Practice Questions - Term I

Date: 20/11/2021

Subject: Mathematics

Topic : Pair of Linear Equations in Two Variables

Class: X

1. Consider two equations in the variables **x** and **y** written in the standard form:
   $5x + 6y + 4 = 0 \; and$
   $10x + 12y + 7 = 0$
   What is the nature of these two lines?

   A. Coincident
   B. Intersecting
   C. Parallel ✔
   D. Coincident or parallel

The equations of the two lines are:

$5x + 6y + 4 = 0$
$10x + 12y + 7 = 0$

Here,
$a_1 = 5, b_1 = 6, c_1 = 4, a_2 = 10, b_2 = 12, c_2 = 7.$

$\frac{a_1}{a_2} = \frac{5}{10} = \frac{1}{2}$

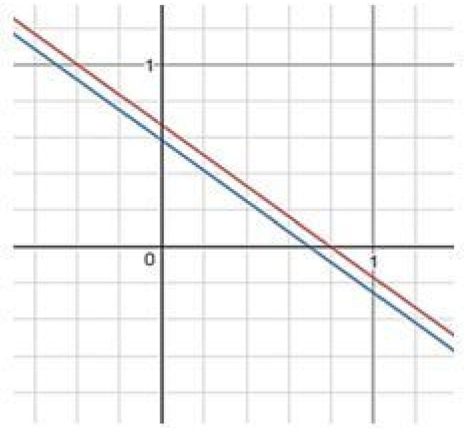
$\frac{b_1}{b_2} = \frac{6}{12} = \frac{1}{2}$

$\frac{c_1}{c_2} = \frac{4}{7}.$

$\Rightarrow \frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}.$

$\Rightarrow$ The pair of equations have no solutions, i.e, they are parallel.

Also, when we plot the graphs of these two equations, it is visible that they are parallel to each other.



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2. The number of solutions of the given pair of linear equations $3x - 9y = 10$ and $9x - 27y = 30$ is:

A. Infinite

B. One

C. Two

D. Zero

$a_1 = 3,\ b_1 = -9,\ and\ c_1 = 10$
$a_2 = 9,\ b_2 = 27,\ and\ c_2 = 30$

$\frac{a_1}{a_2} = \frac{3}{9},\ \frac{b_1}{b_2} = \frac{-9}{27},\ \frac{c_1}{c_2} = \frac{10}{30}$
$\Rightarrow \frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2} = \frac{1}{3}$

So, the given pair of straight lines have infinite solutions.

3. If the lines given by 3x + 2ky = 2 and 3x + 5y = 1 are parallel, then the value of 'k' is.

A. $\frac{15}{4}$

B. $\frac{4}{15}$

C. $\frac{3}{4}$

D. $\frac{4}{3}$

Condition for parallel lines is
$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$
Given 3x + 2ky – 2 = 0
And 2x + 5y – 1 = 0
Here, $a1 = 3,\ b1 = 2k,\ c1 = -2$
and $a_2 = 2,\ b_2 = 5,\ c_2 = -1$

From Eq (i), $\frac{3}{2} = \frac{2k}{5}$
$\therefore k = \frac{15}{4}$

Also, $\frac{c_1}{c_2} = \frac{-2}{-1} = 2$

Thus, $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

4. One equation of a pair of dependent linear equations is $x + y = 30$. The second equation can be

A. $4x + 5y = 150$

B. $5x + 5y = 150$

C. $5x + 5y = 15$

D. $4x + 5y = 150$

When we plot the 2 lines, if we get a single line, then the two lines are coincident lines.
We have the equation $x + y = 30$.
Multiplying both the sides by 5, we get $5x + 5y = 150$.
Hence, $x + y = 30$ and $5x + 5y = 150$ are coincident lines.

