MCQs (Pair of linear equations in two variables) RDS

1) The value of k for which the system of equations $kx - y = 2$ and $6x - 2y = 3$ has a unique solution is
(a) $=3$ (b) $\neq 3$ (c) $\neq 0$ (d) $= 0$

Solution:-

Let the given eq:s be of the form $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$; where $a_1 = k$, $b_1 = -1$, $c_1 = -2$
$a_2 = 6$, $b_2 = -2$, $c_2 = -3$

For unique solution, $\frac{a_1}{a_2} \neq \frac{b_1}{b_2} \Rightarrow \frac{k}{6} \neq \frac{1}{2}$

$\Rightarrow k \neq 3$ (b)

2) The value of k for which the system of equations $2x + 3y = 5$ and $4x + ky = 10$ has infinite number of solutions is (a) 1 (b) 3 (c) 6 (d) 0

Solution :-

Let the given eq:s be of the form $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$; where $a_1 = 2$, $b_1 = 3$, $c_1 = -5$ and $a_2 = 4$, $b_2 = k$, $c_2 = -10$.

For infinite number solutions, $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

$\Rightarrow \frac{2}{4} = \frac{3}{k} = \frac{-5}{-10}$

$\therefore \frac{1}{2} = \frac{3}{k} \Rightarrow k = 6$ (c)

3) The value of k for which the system of equations $x + 2y - 3 = 0$ and $5x + ky + 7 = 0$ has no solution is
(a) 10 (b) 6 (c) 3 (d) 1

Solution :-

Let the given equations be of the form $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$; where $a_1 = 1$, $b_1 = 2$, $c_1 = -3$ and $a_2 = 5$, $b_2 = k$, $c_2 = 7$.

For no solution, $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2} \Rightarrow \frac{1}{5} = \frac{2}{k} \neq \frac{-3}{7}$

$\therefore k = 10$ (a)

4) The value of k for which the system of equations $3x + 5y = 0$ and $kx + 10y = 0$ has a non-zero solution is

(a) 0 (b) 2 (c) 6 (d) 8

Solution:-

Let the given eq:s be of the form $a_1x+b_1y+c_1=0$ and $a_2x+b_2y+c_2=0$; where $a_1=3, b_1=5, c_1=0$ and $a_2=k, b_2=10, c_2=0$

For a non-zero solution, $\frac{a_1}{a_2}=\frac{b_1}{b_2} \Rightarrow \frac{3}{k}=\frac{5}{10}$

$\Rightarrow \frac{3}{k}=\frac{1}{2} \Rightarrow k=6$ (c)

5) If the system of equations $2x+3y=7$ and $(a+b)x+(2a-b)y=21$ has infinitely many solutions, then

(a) $a=1, b=5$ (b) $a=5, b=1$ (c) $a=-1, b=5$ (d) $a=5, b=-1$

Solution:-

Let the given equations be of the form $a_1x+b_1y+c_1=0$ and $a_2x+b_2y+c_2=0$; where $a_1=2, b_1=3, c_1=-7$

$a_2=(a+b), b_2=2a-b, c_2=-21$

For infinitely many solutions,

$$\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2} \Rightarrow \underset{\mathrm{I}}{\frac{2}{a+b}}=\underset{\mathrm{II}}{\frac{3}{2a-b}}=\underset{\mathrm{III}}{\frac{-7}{-21}}$$

From I and III, $\frac{2}{a+b}=\frac{\cancel{7}^1}{\cancel{21}_3} \Rightarrow a+b=6 \rightarrow (1)$

From II and III, $\frac{3}{2a-b}=\frac{\cancel{7}^1}{\cancel{21}_3} \Rightarrow 2a-b=9 \rightarrow (2)$

$(1)+(2)$, $3a=15$

$a=5$, $b=1$ (b)

6) If the system of equations $3x+y=1$ and $(2k-1)x+(k-1)y=2k+1$ inconsistent, then $k=$

(a) 1 (b) 0 (c) -1 (d) 2

Solution:-

Let the given eq: be of the form $a_1x+b_1y+c_1=0$ and $a_2x+b_2y+c_2=0$; where $a_1=3, b_1=1, c_1=-1$ and $a_2=2k-1, b_2=k-1, c_2=-(2k+1)$.

