#419360

Topic: Linear Inequations

Solve $24x < 100$, when (i) x is a natural number. (ii) x is an integer

Solution

$24x < 100$

$\Rightarrow x < \dfrac{100}{24}$

$\Rightarrow x < \dfrac{25}{6}$

(i) It is evident that $1, 2, 3$ and 4 are the only natural numbers less than $\dfrac{25}{6}$,

Thus when x is a natural number ,the solutions of the given inequality are $1, 2, 3$ and 4.

Hence, in this case, the solution set is $\{1, 2, 3, 4\}$.

(ii) The integers less than $\dfrac{25}{6}$ are $.......-3, -2, -1, 0, 1, 2, 3, 4$.

Hence,in this case ,the solution set is $\{............-3, -2, -1, 0, 1, 2, 3, 4\}$.

#419361

Topic: Linear Inequations

Solve $-12x > 30$, when (i) x is a natural number. (ii) x is an integer

Solution

The given inequality is $-12x > 30$.

$\Rightarrow \dfrac{-12x}{-12} < \dfrac{30}{-12}$ [Dividing both sides by same negative number]

$\Rightarrow x < -\dfrac{5}{2}$

(i) There is no natural number less than $\left(-\dfrac{5}{2}\right)$

(ii) The integers less than $\left(-\dfrac{5}{2}\right)$ are $-\infty, ..., -5, -4, -3$.

#419362

Topic: Linear Inequations

Solve $5x - 3 < 7$, when (i) x is an integer. (ii) x is a real number.

Solution

The given inequality is, $5x - 3 < 7$

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

$\Rightarrow 5x < 10$

$\Rightarrow \dfrac{5x}{5} < \dfrac{10}{5}$

$\Rightarrow x < 2$

(i) The integers less than 2 are $......., -4, -3, -3, -1, 0, 1$.

Thus when x is an integer, the solutions of the given inequality are

all the integral values of x which are less than 2.

(ii) When x is real number the solution is given by $x < 2$,

i.e., all real numbers x which are less than 2.

Thus, the solution set of the given inequality is $x \in (-\infty, 2)$

#419363

Topic: Linear Inequations

Solve $3x + 8 > 2,$ when (i) x is an integer. (ii) x is a real number

Solution

The given inequality is $3x + 8 > 2$

$\Rightarrow 3x + 8 - 8 > 2 - 8$

$\Rightarrow 3x > -6$

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

$\Rightarrow x > -2$

(i) The integers greater than -2 are $-1, 0, 1, 2, \ldots\ldots.$

Thus when x is an integer, the solutions of the given inequality are $-1, 0, 1, 2$...........

(ii) When x is a real number, the solutions of the given inequality are all the real numbers, which are greater than -2.

Thus in this case, the solution set is $(-2, \infty)$

#419365

Topic: Linear Inequations

Solve the inequalities for real x.

$4x + 3 < 5x + 7$

Solution

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

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

$\Rightarrow x > -4$

$\Rightarrow x \in (-4, \infty)$

#419366

Topic: Linear Inequations

Solve the inequalities for real x.

$3x - 7 > 5x - 1$

Solution

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

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

$\Rightarrow 2x < -6$

$\Rightarrow x < -3$

$\Rightarrow x \in (-\infty, -3)$

#419367

Topic: Linear Inequations

Solve the inequalities for real x.

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

Solution

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

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

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

$\Rightarrow x \leq -3$

$\Rightarrow x \in (-\infty, -3]$

#419368

Topic: Linear Inequations

Solve the inequality for real x.

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

Solution

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

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

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

$\Rightarrow x \leq 4$

$\Rightarrow x \in (-\infty, 4]$

#419371

Topic: Linear Inequations

Solve the inequality for real x.

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

Solution

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

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

$\Rightarrow x\left(\frac{6 + 3 + 2}{6}\right) < 11$

$\Rightarrow \frac{11x}{6} < 11$

$\Rightarrow x < 6$

$\Rightarrow x \in (-\infty, 6)$

#419372

Topic: Linear Inequations

Solve the inequality for real x.

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

Solution

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

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

$\Rightarrow \frac{2x - 3x}{6} > 1$

$\Rightarrow \frac{-x}{6} > 1$

$\Rightarrow x < -6$

$\Rightarrow x \in (-\infty, -6)$

#419374

Topic: Linear Inequations

Solve the inequality for real x.

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

Solution

Given, $\frac{3(x-2)}{5} \le \frac{5(2-x)}{3}$

$\Rightarrow 9(x-2) \le 25(2-x)$

$\Rightarrow 9x - 18 \le 25(2-x)$

$\Rightarrow 9x - 18 + 25x \le 50$

$\Rightarrow 34x - 18 \le 50$

$\Rightarrow 34x \le 50 + 18$

$\Rightarrow 34x \le 68 \Rightarrow x \le 2$ or $x \in (-\infty, 2]$

#419377

Topic: Linear Inequations

Solve the inequality for real x.

