ including points on this line because points on line also satisfy the inequality.

Hence, solution to these linear inequalities is shaded region as shown in figure including points on the respective lines.

This can be represented as follows:



Question:12â□□â□□â□□â□□â□□â□□â□□ Solve the following system of inequalities graphically: $x-2y\leq 3, 3x+4y\geq 12, x\geq 0, y\geq 1$

Answer:

$x-2y\leq 3, 3x+4y\geq 12, x\geq 0, y\geq 1$

Graphical representation of $x-2y=3$, $3x+4y=12$, $x=0$ and $y=1$ is given in graph below.

For $x-2y\leq 3$,

The solution to this inequality is region above the line $(x-2y=3)$ including points on this line because points on line also satisfy the inequality.

For $3x+4y\geq 12$,

The solution to this inequality is region above the line $(3x + 4y = 12)$ including points on this line because points on line also satisfy the inequality.

For $x \geq 0,$

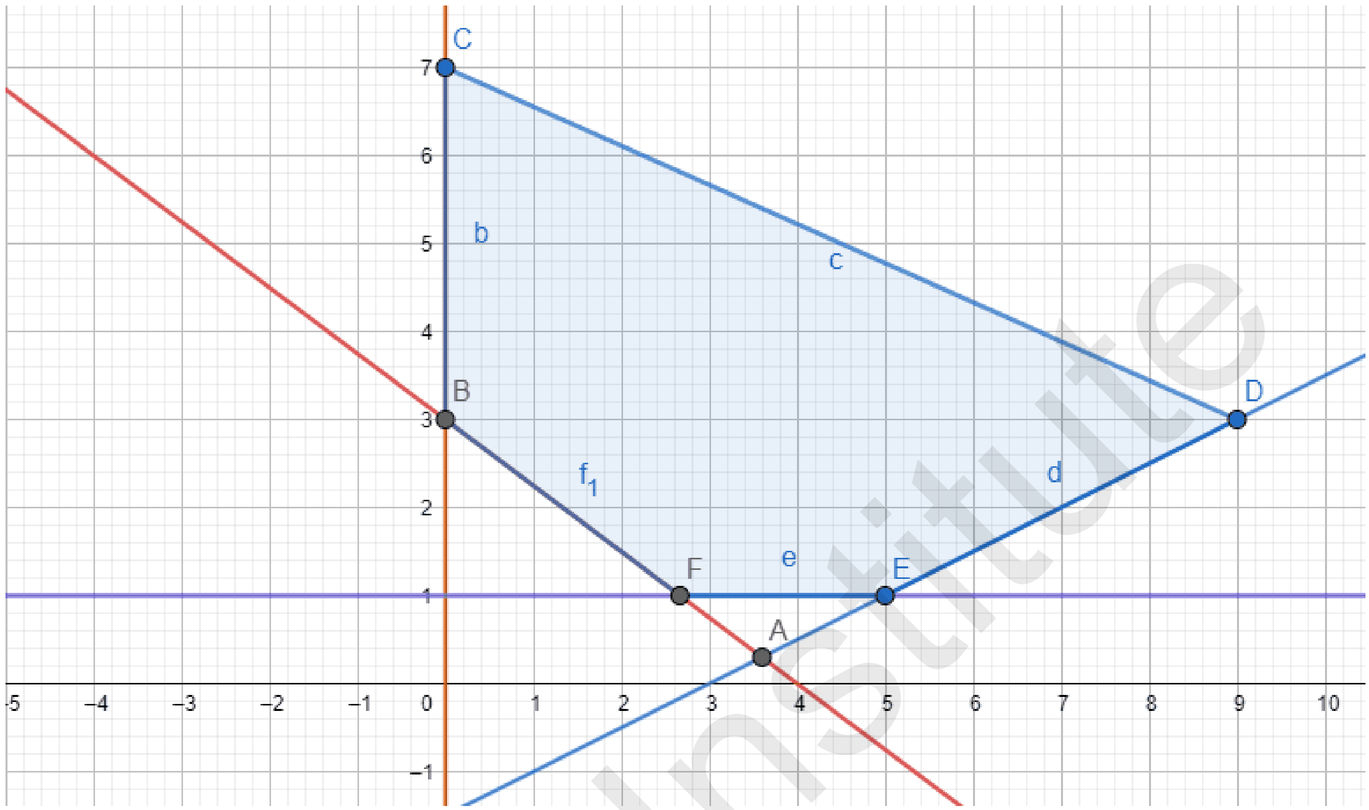
The solution to this inequality is region right hand side of the line $(x = 0)$ including points on this line because points on line also satisfy the inequality.