For inconsistent equations, $\frac{a_1}{a_2}=\frac{b_1}{b_2}\neq\frac{c_1}{c_2}$

$$\Rightarrow \frac{3}{2k-1}=\frac{1}{k-1}\neq\frac{-1}{-(2k+1)}$$

Thus, $\frac{3}{2k-1} = \frac{1}{k-1}$ $\Rightarrow 3(k-1) = 2k-1$

$\Rightarrow 3k-3 = 2k-1$

$\Rightarrow 3k-2k = -1+3$

$\Rightarrow k = 2$ (d)

7) If $am \neq bl$, then the system of equations $ax+by=c$ and $lx+my=n$
(a) has a unique solution (b) has no solution
(c) has infinitely many solutions (d) may or may not have a solution.

Solution:-

Given, $am \neq bl$

$$\Rightarrow \frac{a}{l} \neq \frac{b}{m} \longrightarrow (1)$$

Since the given eq:s $ax+by-c=0$ and $lx+my-n=0$ are of the form $a_1x+b_1y+c_1=0$ and $a_2x+b_2y+c_2=0$, the above condition (1) satisfies $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$
Hence they have a unique solution (a)

8) If the system of equations $2x+3y=7$; $2ax+(a+b)y=28$ has infinitely many solutions, then
(a) $a=2b$ (b) $b=2a$ (c) $a+2b=0$ (d) $2a+b=0$

Solution:-

Let the given equations be of the form $a_1x+b_1y+c_1=0$ and $a_2x+b_2y+c_2=0$; where $a_1=2, b_1=3, c_1=-7$

$a_2=2a, b_2=a+b, c_2=-28$

For infinitely many solutions, $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

$$\Rightarrow \underbrace{\frac{2}{2a}}_{\text{I}} = \underbrace{\frac{3}{a+b}}_{\text{II}} = \underbrace{\frac{-7}{-28}}_{\text{III}}$$

From I and III, $\frac{\cancel{2}\,1}{2a} = \frac{\cancel{7}\,1}{\cancel{28}\,4} \Rightarrow a=4$

From II and III, $\frac{3}{a+b} = \frac{\cancel{7}\,1}{\cancel{28}\,4} \Rightarrow a+b=12$

$\Rightarrow b = 8$

$\therefore b = 2a$ (b)

9) The value of k for which the system of equations $x+2y=5$; $3x+ky+15=0$ has no solution is
(a) 6 (b) -6 (c) $3/2$ (d) none of these.

Solution:- Let the given equations be of the form $a_1x+b_1y+c_1=0$ and $a_2x+b_2y+c_2=0$; where $a_1=1, b_1=2, c_1=-5$
$a_2=3, b_2=k, c_2=15$

For no solution, $\frac{a_1}{a_2}=\frac{b_1}{b_2}\neq\frac{c_1}{c_2}$

$$\Rightarrow \underbrace{\frac{1}{3}}_{\text{I}} = \underbrace{\frac{2}{k}}_{\text{II}} \neq \underbrace{\frac{-5}{15}}_{\text{III}}$$

From I and II, $\therefore k=6$ (a)

10) If $2x-3y=7$ and $(a+b)x-(a+b-3)y=4a+b$ represent coincident lines, then a and b satisfy the equation
(a) $a+5b=0$ (b) $5a+b=0$ (c) $a-5b=0$ (d) $5a-b=0$

Solution:-
Let the given equations be of the form $a_1x+b_1y+c_1=0$ and $a_2x+b_2y+c_2=0$; where $a_1=2, b_1=-3, c_1=-7$
$a_2=a+b, b_2=-(a+b-3), c_2=-(4a+b)$

For coincident lines, $\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$

$$\Rightarrow \underbrace{\frac{2}{a+b}}_{\text{I}} = \underbrace{\frac{-3}{-(a+b-3)}}_{\text{II}} = \underbrace{\frac{-7}{-(4a+b)}}_{\text{III}}$$

From I and III, $\frac{2}{a+b}=\frac{7}{4a+b} \Rightarrow 8a+2b=7a+7b$
$\Rightarrow a-5b=0 \rightarrow (1)$ (C)

From II and III, ...

11) If a pair of linear equations in two variables is consistent, then the lines represented by two equations are
(a) intersecting (b) parallel (c) always coincident (d) intersecting or coincident.