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

Solution

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

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

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

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

$\Rightarrow 24 \ge \frac{10x - 9x}{5}$

$\Rightarrow 24 \ge \frac{x}{5} \Rightarrow x \le 120$ or $x \in (-\infty, 120]$

#419378

Topic: Linear Inequations

Solve the inequality for real x.

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

Solution

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

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

$\Rightarrow 4x - 4 < 6x - 12$

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

$\Rightarrow 8 < 2x \Rightarrow x > 4$ or $x \in (4, \infty)$

#419380

Topic: Linear Inequations

Solve the inequality for real x.

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

Solution

Given, $37 - (3x+5) \ge 9x - 8(x-3)$

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

$\Rightarrow 32 - 3x \ge x + 24$

$\Rightarrow 32 - 24 \ge x + 3x$

$\Rightarrow 8 \ge 4x \Rightarrow x \le 2$ or $x \in (-\infty, 2]$

#419381

Topic: Linear Inequations

Solve the inequality for real x.

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

Solution

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

$\Rightarrow \frac{x}{4} < \frac{5(5x-2)-3(7x-3)}{15}$

$\Rightarrow \frac{x}{4} < \frac{(25x-10-21x+9)}{15}$

$\Rightarrow \frac{x}{4} < \frac{4x-1}{15}$

$\Rightarrow 15x < 4(4x-1)$

$\Rightarrow 15x < 16x-4$

$\Rightarrow 4 < 16x-15x$

$\Rightarrow x > 4$ or $x \in (4, \infty)$

#419382

Topic: Linear Inequations

Solve the inequality for real x.

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

Solution

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

$\Rightarrow \frac{(2x-1)}{3} \geq \frac{5(3x-2)-4(2-x)}{20}$

$\Rightarrow \frac{(2x-1)}{3} \geq \frac{15x-10-8+4x}{20}$

$\Rightarrow \frac{(2x-1)}{3} \geq \frac{19x-18}{20}$

$\Rightarrow 20(2x-1) \geq 3(19x-18)$

$\Rightarrow 40x-20 \geq 57x-54$

$\Rightarrow -20+54 \geq 57x-40x$

$\Rightarrow 34 \geq 17x$

$\Rightarrow x \leq 2$ or $x \in (-\infty, 2]$

#419384

Topic: Linear Inequations

Solve the inequality and show the graph of the solution on number line:

$3x-2 < 2x+1$

Solution

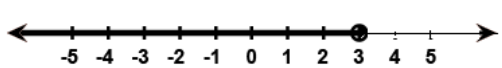
Given, $3x-2 < 2x+1$

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

$\Rightarrow x < 3$ or $x \in (-\infty, 3)$

The lines $y = 3x-2$ and $y = 2x+1$ both will intersect at $x = 3$

Clearly, the dark line shows the solution of $3x-2 < 2x+1$.



#419385

Topic: Linear Inequations

Solve the inequality and show the graph of the solution on number line:

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

Solution

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

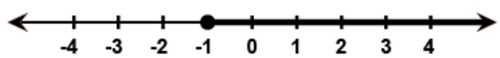
$\Rightarrow 5x - 3x \geq -5 + 3$

$\Rightarrow 2x \geq -2$

$\Rightarrow x \geq -1$ or $x \in [-1, \infty)$

Blue line is $y = 5x - 3$ and red line is $y = 3x - 5$

Both line intersect at $x = -1$ and It is clearly observed from graph that for $x > -1 \Rightarrow 5x - 3 > 3x - 5$



#419386

Topic: Linear Inequations

Solve the inequality and show the graph of the solution on number line:

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

Solution

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

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

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

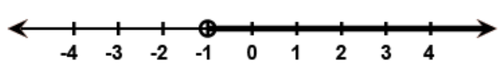
$\Rightarrow -5 < 5x$

$\Rightarrow x > -1$or $x \in (-1, \infty)$

Blue line is $y = 3 - 3x$ and red line is $y = 2x + 8$

Both line intersect at $x = -1$ and It is clearly observed from graph that

For $x > -1 \Rightarrow 2x + 8 > 3 - 3x$



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

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

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

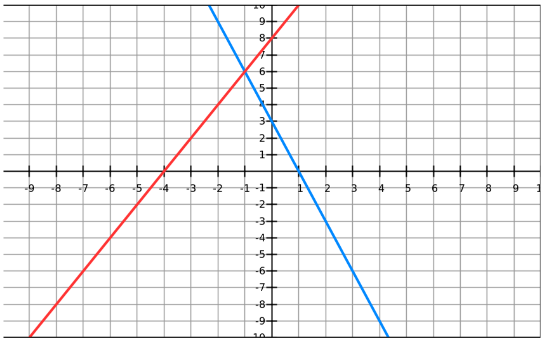
$\Rightarrow -5 < 5x$

$\Rightarrow x > -1$ or $x \in (-1, \infty)$

Blue line is $y = 3 - 3x$ and red line is $y = 2x + 8$

Both line intersect at $x = -1$ and It is clearly observed from graph that

For $x > -1 \Rightarrow 2x + 8 > 3 - 3x$



#419388

Topic: Linear Inequations

Solve the inequality and show the graph of the solution on number line:

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

Solution

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

$\Rightarrow \frac{x}{2} \geq \frac{5(5x-2) - 3(7x-3)}{15}$

$\Rightarrow \frac{x}{2} \geq \frac{25x - 10 - 21x + 9}{15}$

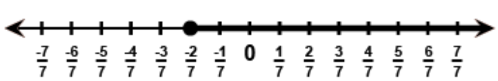
$\Rightarrow \frac{x}{2} \geq \frac{4x - 1}{15}$

$\Rightarrow 15x \geq 2(4x - 1)$

$\Rightarrow 15x \geq 8x - 2$

$\Rightarrow 7x \geq -2$

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



#419389

Topic: Linear Inequations

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.

Solution

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

Since the student should have an average of at least 60 marks.

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

$\Rightarrow 145 + x \geq 180$

$\Rightarrow x \geq 180 - 145$

$\Rightarrow x \geq 35$

Thus the student must obtain a minimum of 35 marks to have an average of at least 60 marks.

#419390

Topic: Linear Inequations

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 Sunitas marks in first four examinations are $87, 92, 94$ and 95, find minimum marks that Sunita must obtain in the fifth examination to get grade A in the course.

Solution

Let x be the marks obtained by Sunita in the fifth examination.

In order to receive grade 'A' in the course she must obtain an average of 90 marks or more in five examinations.

Therefore,

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

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

$\Rightarrow 368 + x \geq 450$

$\Rightarrow x \geq 450 - 368$

$\Rightarrow x \geq 82$

Thus sunita must obtain greater than or equal to 82 marks in the fifth examination.

#419391

Topic: Linear Inequations

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

Solution

Let x be the smaller of the two consecutive odd positive integers.

Then, the other integer will be $x+2$.

Since both the integers are smaller than 10,

$\Rightarrow x + 2 < 10$

$\Rightarrow x < 10 - 2$

$\Rightarrow x < 8 \ldots (i)$

Also, the sum of the two integers is more than 11.

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

$\Rightarrow 2x + 2 > 11$

$\Rightarrow 2x > 11 - 2$

$\Rightarrow 2x > 9$

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

$\Rightarrow x > 4.5$ ...(ii)

From (i) and (ii) since x is an odd number ,x can take the values 5 and 7. Thus the required possible pairs are $(5, 7)$ and $(7, 9)$

#419393

Topic: Linear Inequations

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

Solution

Let x be the smaller of the two consecutive even positive integers .

Then the other integer is $x+2$.

Since both the integers are larger than 5, $x>5$ ....(1)

Also the sum of the two integers is less than 23.

$x+(x+2)<23$

$\Rightarrow 2x+2<23$

$\Rightarrow 2x<23-2$

$\Rightarrow 2x<21$

$\Rightarrow x<\dfrac{21}{2}$

$\Rightarrow x<10.5$....(2)

From (1) and (2) we obtain $5<x<10.5$.

Since x is an even number, x can take the values 6, 8 and 10.

Thus the required possible pairs are $(6,8)$, $(8,10)$ and $(10,12)$.

#419394

Topic: Linear Inequations

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 in cm. of the shortest side.

Answer: 9

Solution

Let the length of the shortest side of the triangle be x cm.

Then length of the longest side $=3x$ cm.

Thus the length of the third side $=(3x-2)$ cm.

Since the perimeter of the triangle is at least 61 cm,

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

$\Rightarrow 7x-2\geq 61$

$\Rightarrow 7x\geq 61+2$

$\Rightarrow 7x\geq 63$

$\Rightarrow x\geq 9$

Thus the minimum length of the shortest side is 9 cm.

#419395

Topic: Linear Inequations

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 5 cm longer than the second?

Solution

Let the length of the shortest piece be x cm .

Then the length of the second piece and the third piece are $(x+3)$ cm and $2x$ cm respectively.

Since the three lengths are to be cut from a single piece of board of length 91 cm,

$x+(x+3)+2x \le 91$

$\Rightarrow 4x+3 \le 91$

$\Rightarrow 4x \le 91-3$

$\Rightarrow 4x \le 88$

$\Rightarrow \dfrac{4x}{4} \le \dfrac{88}{4}$

$\Rightarrow x \le 22$-----(i)

Also the third piece is at least 5 cm longer than the second piece.

$\therefore 2x \ge (x+3)+5$

$\Rightarrow 2x \ge x+8$

$\Rightarrow x \ge 8$....(2)

From (1) and (2) we obtain

$8 \le x \le 22$

Thus the possible length of the shortest board is greater than or equal to 8 cm but less than or equal to 22 cm.