For $y \geq 1,$

The solution to this inequality is region above the line $(y = 1)$ including points on this line because points on line also satisfy the inequality.

Hence, solution to these linear inequalities is shaded region as shown in figure including points on the respective lines.

This can be represented as follows:



Question:13â□□â□□â□□â□□â□□â□□â□□ Solve the following system of inequalities graphically: $4x + 3y \leq 60,\ \ y \geq 2x,\ \ x \geq 3,\ \ x, y \geq 0$

Answer:

$4x + 3y \leq 60,\ \ y \geq 2x,\ \ x \geq 3,\ \ x, y \geq 0$

Graphical representation of $4x + 3y = 60$, $y = 2x$, $x = 3$, $x = 0$ *and* $y = 0$ is given in graph below.

For $4x + 3y \leq 60,$

The solution to this inequality is region below the line $(4x + 3y = 60)$ including points on this line because points on the line also satisfy the inequality.

For $y \geq 2x$,

The solution to this inequality is region above the line $(y = 2x)$ including points on this line because points on the line also satisfy the inequality.

For $x \geq 3$,

The solution to this inequality is region right hand side of the line $(x = 3)$ including points on this line because points on the line also satisfy the inequality.

For $x \geq 0,$

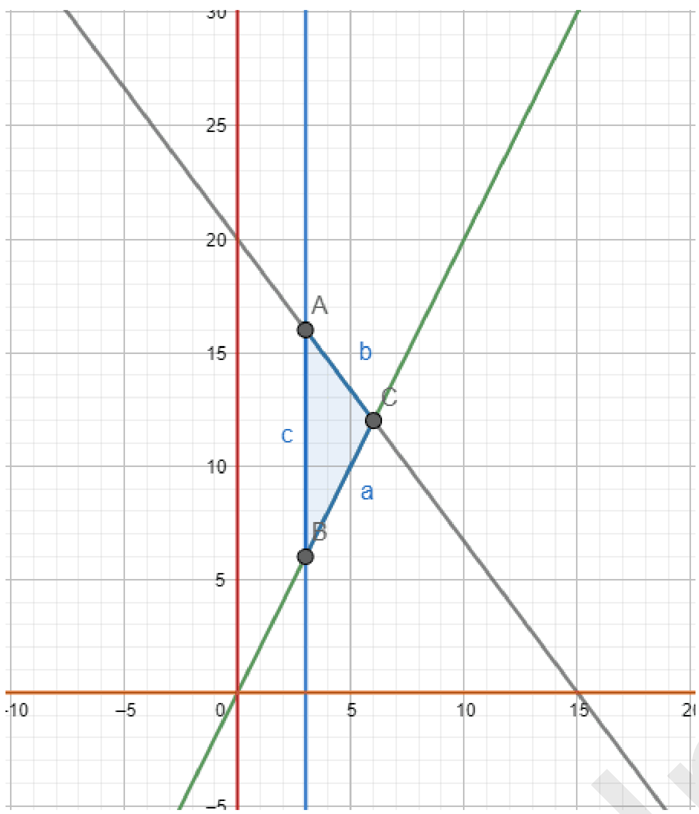
The solution to this inequality is region right hand side of the line $(x = 0)$ including points on this line because points on the line also satisfy the inequality.

