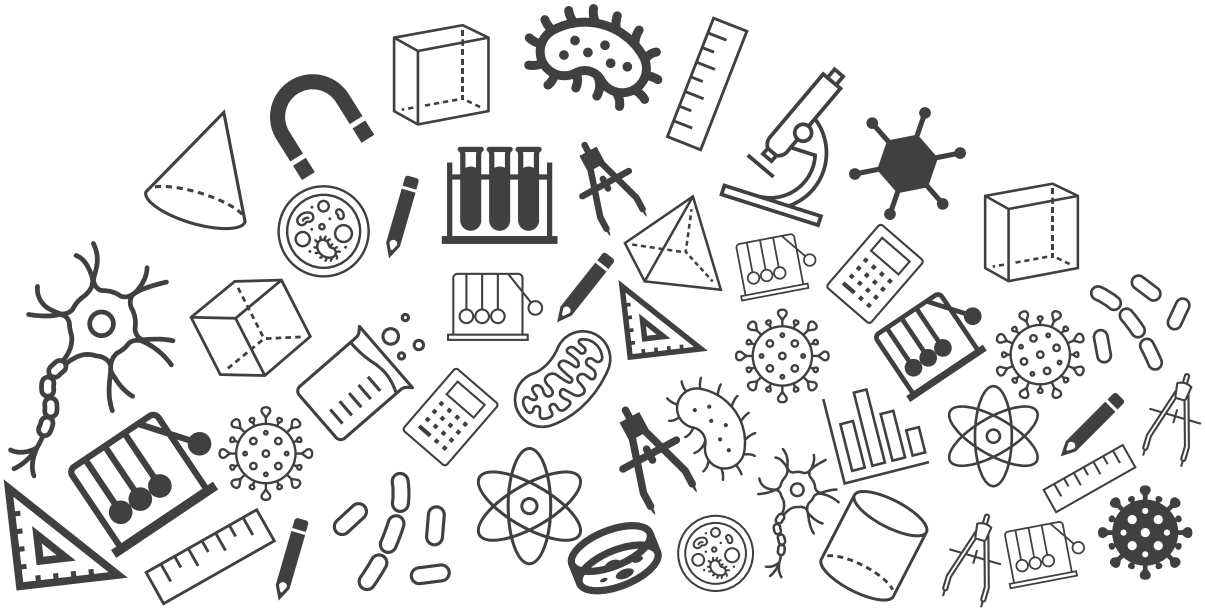
Grade 10

Mathematics

Exam Important Questions



Pair of Linear Equations in Two Variables

Topic : Exam Important Questions

1. Solve :
$2x - 3y = 2,\ x + 2y = 8$
using the method of substitution.

[3 marks]

Given,
$2x - 3y = 2 \ldots (1)$
$x + 2y = 8 \ldots (2)$

From (2), we have,
$x = 8 - 2y \qquad (1mark)$

Substituting this value of x in (1), we have,
$2(8 - 2y) - 3y = 2$
i.e., $16 - 4y - 3y = 2 \implies 7y = 14$
$\implies y = 2$ (1 mark)

Now, $x = 8 - 2y \implies x = 8 - 2(2) = 4$
Thus, $x = 4\ and\ y = 2 \qquad (1mark)$

2. Abdul travelled 300 km by train and 200 km by taxi taking 5 hours 30 minutes.But,if he travels 260 km by train and 240 km by taxi,he takes 6 minutes longer.Find the speed of the train and that of the taxi.
(3 Marks)

Let the speed of the train and taxi be x km/hr and y km/hr respectively.

Now,

time taken by train to cover 300 km $= \frac{300}{x}$ hours

and time taken by taxi to cover 200 km $= \frac{200}{y}$ hours

also

total time taken = 5 hours 30 minutes
$= 5\frac{1}{2} hours = \frac{11}{2} hours$
$\Rightarrow \frac{300}{x} + \frac{200}{y} = \frac{11}{2}$
$\Rightarrow \frac{600}{x} + \frac{400}{y} = 11 - - - -(1)$ $(1 Mark)$

also, time taken by train to cover 260 km $= \frac{260}{x}$ hours

time taken by taxi to cover 240 km $= \frac{240}{y}$ hours

and total time taken = 5 hours 30 minutes + 6 minutes

= 5 hours 36 minutes $= 5\frac{5}{3} hours = \frac{28}{5}$

$\Rightarrow \frac{260}{x} + \frac{240}{y} = \frac{28}{5}$
$\Rightarrow \frac{325}{x} + \frac{300}{y} = 7 - - - (2)$ $(1 Mark)$