5. For what value of k, will the following system of equations have infinitely many solutions?
$2x + 3y = 4, (k + 2)x + 6y = 3k + 2$

A. k = 2

B. k = 3

C. k = 4

D. k = 5

Given: $2x + 3y = 4, (k + 2)x + 6y = 3k + 2$

Condition for infinitely many solutions is

$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

$a_1 = 2, a_2 = k + 2,\ b_1 = 3, b_2 = 6,\ c_1 = 4 c_2 = 3k + 2$

$\frac{2}{k+2} = \frac{3}{6} = \frac{4}{3k+2}$

$\frac{2}{k+2} = \frac{3}{6}$

$\frac{2}{k+2} = \frac{1}{2}$

$k + 2 = 4$

$k = 2$

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6. Determine the value of k for which the given system of equations has a unique solution:
$x - ky = 2, 3x + 2y = -5$

- **A.** The given system of equations will have unique solution for all real values of k other than $-\frac{2}{3}$
- **B.** The given system of equations will have unique solution for all real values of k other than $\frac{2}{3}$
- **C.** The given system of equations will have unique solution for all real values of k other than $\frac{5}{2}$
- **D.** The given system of equations will have unique solution for all real values of k other than $\frac{2}{9}$

Condition for the unique solution the condition is

$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

$\Rightarrow \frac{1}{3} \neq \frac{-k}{2}$

$\Rightarrow k \neq \frac{-2}{3}$

7. What is the solution of the pair of linear equations: $2x - 3y = 2,\ x + 2y = 8$?

- A. $x = 2\ and\ y = 4$
- B. $x = 4\ and\ y = 2$
- C. $x = 4\ and\ y = 4$
- D. $x = 2\ and\ y = 2$

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

From (2), we have,
$x = 8 - 2y$

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

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

8. The age of the father is twice the sum of the ages of his two children. After 20 years, his age will be equal to the sum of the ages of his children. Find the age of the father.

A. 45 years

B. 50 years

C. 40 years

D. 30 years

Let the father's age be x years and the sum of ages of 2 children be y years.
As per the question,
$x=2y$.....(1)
After 20 years,
$x+20=y+20+20$
$\Rightarrow x+20=y+40$
$\Rightarrow x=y+20$.....(2)
Equating (1) & (2),
$y = 20$
Substituting $y = 20$ in equation (1), we get
$x = 40$
Hence, the father's age is 40 years.

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9. What is the solution of the pair of linear equations $x+y=18$ and $x-2y=0$?

A. $x=12\ \&\ y=6$

B. $x=6\ \&\ y=12$

C. $x=11\ \&\ y=7$

D. $x=7\ \&\ y=11$

Given $x+y=18---(i)$ and
$x-2y=0---(ii)$
Here, we use substitution method to solve the given system of equations.

From (ii) we get $x=2y$

Substitute the value of x in (i)