#419397

Topic: Linear Inequations

Solve the following inequalities graphically in two-dimensional plane:

x + y < 5

Solution

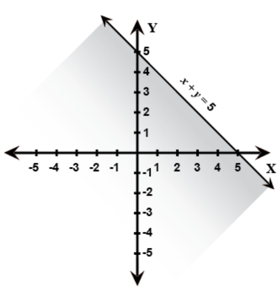
$x+y<5$ is the shaded region shown in the graph.

If we put $O(0,0)$ in the LHS,we get LHS $=0$

Now $LHS<5$

Means $O(0,0)$ lies on "less than " side of the line.

Hence required region is "origin" side of the line.



#419398

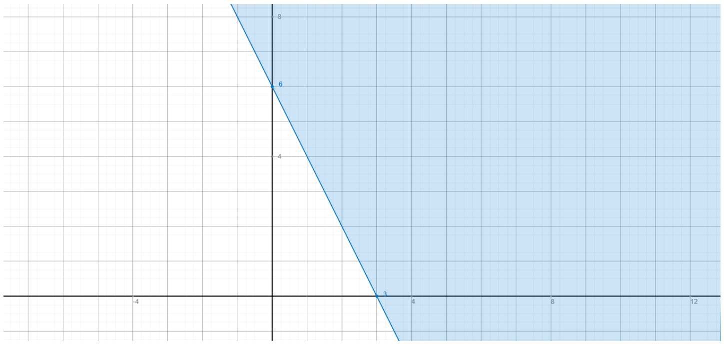
Topic: Linear Inequations

Solve the following inequalities graphically in two-dimensional plane:

$2x+y \ge 6$

Solution

The graphical representation of $2x + y \geq 6$ is shown in the graph. Shaded region represents the given condition.



#419399

Topic: Linear Inequations

Solve the following inequalities graphically in two-dimensional plane:

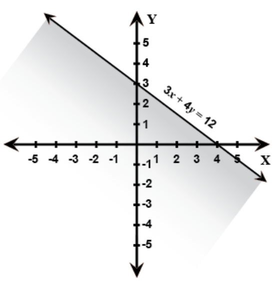
$3x + 4y \leq 12$

Solution

Put $O(0, 0)$ in the LHS we get $LHS = 0$

$0 < 12$

So origin is on "less than " side of the line.



#419400

Topic: Linear Inequations

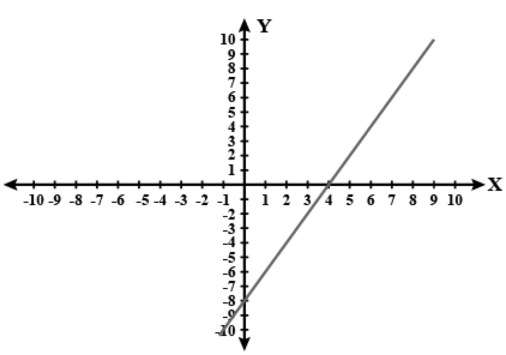
Solve the following inequalities graphically in two-dimensional plane:

$y + 8 \geq 2x$

Solution

$y \geq 2x - 8$

So all the points lies on line or left to the line $y = 2x - 8$ will be your answer



#419401

Topic: Linear Inequations

Solve the following inequalities graphically in two-dimensional plane:

$x - y \le 2$

Solution

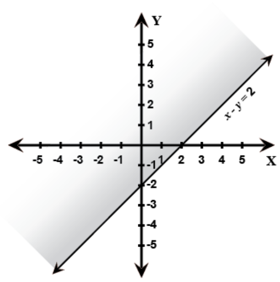
$x - y \le 2$ is the shaded region shown in the graph.

If we put $O(0, 0)$ in the LHS,we get LHS $= 0$

Now $LHS < 0$

Means $O(0, 0)$ lies on "less than " side of the line.

Hence required region is "origin" side of the line.



#419402

Topic: Linear Inequations

Solve the following inequalities graphically in two-dimensional plane:

$2x - 3y > 6$

Solution

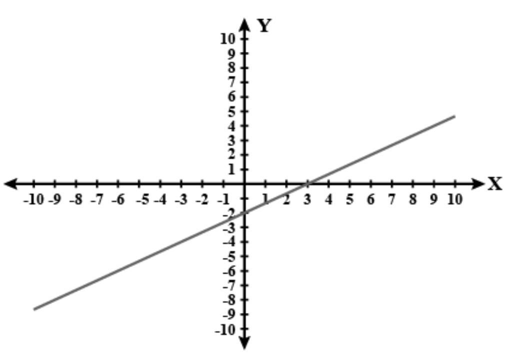
$2x - 3y > 6$

$3y < 2x - 6$

$y < \frac{2x-6}{3}$

Now from graph we have

$y < -2$



#419403

Topic: Linear Inequations

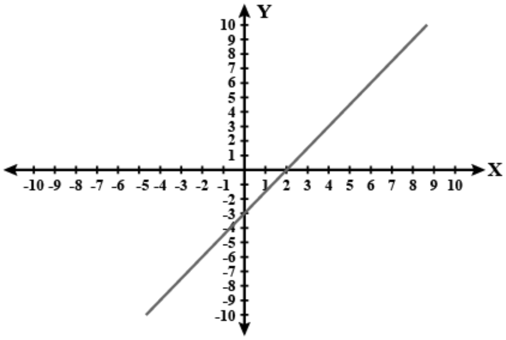
Solve the following inequalities graphically in two-dimensional plane:

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

Solution

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

Will denote the region lies on or above the line $-3x + 2y = -6$



#419404

Topic: Linear Inequations

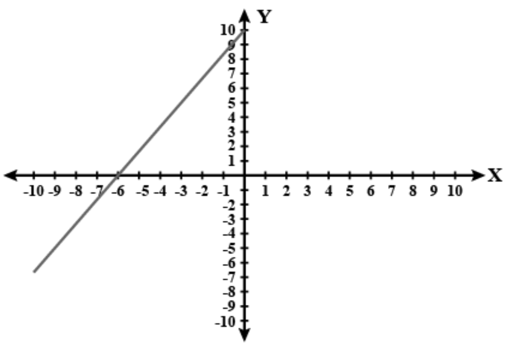
Solve the following inequalities graphically in two-dimensional plane:

$3y - 5x < 30$

Solution

$3y - 5x < 30$ shows the region lies below the line $3y - 5x = 30$

All sets of points(x, y) lies below the line shown in graph satisfy $3y - 5x < 30$



#419405

Topic: Linear Inequations

Solve the following inequalities graphically in two-dimensional plane:

$y < -2$

Solution

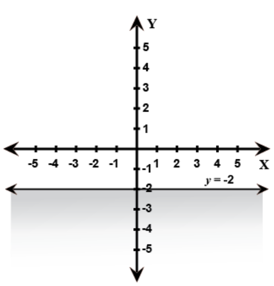
$y < -2$ is the shaded region shown in the graph.

If we put $O(0, 0)$ in the LHS,we get LHS $= 0$

Now $LHS > -2$

Means $O(0, 0)$ lies on opposite side of "less than " side of the line.

Hence required region is "non-origin" side of the line.



#419406

Topic: Linear Inequations

Passage

Solve the following inequalities graphically in two-dimensional plane:

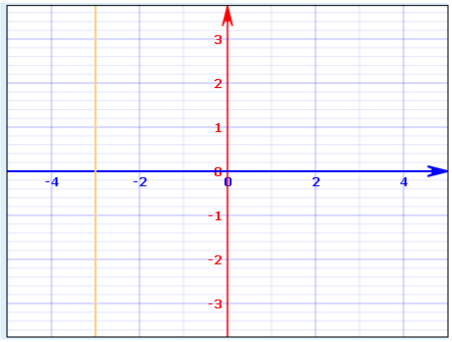
$x > -3$

Solution

Yellow line is $x = -3$

$x > -3$

$x \in (-3, \infty)$



#419407

Topic: Linear Inequations

Solve the given inequalities graphically:

$x \geq 3, y \geq 2$

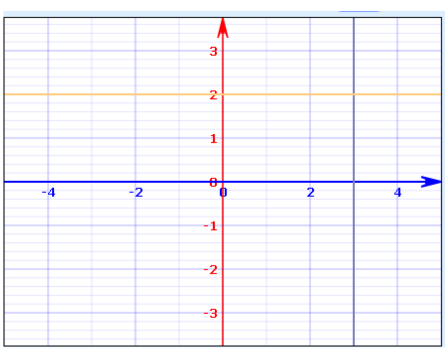
Solution

$x \geq 3, y \geq 2$

$\Rightarrow x \in [3, \infty), y \in [2, \infty)$

Blue line is $x = 3$ and yellow line is $y = 2$

Now we have to look over the region where $x \geq 3$ *and* $y \geq 2$



#419408

Topic: Linear Inequations

Solve the given inequalities graphically:

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

Solution

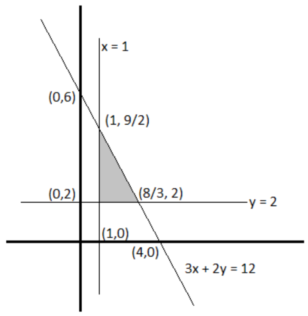
Draw the line $3x + 2y = 12$, $x = 1$ and $y = 2$. Now check for the position of origin w.r.t. the given lines to determine the solution of the inequalities.