For $y \geq 0,$

The solution to this inequality is region above the line $(y = 0)$ including points on this line because points on line also satisfy the inequality.

Hence, solution to these linear inequalities is shaded region as shown in figure including points on the respective lines.

This can be represented as follows:



Question:14â□□â□□â□□â□□â□□â□□â□□ Solve the following system of inequality graphically: $3x + 2y \leq 150,\ x + 4y \leq 80,\ x \leq 15\ y \geq 0,\ x \geq 0$

Answer:

$3x + 2y \leq 150,\ x + 4y \leq 80,\ x \leq 15\ y \geq 0,\ x \geq 0$

Graphical representation of $3x + 2y = 150$, $x + 4y = 80$, $x = 15$, $x = 0\ and\ y = 0$ is given in graph below.

For $3x + 2y \leq 150,$

The solution to this inequality is region below the line $(3x + 2y = 150)$ including points on this line because points on the line also satisfy the inequality.

For $x + 4y \leq 80$,

The solution to this inequality is region below the line $(x + 4y = 80)$ including points on this line because points on the line also satisfy the inequality.

For $x \leq 15$,

The solution to this inequality is region left hand side of the line $(x = 15)$ including points on this line because points on the line also satisfy the inequality.

For $x \geq 0,$

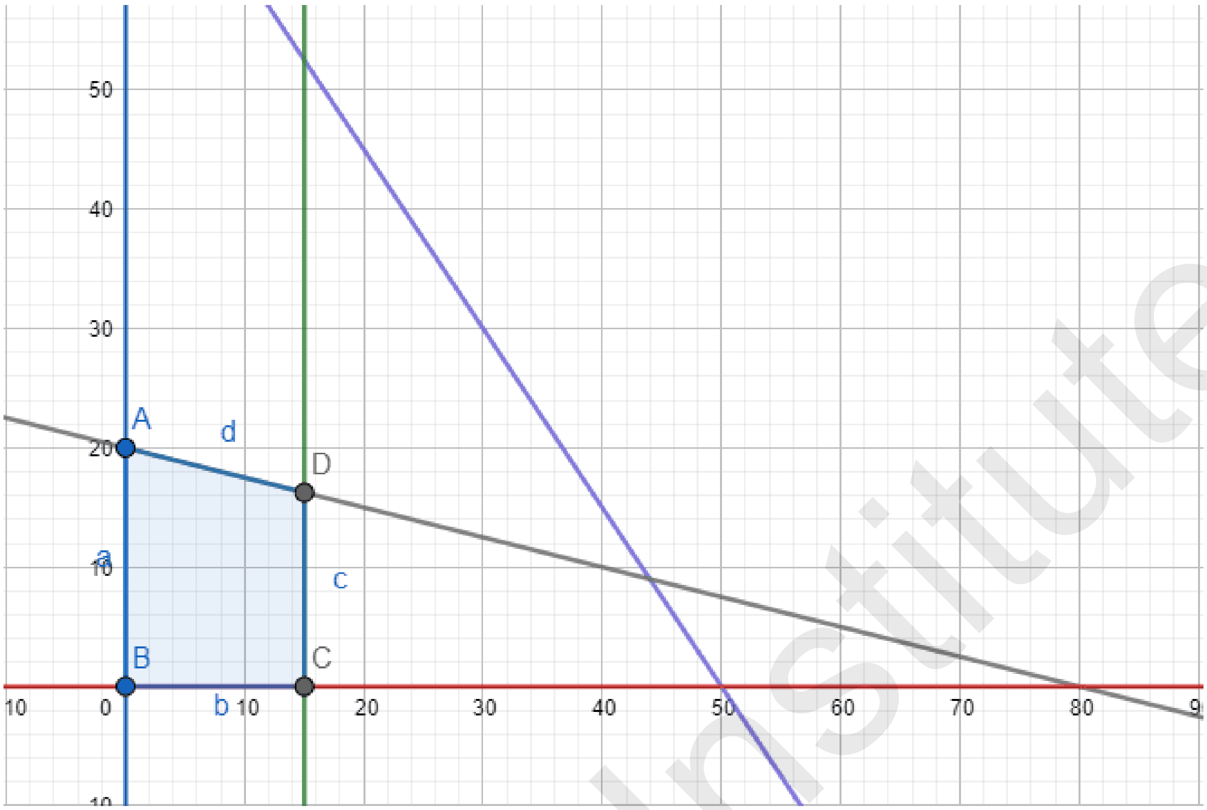
The solution to this inequality is region right hand side of the line $(x = 0)$ including points on this line because points on the line also satisfy the inequality.