$$\Longrightarrow 2y+y=18$$
$$\Longrightarrow 3y=18$$
$$\Longrightarrow y=6$$

Substitute the value of y in (i)
$$\Longrightarrow x+6=18$$
$$x=12$$

$\therefore x=12\ \&\ y=6$

10. What is the solution of the pair of linear equations $3x - 5y = 4$, $9x = 2y + 7$?

A. $x = \frac{9}{13}, y = \frac{-5}{13}$

B. $x = \frac{13}{9}, y = \frac{-13}{5}$

C. $x = \frac{-9}{13}, y = \frac{-5}{13}$

D. $x = \frac{9}{13}, y = \frac{5}{13}$

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

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

On multiplying equation (1) by 3, we get

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

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

$-13y = 5$

$\Rightarrow y = \frac{-5}{13}$

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

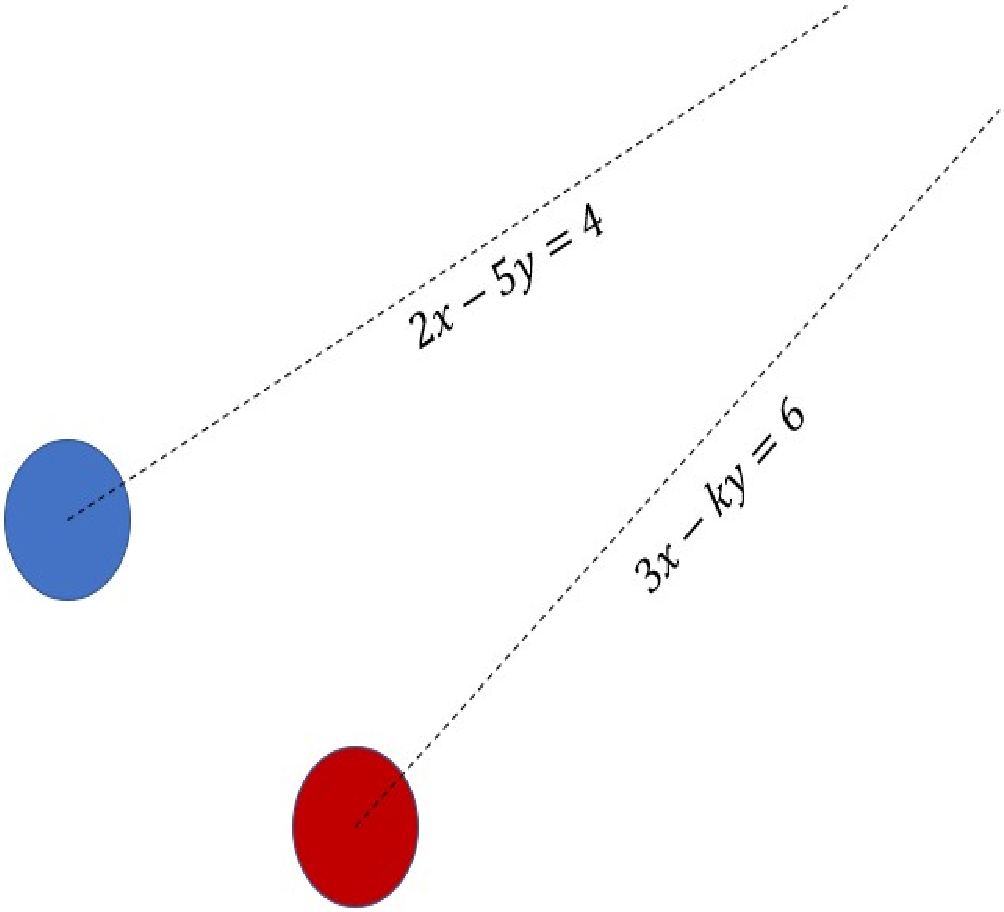
$9x = 2y + 7$

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

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

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

11. The given figure shows the path of two balls.



If path followed by the blue ball and the red ball is 2x-5y=4, and 3x-ky=6 respectively.

Determine the value of 'k' for which both the balls collide.

- **A.** The balls will collide for all the real value of k except $\frac{15}{2}$
- **B.** The balls will collide for all the real value of k except $\frac{2}{15}$
- **C.** The balls will collide for all the values of k
- **D.** The ball will collide at k = $\frac{15}{2}$

For the balls to collide, the path of both the balls should intersect.

$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ ...Eq (i)