Putting $\frac{1}{x} = u$ and $\frac{1}{y} = v$ in (1) and (2) we get

$600u + 400v = 11 - - - -(3)$
$325u + 300v = 7 - - - -(4)$

Solving (3) and (4)

$u = \frac{1}{100}$
$v = \frac{1}{80}$

x = 100 and y = 80 (1 Mark)

Hence the speed of the train is 100 km/hr

and the speed of the taxi is 80 km/hr

3. Solve the given equations by elimination method. (3 marks)

$3x-5y=4$
$9x=2y+7$

$3x-5y=4$.....(1)

$9x=2y+7$
$9x-2y=7$.....(2) (0.5 mark)

On multiplying equation (1) by 3, we get

$9x-15y=12$.....(3) (0.5 mark)

On subtracting (2) from (3), we get

$-13y=5$

$\Rightarrow y=\frac{-5}{13}$ $(1mark)$

On substituting the value of y in (2), we get

$9x=2y+7$

$\Rightarrow x=\frac{7+2y}{9}$

$\Rightarrow x=\frac{7-\frac{10}{13}}{9}$ = $\frac{81}{13\times 9}$

$\Rightarrow x=\frac{9}{13}$

So, $x=\frac{9}{13}$ and $y=\frac{-5}{13}$ is the solution of the given pair of linear equations in two variables. (1 mark)

4. Do the following pair of linear equations have no solution? Justify your answer.
2x + 4y = 3 and 12y + 6x = 6

[2 Marks]
[Graphical Method of Solution of a Pair of Linear Equations]

Condition for no solution $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$
[1 Mark]
2x + 4y = 3 and 12y + 6x = 6
$a_1 = 2, b_1 = 4, c_1 = -3$
$a_2 = 6, b_2 = 12, c_2 = -6$
$\frac{a_1}{a_2} = \frac{2}{6} = \frac{1}{3}, \frac{b_1}{b_2} = \frac{4}{12} = \frac{1}{3}, \frac{c_1}{c_2} = \frac{-3}{-6} = \frac{1}{2}$
$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$
Hence, the given pair of linear equations has no solution.
[1 Mark]

5. Show graphically that each of the following given systems of equations is inconsistent,i.e., has no solution:

$x - 2y = 6, 3x - 6y = 0$

(3 Marks)

We have, $x - 2y = 6 \quad and \quad 3x - 6y = 0$

Now x - 2y = 6

x = 6 + 2y

When y = -2 then, x = 2

When y=-3 then, x=0

Thus, we have the following table giving points on the line x-2y=6

x	2	0
Y	-2	-3

(1 Mark)