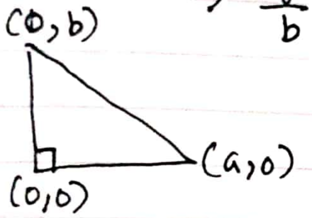
Solution:- intersecting or coincident (d)

12) The area of the triangle formed by the line $\frac{x}{a}+\frac{y}{b}=1$ with the coordinate axes is
(a) ab (b) 2ab (c) ½ ab (d) ¼ ab

Solution:-

When $y=0$, $\frac{x}{a}=1 \Rightarrow x=a$. $\therefore$ the point on x-axis is $(a,0)$

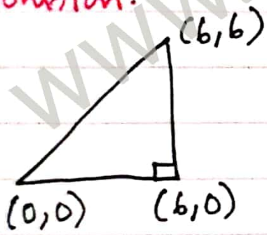
When $x=0$, $\frac{y}{b}=1 \Rightarrow y=b$ $\therefore$ the point on y-axis is $(0,b)$



area $=\frac{1}{2}\times b\times h=\frac{1}{2}\times ab$ (c)

13) The area of the Δ formed by the lines $y=x$, $x=6$ and $y=0$ is (a) 36 sq.units (b) 18 sq.units (c) 9 sq.units (d) 72 sq.units

Solution:- $y=x$ is a line passing through origin.
$x=6$ is a line parallel to y-axis. $y=0$ is x-axis.



area $=\frac{1}{2}\times b\times h=\frac{1}{2}\times 6\times 6=18$ sq.units (b)

14) If the system of equations $2x+3y=5$, $4x+ky=10$ has infinitely many solutions, then $k=$
(a) 1 (b) $\frac{1}{2}$ (c) 3 (d) 6

Solution:-

Let the given equations be of the form $a_1x+b_1y+c_1=0$ and $a_2x+b_2y+c_2=0$; where $a_1=2$, $b_1=3$, $c_1=-5$ and $a_2=4$, $b_2=k$ and $c_2=-10$.

For infinitely many solutions, $\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$

$$\Rightarrow \underset{\mathrm{I}}{\frac{2}{4}}=\underset{\mathrm{II}}{\frac{3}{k}}=\underset{\mathrm{III}}{\frac{-5}{-10}}$$

From I and II, $k=6$ (d)

15) If the system of equations $kx - 5y = 2$, $6x + 2y = 7$ has no solution, then $k =$

(a) -10 (b) -5 (c) -6 (d) -15

Solution:-

Let the given equation be of the form $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$; where $a_1 = k, b_1 = -5, c_1 = -2$ and

$a_2 = 6, b_2 = 2, c_2 = -7$

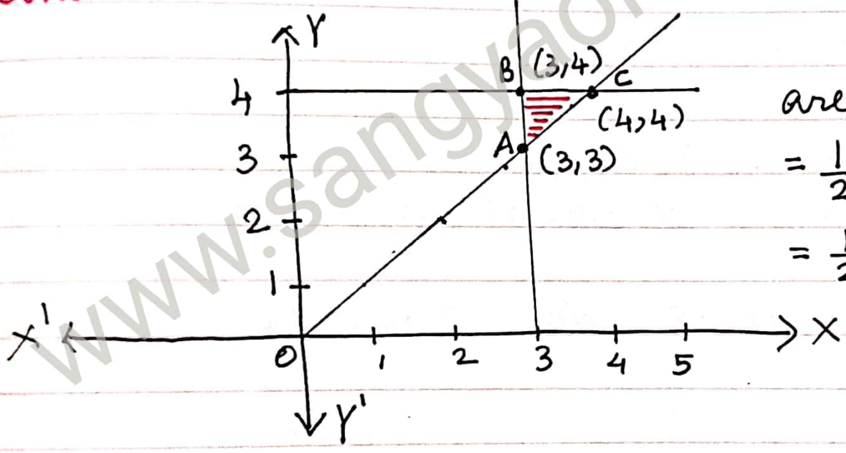
For no solution, $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2} \Rightarrow \underset{\mathrm{I}}{\frac{k}{6}} = \underset{\mathrm{II}}{\frac{-5}{2}} \neq \underset{\mathrm{III}}{\frac{-2}{-7}}$

From I and II, $k = -\frac{30}{2} = -15$ (d)