Given 2x-5y=4, and 3x-ky=6

Here, $a_1 = 2,\ b_1 = -5,\ c_1 = -4$

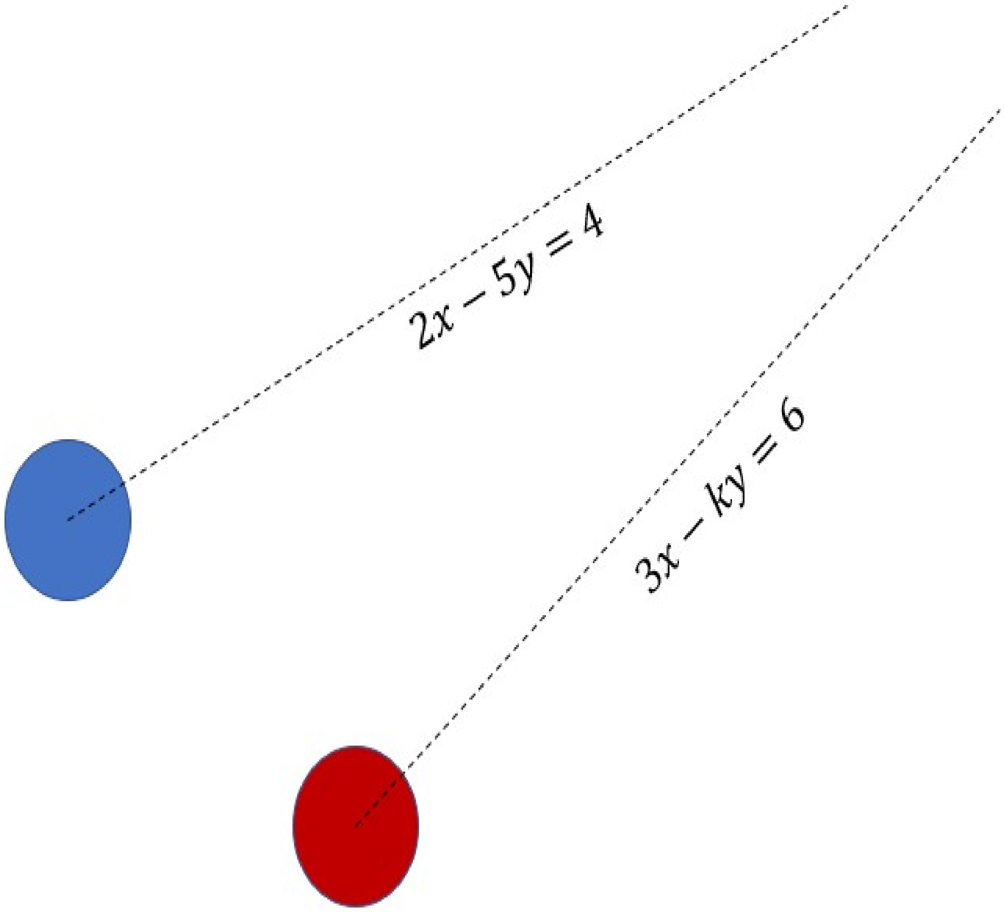
and $a_2 = 3,\ b_2 = -k,\ c_2 = -6$

From Eq (i), $\frac{2}{3} \neq \frac{-5}{-k}$

$\therefore k \neq \frac{15}{2}$

so, the balls will collide for all the real value of k except $\frac{15}{2}$

12. The given figure shows the path of two balls.



If path followed by the blue ball and the red ball is 2x-5y=4, and 3x-ky=6 respectively.

Determine the value of 'k' for which the path of the balls coincides.

A. k = $\frac{-2}{15}$

B. k = $\frac{-15}{2}$

C. k = $\frac{2}{15}$

D. k = $\frac{15}{2}$

if the path of both the balls coincides.

$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ ...Eq (i)