For $3x + 2y - 12$ at $(0, 0)$, $3(0) + 2(0) - 12 < 0$. Hence, $(0, 0)$ lies in the inequality $3x + 2y \le 12$

For $x - 1$ at $(0, 0)$, $0 - 1 < 0$. Hence, $(0, 0)$ doesn't lie in the inequality $x \ge 1$

For $y - 2$ at $(0, 0)$, $0 - 2 < 0$. Hence, $(0, 0)$ doesn't lie in the inequality $y \ge 2$.

The shaded part in the above graph represents the solution of the given inequlities.



#419410

Topic: Linear Inequations

Solve the given inequalities graphically:

$2x + y \ \ge \ 6$ and $3x + 4y \ \le \ 12$

Solution

Given equations are $2x + y \ge 6 \Rightarrow y = 6 - 2x$

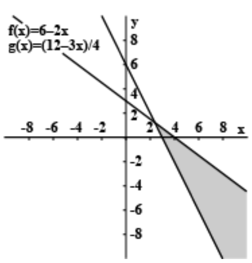
and $3x + 4y \le 12 \Rightarrow y = \dfrac{12 - 3x}{4}$

Let $f(x) = 6 - 2x$

and $g(x) = \dfrac{12 - 3x}{4}$

Intersection of this two lines is shown in figure.

Region is shown in the graph.



#419411

Topic: Linear Inequations

Solve the given inequalities graphically:

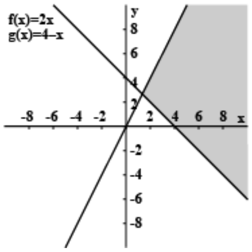
$x + y \ge \ 4$ and $2x - y > 0$

Solution

Given equations are $x + y \geq 4, 2x - y > 0$

Let $f(x) = 2x$ and $g(x) = 4 - x$

The graph of these equations in shown in figure.



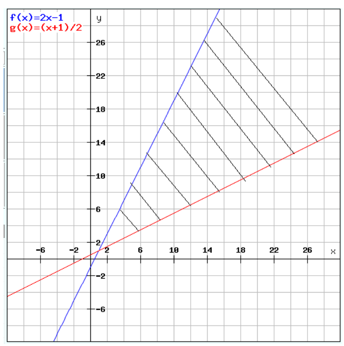
#419730

Topic: Linear Inequations

Solve the following inequations graphically:

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

Solution



#419731

Topic: Linear Inequations

Solve the given inequalities graphically:

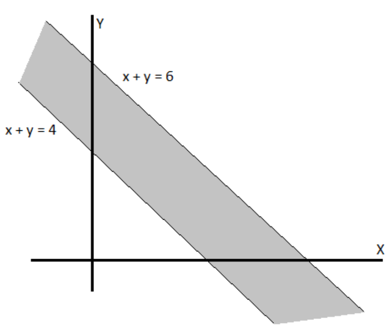
$x + y \leq 6, x + y \geq 4$

Solution

Blue line is $x + y = 6$ and red line is $x + y = 4$

Now we have to look the region which is below or on the $x + y = 6$ line and above or on the $x + y = 4$ line.

So required region is in between the two lines.



#419732

Topic: Linear Inequations

Solve the given inequalities graphically:

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

Solution

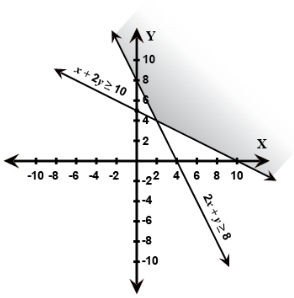
Blue line is $2x + y = 8$ and red line is $x + 2y = 10$

Now according to question we have to look over the region which

$2x + y \geq 8 \;\; and \;\; x + 2y \geq 10$ they intersect at point $(2, 4)$

So for $x > 2$ region is above or on the line $x + 2y = 10$

and for $x < 2$ region is above or on the line $2x + y = 8$



#419733

Topic: Linear Inequations

Solve the given inequalities graphically:

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

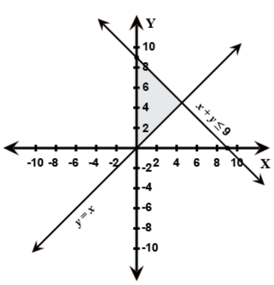
Solution

Blue line is $x + y = 9$ and red line is $y = x$

Now we have to look for $x \geq 0$ region

Line intersect at point let say (a, b) as shown in graph

Region is area of triangle of formed by two lines and y axis as shown in graph



#419734

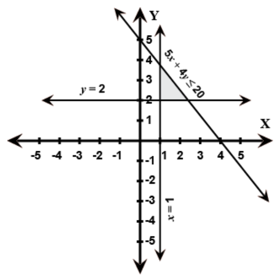
Topic: Linear Inequations

Solve the system of inequalities graphically:

$5x + 4y \leq 20, x \geq 1, y \geq 2$

Solution

Shaded region shows the intersection of given inequality.