Now, 3x - 6y = 0

x = 2y

When y = 0, then y = 0

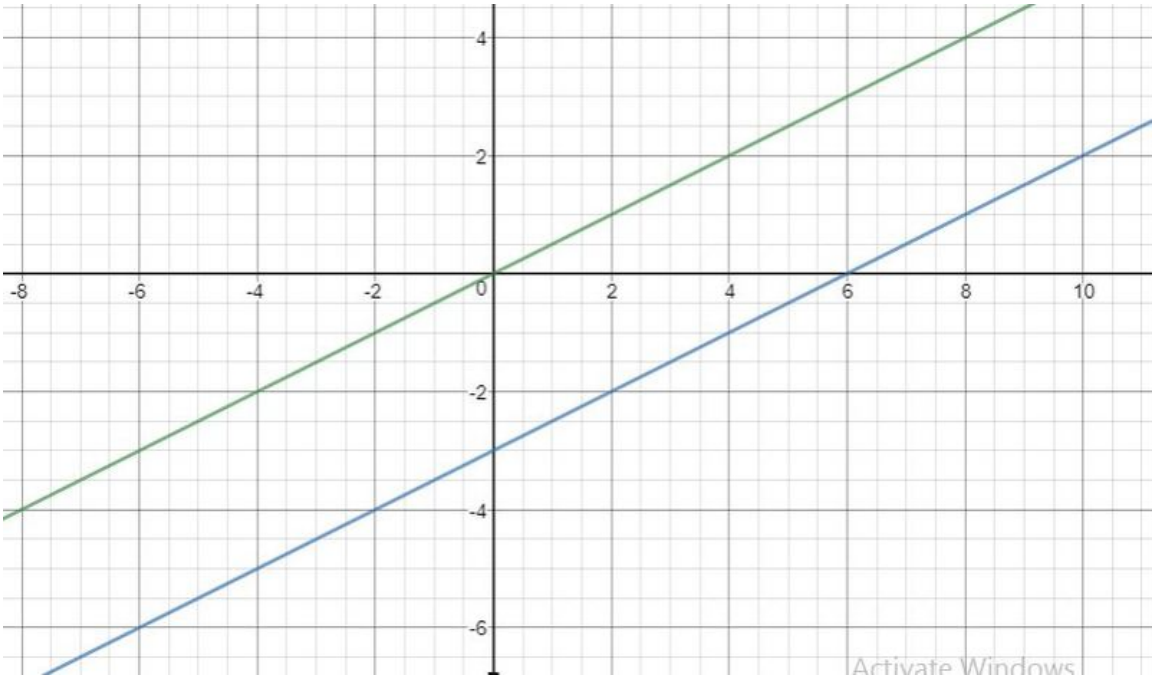
When y=-1 , then x = 2

Thus, we have the following table giving points on the line 3x - 6 y = 0

X	0	2
Y	0	1

(1 Mark)

Graph of the equation x - 2y = 6 and 3x - 6y = 0



(1 Mark)

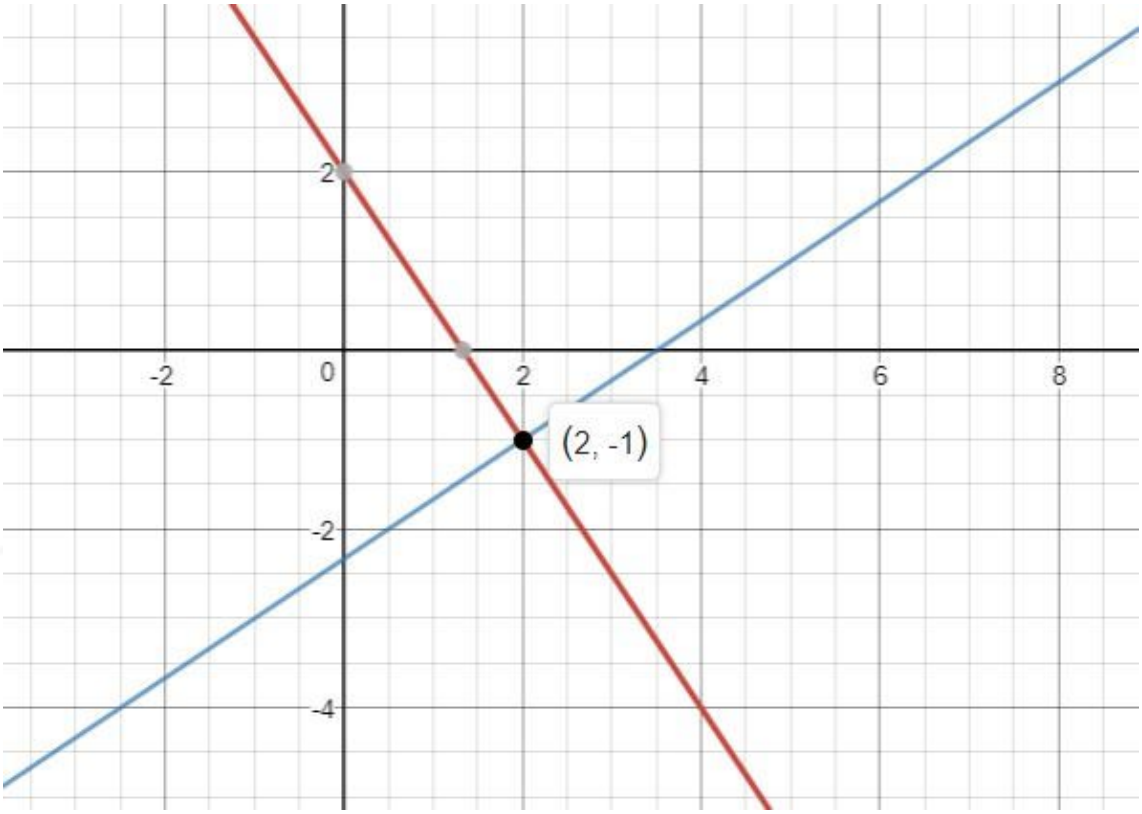
Clearly, two lines are parallel to each other. So, the two lines have no common point.