Given 2x-5y=4, and 3x-ky=6

Here, $a_1 = 2,\ b_1 = -5,\ c_1 = -4$

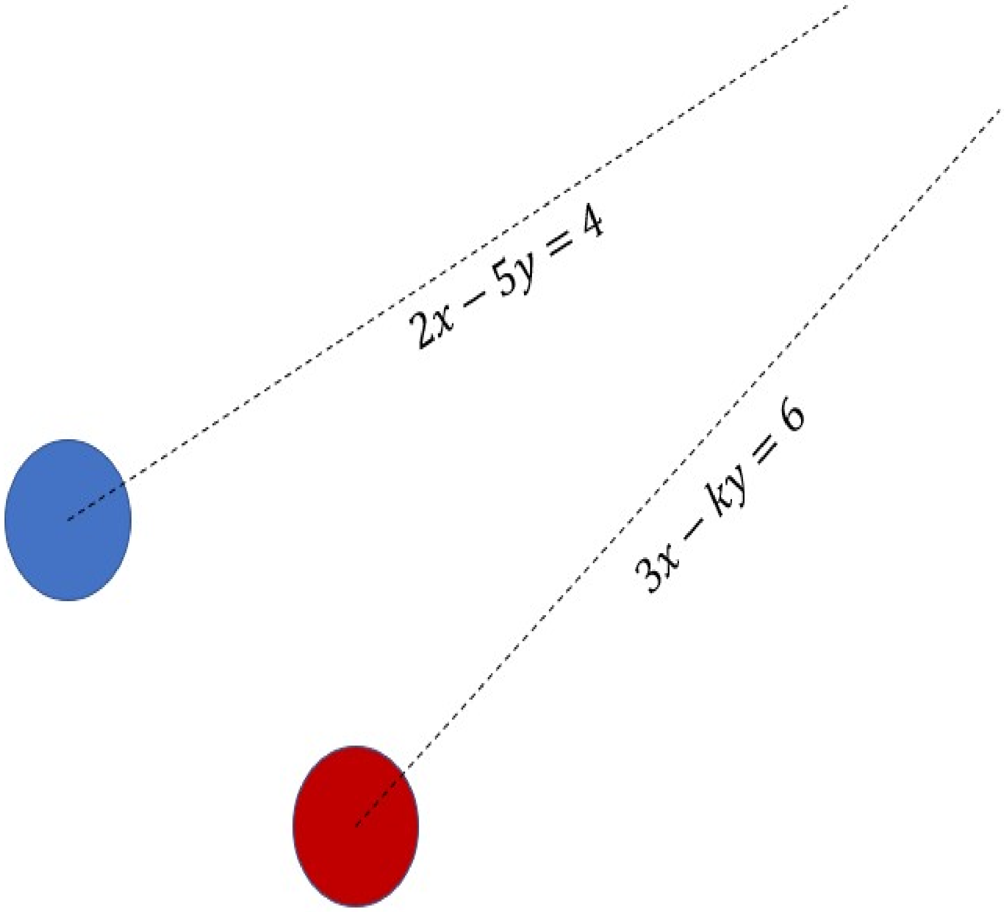
and $a_2 = 3,\ b_2 = -k,\ c_2 = -6$

From Eq (i), $\frac{2}{3} = \frac{-5}{-k} = \frac{-4}{-6}$

$\therefore k = \frac{15}{2}$

so, the path of the balls will coincide for k = $\frac{15}{2}$

13. The given figure shows the path of two balls.



If path followed by the blue ball and the red ball is 2x-5y=4, and 3x-ky=6 respectively.

Determine the value of 'k' for which the path of the balls is parallel.

A. $k = \frac{2}{15}$

B. $k = \frac{15}{2}$

C. It is not possible for the balls to have parallel path

D. $k = \frac{-15}{2}$

If the path of both the balls is parallel,

$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ ...Eq (i)