For $y \geq 0,$

The solution to this inequality is region above the line $(y = 0)$ including points on this line because points on line also satisfy the inequality.

Hence, solution to these linear inequalities is shaded region as shown in figure including points on the respective lines.

This can be represented as follows:



Question:15â□□â□□â□□â□□â□□â□□â□□ Solve the following system of inequality graphically: $x+2y \le 10,\ x+y \ge 1,\ x-y \le 0, x \ge 0,\ y \ge 0$

Answer:

$x+2y \le 10,\ x+y \ge 1,\ x-y \le 0, x \ge 0,\ y \ge 0$

Graphical representation of $x+2y=10$, $x+y=1$, $x-y=0$, $x=0$ and $y=0$ is given in graph below.

For $x+2y \le 10,$

The solution to this inequality is region below the line $(x+2y=10)$ including points on this line because points on line also satisfy the inequality.

For $x+y \ge 1,$,

The solution to this inequality is region above the line $(x + y = 1)$ including points on this line because points on line also satisfy the inequality.

For $x - y \leq 0,$,

The solution to this inequality is region above the line $(x - y = 0)$ including points on this line because points on line also satisfy the inequality.

For $x \geq 0,$

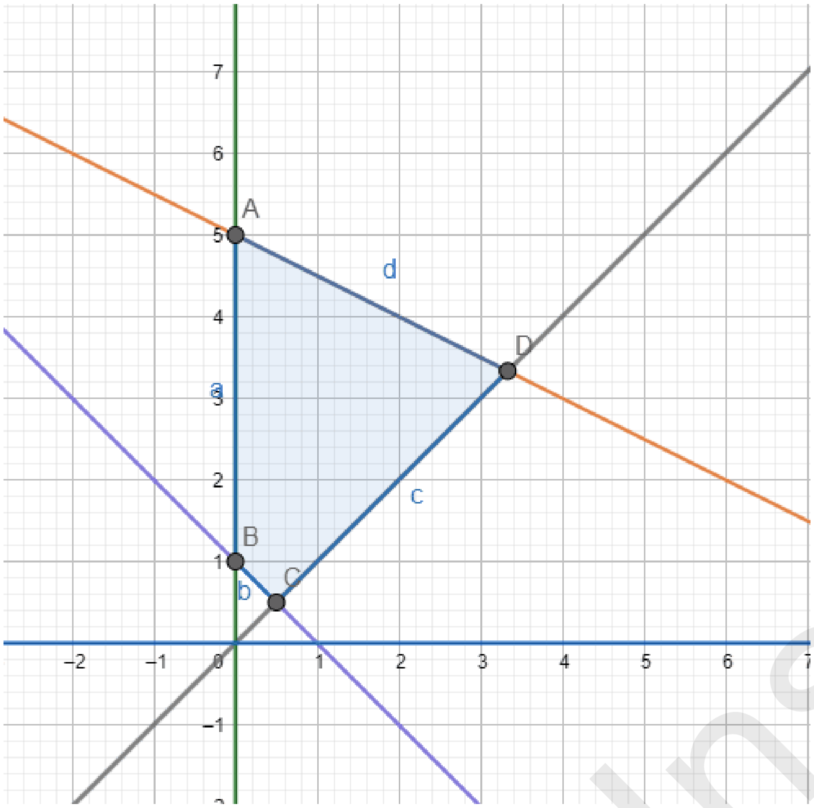
The solution to this inequality is region right hand side of the line $(x = 0)$ including points on this line because points on line also satisfy the inequality.