Hence the given system has no solutions.

6. Solve each of the following systems of equations graphically:

$3x + 2y = 4, 2x - 3y = 7.$
(2 Marks)

The system of the given equation is 3x+2y-4=0 and 2x-3y-7=0



(1 Mark)

Clearly, the two lines intersect at P(2,-1)

Hence x=2 and y=-1 is the solution of the given system of equations.
(1 Mark)

7. Draw the graphs of the equations x - y + 1 = 0 and 3x + 2y - 12 = 0. Determine the coordinates of the vertices of the triangle formed by these lines and the x-axis, and shade the triangular region.
(3 marks)

x - y + 1 = 0
$\Rightarrow$ x = y -1

x	0	1	2
y	1	2	3

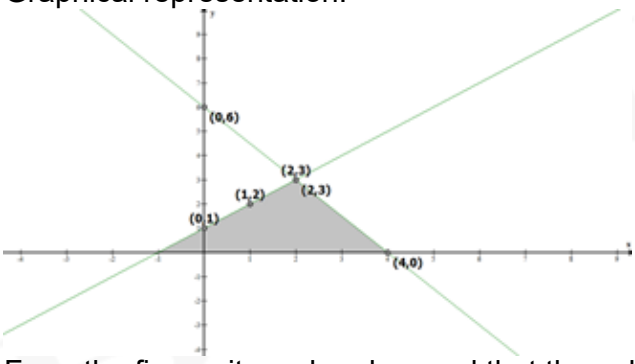
$(1Mark)$

3x + 2y - 12 = 0
$\Rightarrow x = \frac{12-2y}{3}$

x	4	2	0
y	0	3	6

$(1Mark)$

Graphical representation:

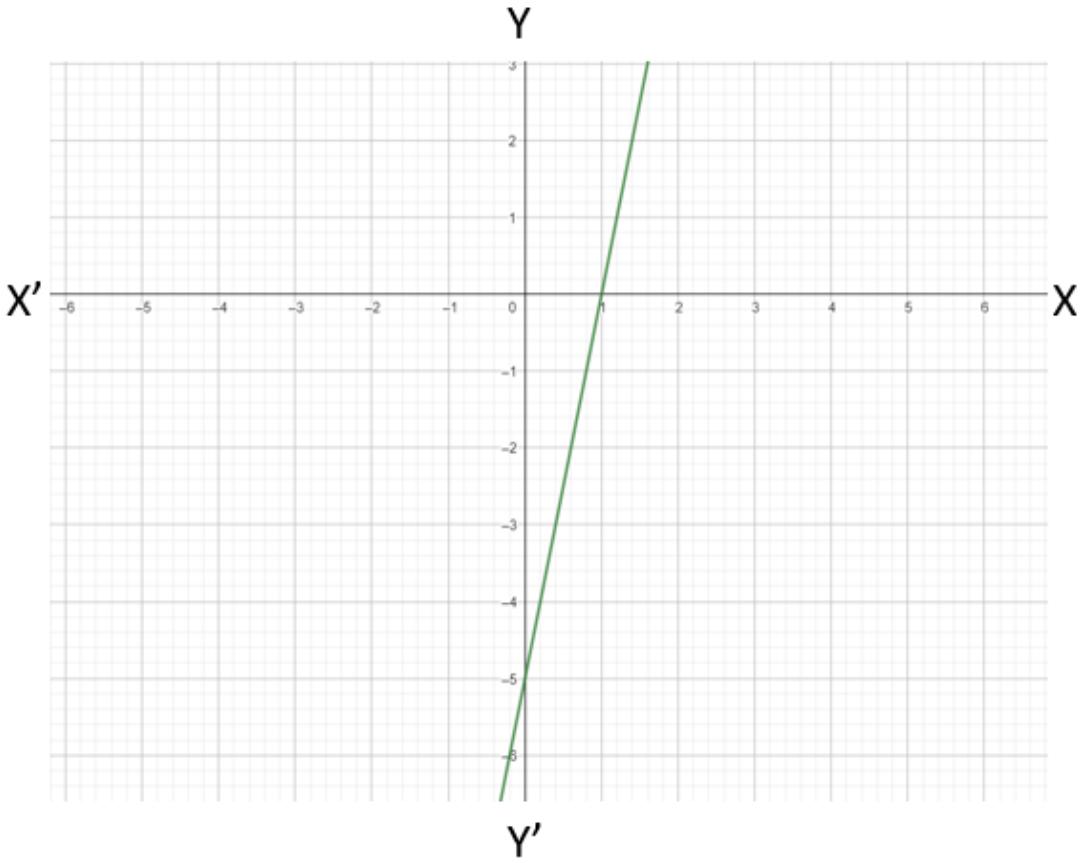


From the figure, it can be observed that these lines are intersecting each other at point (2, 3) and *x*-axis at (- 1, 0) and (4, 0). Therefore, the vertices of the triangle are (2, 3), (- 1, 0), and (4, 0). (1 Mark)

8. Plot the graph of y=5x-5

(3 marks)

In equation y=5x-5,
if x=0, y=-5 (0.5 Marks)
if y=0, x=1 (0.5 Marks)
so the graph will be:



(2 Marks)

9. Graphically, find the number of solution for the following pair of linear equations in two variables:

6x – 3y + 10 = 0

2x – y + 9 = 0

[3 marks]

The first equation is

$6x-3y+10=0$

$\Rightarrow 2x-y+\frac{10}{3}=0$

$y=2x+\frac{10}{3}$

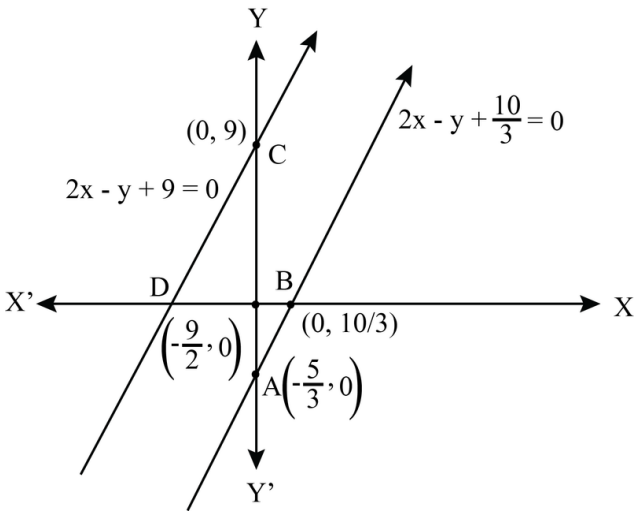
x	0	$-\frac{5}{3}$
y	$\frac{10}{3}$	0
$Points$	A	B

(1 Mark)

$And\ table\ for\ 2x-y+9=0$

x	0	$-\frac{9}{2}$
$Y=2x+9$	9	0
$Points$	C	D

(1 Mark)



Since, the given pair of linear equations in two variables represents two parallel lines. hence, no solution.

(1 Mark)

10. Draw the graphs of the equations 5x - y = 5 and 3x - y = 3. Determine the co-ordinates of the vertices of the triangle formed by these lines and the y axis.
(3 marks)

5x - y = 5
or, y = 5x - 5
The solution table will be as follows.

x	0	1	2
y	-5	0	5

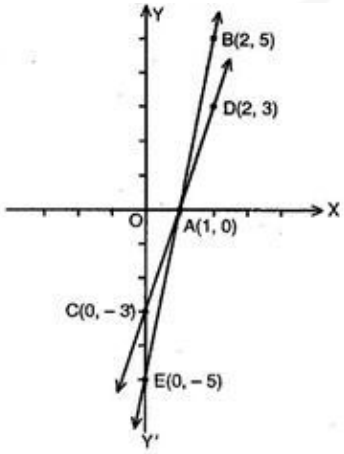
(1 Mark)

3x-y=3
or, y = 3x - 3

x	0	1	2
y	-3	0	3

(1 Mark)

The graphical representation of these lines will be as follows:



(1 Mark)

It can be observed that the required triangle triangle is ΔACE formed by these lines and y axis.
The coordinates of vertices are A (1,0), C (0,-3), E (0,-5).