Given 2x-5y=4, and 3x-ky=6

Here, $a_1 = 2,\ b_1 = -5,\ c_1 = -4$

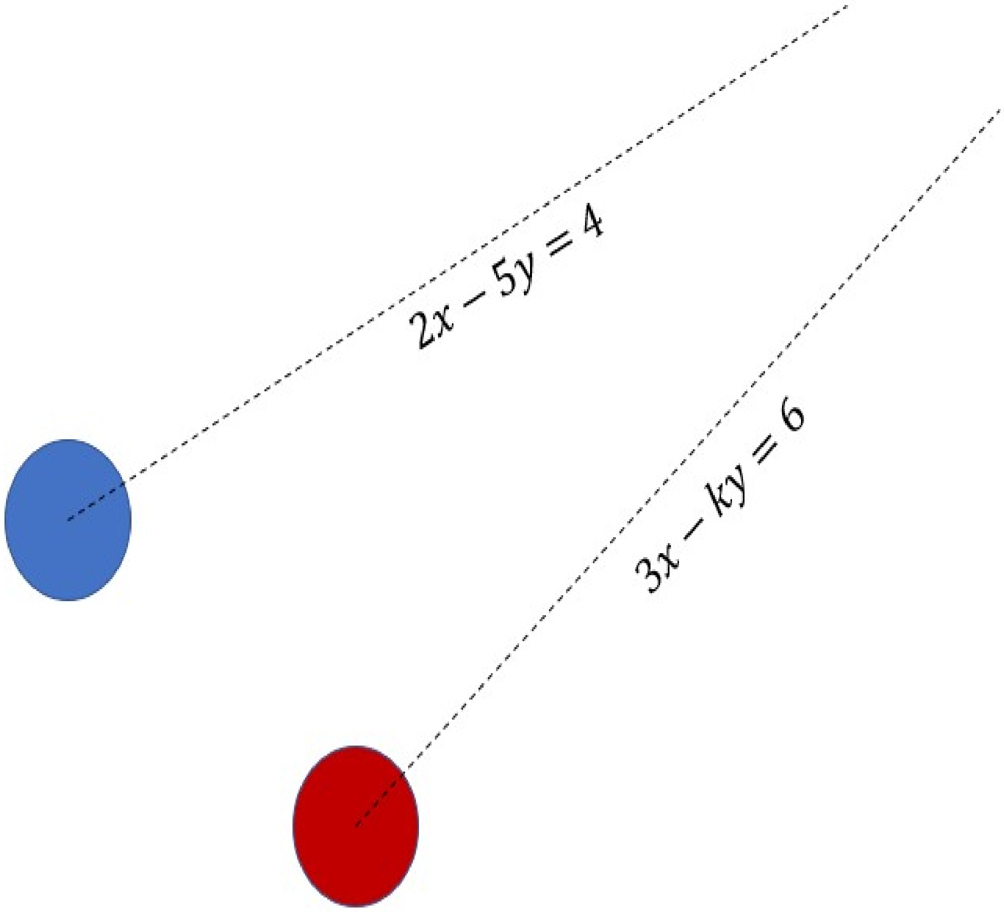
and $a_2 = 3,\ b_2 = -k,\ c_2 = -6$

From Eq (i), $\frac{2}{3} = \frac{-5}{-k} \neq \frac{-4}{-6}$

but we can see that $\frac{2}{3} = \frac{-4}{-6}$ (i.e. $\frac{a_1}{a_2} = \frac{c_1}{c_2}$)

so, it is not possible for the balls to have parallel path.

14. The given figure shows the path of two balls.



If path followed by the blue ball and the red ball is 2x-5y=4, and 3x-ky=6 respectively.

Determine the nature of linear equations of the given paths. Provided k=7.

- **A.** Coinciding
- **B.** Parallel
- **C.** Intersecting
- **D.** Parallel or coinciding

Given 2x-5y=4, and 3x-7y=6

Here, $a_1 = 2,\ b_1 = -5,\ c_1 = -4$

and $a_2 = 3,\ b_2 = -7,\ c_2 = -6$

$\frac{a_1}{a_2} = \frac{2}{3}$

$\frac{b_1}{b_2} = \frac{-5}{-7}$

$\frac{c_1}{c_2} = \frac{-4}{-6}$

$\frac{2}{3} \neq \frac{-5}{-7}$ (i.e. $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$)

so, the nature of the given linear equations is intersecting.