#419735

Topic: Linear Inequations

Solve the system of inequalities graphically:

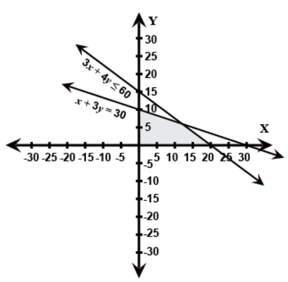
$3x + 4y \le 60,\ \ x + 3y \le 30,\ \ x \ge 0,\ \ y \ge 0$

Solution

For $x, y \ge 0$

See the graph

solution is shaded part.



#419736

Topic: Linear Inequations

Solve the system of inequalities graphically:

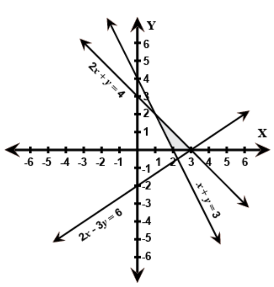
$2x + y \ge\ 4, x + y \le 3, 2x - 3y \le\ 6$

Solution

$2x + y > 4$ for all set of (x, y) which lies above the line $2x + y = 4$

$x + y < 3$ for all set of (x, y) which lies below the line $x + y = 3$

solution is shaded part.



#419737

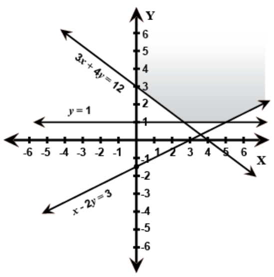
Topic: Linear Inequations

Solve the system of inequalities graphically:

$x-2y \le 3, 3x+4y \ge 12, x \ge 0, y \ge 1$

Solution

$x \ge 0$ *and* $y \ge 1$



#419739

Topic: Linear Inequations

Solve the system of inequalities graphically:

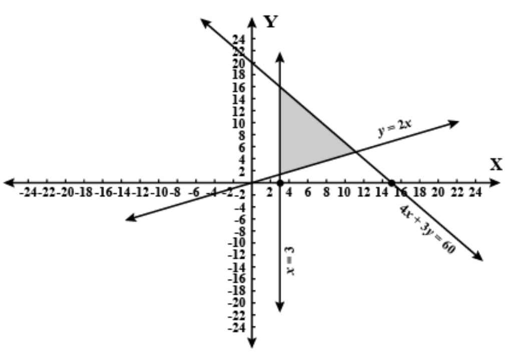
$4x+3y \le 60, y \ge 2x, x \ge 3, (x, y \ge 0)$

Solution

Given equations are $4x+3y \le 60$, $y \ge 2x$ and $x \ge 3$

On plotting these, we get to form a triangle.

Here solution is the shaded part.



#419740

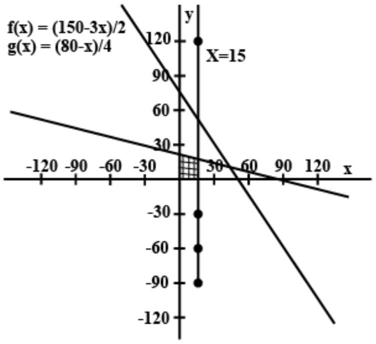
Topic: Linear Inequations

Solve the system of inequalities graphically

$3x+2y \le 150, x+4y \le 80, x \le 15, y \ge 0, x \ge 0$

Solution

solution is shaded part.



#419742
Topic: Linear Inequations

Solve the given inequalities graphically:

$x+2y \leq 10, x+y \geq 1, x-y \leq 0, x \geq 0, y \geq 0$

Solution

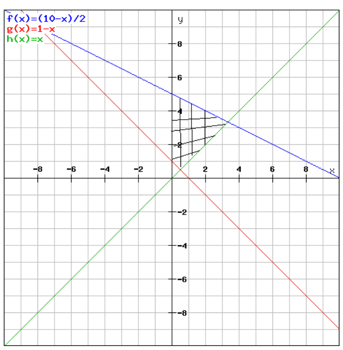
blue line is $x+2y=10$

red line is $x+y=1$

and green line is $x-y=0$

According to question, For $x, y \geq 0$

Region shown in graph



#447479
Topic: Linear Inequations

Solve the inequalities:

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

Solution

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

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

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

$\Rightarrow 2 \leq x \leq 3$

$\Rightarrow x \in [2,3]$

#447480
Topic: Linear Inequations

Solve the inequalities

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

Solution

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

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

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

$\Rightarrow 0 < x \le 2$

$\Rightarrow x \in (0, 2]$

#447481

Topic: Linear Inequations

Solve the inequalities

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

Solution

We have,

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

Add -4 on each of the sides, we get

$-3-4 \le -4+4-\dfrac{7x}{2} \le 18-4$

$\Rightarrow -7 \le -\dfrac{7x}{2} \le 14$

Multiply $\dfrac{2}{7}$ on each of the sides

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

Now multiply each side by -1

$\Rightarrow 2 \ge x \ge -4$, since after multiplying any inequalty by negative number its sign reverses