16) The area of the triangle formed by the lines $x = 3$, $y = 4$ and $x = y$ is

(a) $\frac{1}{2}$ sq. unit (b) 1 sq. unit (c) 2 sq. units (d) none of these

Solution:-

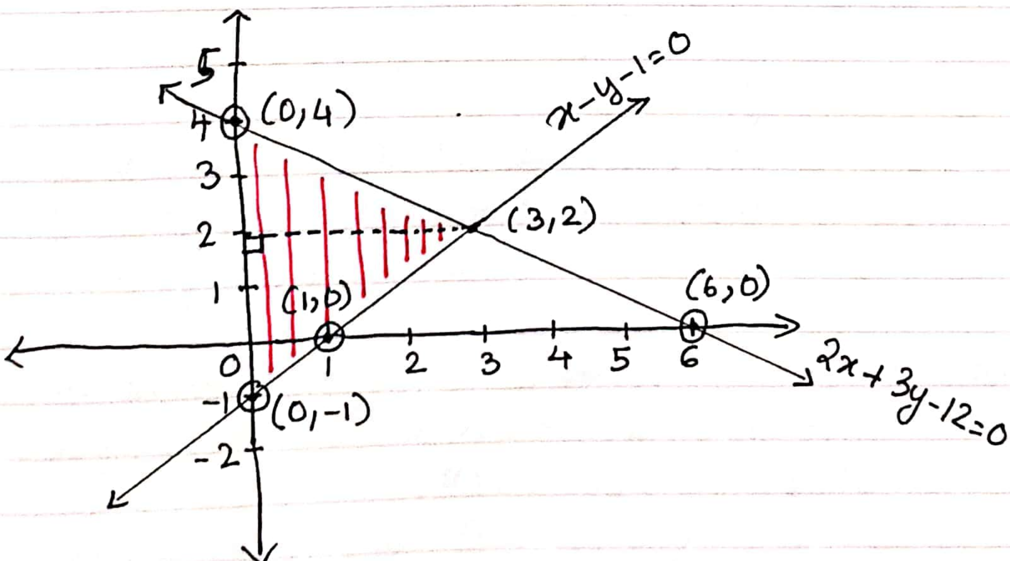


area(ΔABC)

$= \frac{1}{2} \times 1 \times 1$

$= \frac{1}{2}$ sq. unit //

17)



The area of the triangle formed by the lines $2x + 3y = 12$, $x - y - 1 = 0$ and $x = 0$ (a) 7 sq. units (b) 7.5 sq. units (c) 6.5 sq. units (d) 6 sq. units

Solution:-

Area $= \frac{1}{2} \times b \times h = \frac{1}{2} \times 5 \times 3 = \frac{15}{2} = 7.5$ sq.units (b)

18) The Sum of the digits of a two digit number is 9. If 27 is added to it, the digits of the number get reversed. The number is

(a) 25 (b) 72 (c) 63 (d) 36

Solution:-

T	O
x	y

Original number $= 10x+y$

Reversed number $= 10y+x$

ATQ, $x+y=9 \rightarrow (1)$

Also, $10x+y+27 = 10y+x$

$\Rightarrow 9x-9y = -27$

$\Rightarrow x-y = -3 \rightarrow (2)$

(1)+(2), $2x = 6$

$x = 3$

From eq:(1), $y=6$

Hence the number is 36 (d)

19) If $x=a, y=b$ is the solution of the Systems of equations $x-y=2$ and $x+y=4$, then the values of a and b are respectively

(a) 3 and 1 (b) 3 and 5 (c) 5 and 3 (d) -1 and -3

Solution:-

When $x=a$ and $y=b$, $a-b=2 \rightarrow (1)$

$a+b=4 \rightarrow (2)$

(1)+(2), $2a=6$

$a=3$ $b=1$ (a)

20) For what value of k, do the equations $3x-y+8=0$ and $6x-ky+16=0$ represent coincident lines?

(a) $\frac{1}{2}$ (b) $-\frac{1}{2}$ (c) 2 (d) -2

Solution:-

Let the given eq:s be of the form $a_1x+b_1y+c_1=0$ and $a_2x+b_2y+c_2=0$; where $a_1=3, b_1=-1, c_1=8$

$a_2=6, b_2=-k, c_2=16$

For coincident lines, $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2} \Rightarrow \underset{\text{I}}{\frac{3}{6}} = \underset{\text{II}}{\frac{-1}{-k}} = \underset{\text{III}}{\frac{8}{16}}$

From I and II, $\frac{3}{6} = \frac{1}{k} \Rightarrow k = 2$ (c)

21) Aruna has only ₹1 and ₹2 coins with her. If the total number of coins that she has is 50 and the amount of money with her is ₹75, then the number of ₹1 and ₹2 coins are respectively
(a) 35 and 15 (b) 35 and 20 (c) 15 and 35 (d) 25 and 25

Solution:-

Let the number of ₹1 coins be x and that of ₹2 be y.