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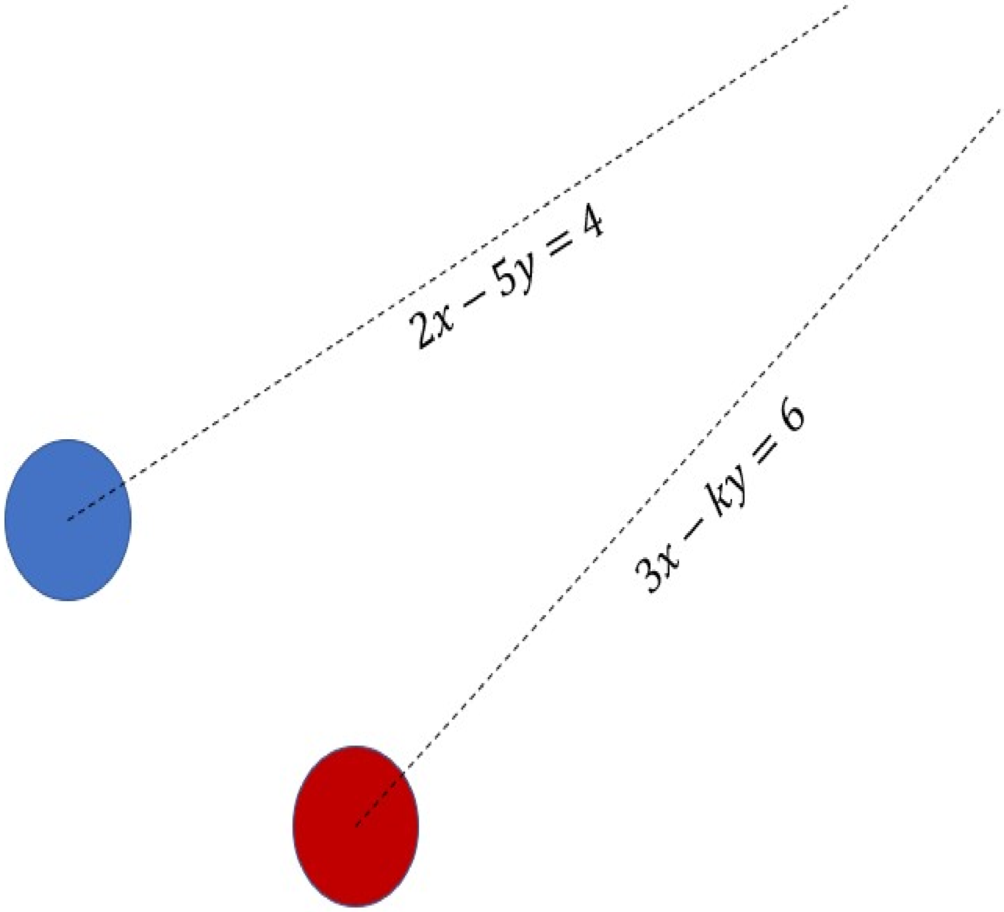
15. The given figure shows the path of two balls.



If path followed by the blue ball and the red ball is 2x-5y=4, and 3x-ky=6 respectively.

Determine the point of intersection of the path of the balls. Provided k=7.

- **A.** (0,2)
- **B.** (2,2)
- **C.** (0,0)
- **D.** (2,0) ✔

Given 2x-5y=4 ...eq(1)
and 3x-7y=6 ...eq(2)
from eq(1), x= $\frac{4+5y}{2}$ ...eq(3)
substituting eq(3) in eq(2)
so, 3($\frac{4+5y}{2}$) - 7y = 6
∴ 12 +15y - 14y = 12
∴ y=0
putting the obtained value of y in eq(3)
x=$\frac{4+0}{2}$= 2.
so the point of intersection is (2,0).

16. If $3x - 4y = 1$ and $5x - 6y = 7$, then $x + y$ = ____.

A. 16

B. 20

C. 18

D. 19

Given,
$3x - 4y = 1...(i)$
$5x - 6y = 7...(ii)$

To make the coefficients of x equal, multiply equation (1) by 5 and equation (2) by 3.