For $y \geq 0,$

The solution to this inequality is region above the line $(y = 0)$ including points on this line because points on line also satisfy the inequality.

Hence, solution to these linear inequalities is shaded region as shown in figure including points on the respective lines.

This can be represented as follows:



NCERT solutions for class 11 maths chapter 6 linear inequalities-Miscellaneous Exercise

Question:1â□□â□□â□□â□□â□□â□□â□□ Solve the inequality $2 \leq 3x - 4 \leq 5$

Answer:

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

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

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

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

$\Rightarrow \quad \frac{6}{3} \leq x \leq \frac{9}{3}$

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

Thus, all the real numbers greater than equal to 2 and less than equal to 3 are solutions to this inequality.

Solution set is $[2, 3]$

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

Answer:

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

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

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

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

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

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

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

Solution set is $(01]$

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

Answer:

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

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

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

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

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

$\Rightarrow \quad 7 \times 2 \geq 7x \geq -14 \times 2$

$\Rightarrow \quad 14 \geq 7x \geq -28$

$\Rightarrow \quad \frac{14}{7} \geq x \geq \frac{-28}{7}$

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

Solution set is $[-4,2]$

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

Answer:

Given The inequality

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

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

$$\Rightarrow \quad -15 \times 5 < 3(x-2) \leq 0 \times 5$$

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

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

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

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

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

The solution set is $(-23, 2]$

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

Answer:

Given the inequality

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

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

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

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

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

$$\Rightarrow \ -16 \times 5 < 3x \leq -2 \times 5$$

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

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

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

Question:6â□□â□□â□□â□□â□□â□□â□□ Solve the inequality $7 \leq \frac{(3x+11)}{2} \leq 11$

Answer:

Given the linear inequality

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

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

$$\Rightarrow \ 7 \times 2 \leq (3x+11) \leq 11 \times 2$$

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

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

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

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

The solution set of the given inequality is $[1, \frac{11}{3}]$

Question:7â□□â□□â□□â□□â□□â□□â□□ Solve the inequality and represent the solution graphically on number line. $5x + 1 > -24,\ 5x - 1 < 24$

Answer:

Given : $5x + 1 > -24,\ 5x - 1 < 24$

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

$\Rightarrow 5x > -24 - 1 \quad and \quad 5x < 24 + 1$

$\Rightarrow 5x > -25 \quad and \quad 5x < 25$

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

$\Rightarrow x > -5 \quad and \quad x < 5$

$(-5, 5)$

The solution graphically on the number line is as shown

:

Question:8 Solve the inequality and represent the solution graphically on number line. $2(x-1)<x+5,\ 3(x+2)>2-x$

Answer:

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

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

$\Rightarrow \ 2x-2<x+5 \quad and \quad 3x+6>2-x$

$\Rightarrow \ 2x-x<2+5 \quad and \quad 3x+x>2-6$

$\Rightarrow \ x<7 \quad and \quad 4x>-4$

$\Rightarrow \ x<7 \quad and \quad x>-1$

$(-1,7)$

The solution graphically on the number line is as shown :

Question:9 Solve the inequality and represent the solution graphically on number line. $3x-7>2(x-6),\ 6-x>11-2x$

Answer:

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

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

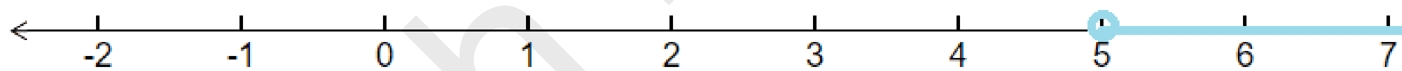
$$\Rightarrow \ 3x - 7 > 2x - 12 \quad and \quad 6 - x > 11 - 2x$$

$$\Rightarrow \ 3x - 2x > 7 - 12 \quad and \quad 2x - x > 11 - 6$$

$$\Rightarrow \ x > -5 \quad and \quad x > 5$$

$$x \in (5, \infty)$$

The solution graphically on the number line is as shown :



Question:10 Solve the inequality and represent the solution graphically on number line.

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

Answer:

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

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

$$\Rightarrow \ 10x - 35 - 6x - 9 \leq 0 \quad and \quad 2x - 6x \leq 47 - 19$$

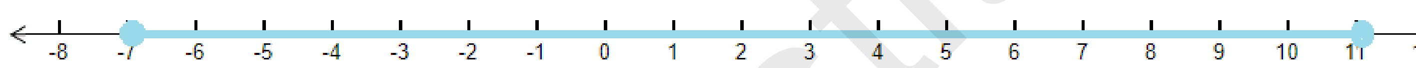
$\Rightarrow \quad 4x - 44 \leq 0 \quad and \qquad -4x \leq 28$

$\Rightarrow \quad 4x \leq 44 \quad and \qquad 4x \geq -28$

$\Rightarrow \quad x \leq 11 \quad and \qquad x \geq -7$

$x \in [-7, 11]$

The solution graphically on the number line is as shown :



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 the value of $F = \frac{9}{5}C + 32$, we have

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

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

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

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

$\Rightarrow \quad 180 < 9C < 225$

$\Rightarrow \quad \frac{180}{9} < C < \frac{225}{9}$

$\Rightarrow \quad 20 < C < 25$

the range in temperature in degree Celsius (C) is between 20 to 25.

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.

Total mixture = (x+640) litres

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

$\therefore\ 2\%x + 8\%\,of\,640 > 4\%\,of\,(640 + x)$ and $2\%x + 8\%\,of\,640 < 6\%\,of\,(x + 640)$

$\Rightarrow\ 2\%x + 8\%\,of\,640 > 4\%\,of\,(640 + x)$ and $2\%x + 8\%\,of\,640 < 6\%\,of\,(x + 640)$

$\Rightarrow\ \frac{2}{100}x + (\frac{8}{100})640 > \frac{4}{100}(640 + x) \Rightarrow\ \frac{2}{100}x + (\frac{8}{100})640 < \frac{6}{100}(640 + x)$

$\Rightarrow\ 2x + 5120 > 4x + 2560 \Rightarrow\ 2x + 5120 < 6x + 3840$

$\Rightarrow\ 5120 - 2560 > 4x - 2x \Rightarrow\ 5120 - 3840 < 6x - 2x$

$\Rightarrow\ 2560 > 2x \Rightarrow\ 1280 < 4x$

$\Rightarrow\ 1280 > x \Rightarrow\ 320 < x$

Thus, the number of litres 2% of boric acid solution that is to be added will have to be more than 320 and 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.

Total mixture = (x+1125) litres

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

The resulting mixture contain more than 25 % but less than 30% acid.

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

$\Rightarrow\ 30\%\, of\ (1125 + x) > 45\%\, of\ (1125)$ and $25\%\, of\ (1125 + x) < 45\%\, of\ 1125$

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

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

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

$\Rightarrow\ 30x > (15) \times (1125) \Rightarrow\ 25x < (20)1125$

$$\Rightarrow\ x > \frac{15 \times 1125}{30} \Rightarrow\ x < \frac{20 \times 1125}{25}$$

$$\Rightarrow\ x > 562.5 \Rightarrow\ x < 900$$

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