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

$\Rightarrow x \in [-4, 2]$

#447482

Topic: Linear Inequations

Solve the inequalities

$-15 < \dfrac{3(x-2)}{5} \le 0$

Solution

$-15 < \dfrac{3(x-2)}{5} \le 0$

$-25 < x-2 \le 0$

$-23 < x \le 2$

$x \in (-23, 2]$

#447483

Topic: Linear Inequations

Solve the inequalities

$-12 < 4 + \dfrac{3x}{5} \le 2$

Solution

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

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

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

$\dfrac{-80}{3} < x \leq \dfrac{-10}{3}$

$\therefore x \in \left(\dfrac{-80}{3}, \dfrac{-10}{3}\right]$

#447484

Topic: Linear Inequations

Solve the inequalities

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

Solution

Given :

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

$14 < 3x + 11 \leq 22$

$3 < 3x \leq 11$

$1 < x \leq \dfrac{11}{3}$

$\therefore x \in \left(1, \dfrac{11}{3}\right]$

#447485

Topic: Linear Inequations

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

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

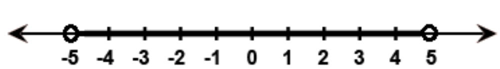
Solution

We have, $5x + 1 > -24 \Rightarrow 5x > -24 - 1 = -25 \Rightarrow x > -5$

and $5x - 1 < 24 \Rightarrow 5x < 24 + 1 = 25 \Rightarrow x < 5$

Thus combining above we get $-5 < x < 5$

Solution is shown in above graph.



#447486

Topic: Linear Inequations

Solve the inequality and represent the solution graphically on number line.

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

Solution

Red line is $y = 2x - 2$

Green line is $y = x + 5$

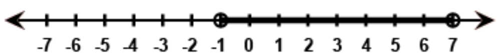
black line $y = 2 - x$

blue line is $y = 3x + 6$

Since $2x - 1 < x + 5$ *for* all $x < 7$

and $3(x + 2) > 2 - x$ *for all* $x > -1$

So intersection of these $x \in (-1, 7)$



#447487

Topic: Linear Inequations

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

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

Solution

Red line is $y = 3x - 7$

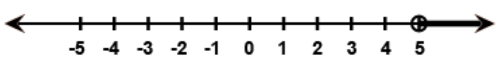
Green line is $y = 2x - 12$

black line $y = 11 - 2x$

blue line is $y = 6 - x$

Since $3x - 7 > 2x - 12$ for all $x > -5$

and $6 - x > 11 - 2x$ for all $x > 5$



#447488

Topic: Linear Inequations

Solve the inequality and represent the solution graphically on number line.

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

Solution

We have,

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

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

$\Rightarrow 4x - 44 \leq 0 \Rightarrow x \leq 11$

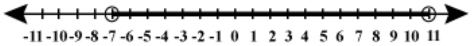
And $2x + 19 \leq 6x + 47$

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

$\Rightarrow -4x \leq 28 \Rightarrow x \geq -7$

Thus using above two we have $-7 \leq x \leq 11$

Solution is also shown graphically



#447489

Topic: Linear Inequations

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

Solution

We have, $F = \frac{9}{5}C + 32 \Rightarrow C = \frac{5}{9}(F - 32)$

Now at $F = 68^o$, $C = \frac{5}{9}(68 - 32) = \frac{5}{9}(36) = 20$

and at $F = 77^o$, $C = \frac{5}{9}(77 - 32) = \frac{5}{9}(45) = 25$

Hence range of temperature in degree Celsius is $[20^oC, 25^oC]$

#447490

Topic: Linear Inequations

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?

Solution

Let's add x liter of 2% boric acid solution.

Let's find x when final solution is 4% boric acid

Equating water content

$0.98x + .92 \times 640 = .96(x + 640).02x = 25.6x = 1280$

Similarly for 6% boric solution

$0.98x + .92 \times 640 = .94(x + 640).04x = 12.8x = 320$

#447491

Topic: Linear Inequations

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?

Solution

Let's add x litres of water

Now if the solution is 45% acid then it is 55% water.

Equating water in initial and final solution

$x + 0.55(1125) = 0.75(x + 1125)$ [When solution is 25% acid]

$x + 618.75 = 0.75x + 843.75$ [When solution is 30% acid]

$0.25x = 225$

$x = 900$ (to get 25% of acidic solution)

$x + 0.55(1125) = 0.7(x + 1125)$

$x + 618.75 = 0.7x + 787.5$

$0.3x = 168.75$

$x = 562.5$ (to get 30% of acidic solution)

i.e $562.5 < x < 900$

#447492

Topic: Linear Inequations

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 $80 \le IQ \le 140$ for a group 12 years old children, find the range of their mental age.

Solution

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

$96 \le MA \times 10 \le 14 \times 12$

$9.6 \le MA \le 16.8$

range of mental age is$[9.6, 16.8]$