$Equation(1) \times 5 \Rightarrow$
$15x - 20y = 5...(iii)$

$Equation(2) \times 3 \Rightarrow$
$15x - 18y = 21...(iv)$

(iv) - (iii)
$\Rightarrow\ 2y = 21 - 5 = 16$
$\Rightarrow y = 8$

Substitute the value of y in (i) $3x - 4 \times 8 = 1$
$3x = 33$
$\Rightarrow x = 11$

$\Rightarrow x + y = 11 + 8 = 19$

17. Six years hence, Rahul's age will be three times his son's age and three years ago, he was nine times as old as his son. Rahul's present age is:

- **A.** 28 years
- **B.** 30 years
- **C.** 32 years
- **D.** 34 years

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Let Rahul's present age be x years and his son's age be y years.

Six years hence, Rahul's age = $(x+6)$ years
Son's age = $(y+6)$ years.

According to the question
$x+6=3(y+6)$
$\Rightarrow x+6=3y+18$
$\Rightarrow x-3y=12$ .....(i)

Now, three years ago, Rahul's age = $(x-3)$ years
Son's age = $y-3$ years

According to the question
$x-3=9(y-3)$
$\Rightarrow x-3=9y-27$
$\Rightarrow x-9y=-24$ ....(ii)

On subtracting (ii) from (i) we get
$6y=36 \Rightarrow y=6.$

On substituting the value of y in (i), we get
$x-18=12$
$\Rightarrow x=30\ years$

$\therefore$ Rahul's present age is 30 years.

For verification,

Presently Rahul's age is 30 years and his son's age is 6 years.
3 years back, Rahul was 27 years and son was 3 years old.
That is correct according to the given condition,
His age was 9 times more than his son's age.

6 years hence he will be 36 years and son will be 12 years old.
That is correct according to the given condition.
His age will be 3 times of his son's age.

18. 54 is divided into two parts such that sum of 10 times the first part and 22 times the second part is 780. What is the bigger part?

- **A.** 34
- **B.** 32
- **C.** 30
- **D.** 24

Let the 2 parts of 54 be x and y

$x+y = 54$ ....(i)

and $10x + 22y = 780$ ...(ii)

Multiply (i) by 10 , we get

$10x + 10y = 540$ ...(iii)

Subtracting (ii) from (iii)

$-12y = -240$

$y = 20$

Subsituting $y = 20$ in $x + y = 54$,

$\implies x + 20 = 54$

$\implies x = 34$

Hence, $x = 34$ and $y = 20$

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19. Find the value of k for which each of the following systems of equations has no solution:

$kx + 3y = 3, 12x + ky = 6.$

A. k = 6

B. k = -6

C. k = -3

D. k = 3

Equations are written as

kx + 3y – 3 = 0 .....(1)

12x + ky – 6 = 0 .... (2)

$a_1 = k,\ b_1 = 3,\ c_1 = -3$

$a_2 = 12,\ b_2 = k,\ c_2 = -6$

for no solution we must have:

$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

Now,

$\frac{k}{12} = \frac{3}{k} \neq \frac{-3}{-6}$

$\frac{k}{12} = \frac{3}{k}$

and

$\frac{3}{k} \neq \frac{1}{2}$

$k^2 = 36, k \neq 6$

Hence, k = -6

Hence, the given system of equations is has no solution if k =-6.

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20. 5 chairs and 4 tables together cost Rs.5600,while 4 chairs and 3 tables together cost Rs.4340.Find the cost of a chair and that of a table respectively.

- A. 700, 560
- B. 700, 700
- C. 560, 560
- D. 560,700

Let the price of one chair is x and the price of one table is y

According to question

$5x+4y = 5600$ ---(1)

$4x+3y = 4340$ ---(2)

$4\times(1)$

$20x+16y = 22400$ ---(3)

$5\times(2)$

$20x+15y = 21700$ ---(4)

(3) - (4)

$y = 700$

put y in (1)

$5x+4(700) = 5600$

$5x = 5600 - 2800 = 2800$

$x = 560$

So the price of one chair is 560 and the price of one table is 700