ATQ, $x + y = 50 \rightarrow (1)$

$1x + 2y = 75 \rightarrow (2)$

$(1) - (2)$, $-y = -25$

$y = 25$; $x = 25$ (d)

<u>Fill in the Blanks</u>

1) The pair of equations $y = 0$ and $y = -7$ has <u>no solution</u>
[$y = 0$ is the x-axis
$y = -7$ is a line parallel to x-axis]

2) The pair of equations $x = a$ and $y = b$ has <u>unique</u> solution
[$x = a$ and $y = b$ intersect at (a, b)]

3) If the pair of equations $3x + 2ky = 2$ and $2x + 5y + 1 = 0$ has no solution, then $k =$ <u>15/4</u>

[$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ for no solution

$\Rightarrow \frac{3}{2} = \frac{2k}{5} \neq \frac{-2}{1}$

$\frac{3}{2} = \frac{2k}{5} \Rightarrow k = \frac{15}{4}$]

4) If a pair of linear equations is consistent, then the lines representing them are either <u>intersecting</u> or <u>coincident</u>

5) There is (are) <u>no</u> value(s) for c for which the pair of equations $cx - y = 2$ and $6x - 2y = 3$ have infinitely many solutions

[$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ for infinitely many solutions

$\Rightarrow \underset{\text{I}}{\frac{c}{6}} = \underset{\text{II}}{\frac{-1}{-2}} = \underset{\text{III}}{\frac{-2}{-3}}$

From I and II, $c = 3$
From I and III, $c = \frac{2 \times \cancel{6}^{2}}{\cancel{3}_{1}} = 4$
Which is not possible.
Hence no value of c for which the given eq:s have infinitely many solutions]

6) If one equation of a pair of dependent linear equation is $5x - 7y + 2 = 0$, then the second equation is given by $5ax - 7ay + 2a = 0$

[For dependent eq:s, $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

$5x - 7y + 2 = 0$

Then $5ax - 7ay + 2a = 0$; where a is any non-zero real number]

7) If a pair of linear equations is consistent with a unique solution, then the lines representing them are intersecting

8) The pair of equations $\lambda x + 3y = 7$, $2x + 6y = 14$ will have infinitely many solutions for $\lambda = 1$

[For infinitely many solutions, $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

$\Rightarrow \frac{\lambda}{2} = \frac{\cancel{3}^{1}}{\cancel{6}_{2}} = \frac{\cancel{-7}^{1}}{\cancel{-14}_{2}}$

$\therefore \lambda = 1$]

9) If the pair of equations $2x + 3y - 5 = 0$ and $px - 6y - 8 = 0$ has a unique solution for all real values of p except -4

[For unique solution, $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

$\Rightarrow \frac{2}{p} \neq \frac{\cancel{3}^{1}}{\cancel{-6}_{-2}}$

$\Rightarrow p \neq -4$]

10) If the lines represented by the equations $3x-y-5=0$ and $6x-2y-p=0$ are parallel, then p is not equal to <u>10</u>

[For parallel lines, $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

$$\Rightarrow \frac{3}{6} = \frac{-1}{-2} \neq \frac{-5}{-p}$$

$$\Rightarrow p \neq 10]$$

11) If $x=a, y=b$ is the solution of the pair of equations $x-y=2$ and $x+y=4$, then $a = \underline{3}$ and $b = \underline{1}$

[$a-b=2$
$a+b=4$
$2a=6$
$a=3, b=1$]

12) If the pair of equations $ax+2y=7$ and $3x+by=16$ represent parallel lines, then $ab = \underline{6}$

[For parallel lines, $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

$$\Rightarrow \frac{a}{3} = \frac{2}{b} \neq \frac{-7}{-16}$$

$$\therefore ab = 6]$$

13) The line $4x+3y-12=0$ cuts the coordinate axes at A and B. The area of ΔOAB is <u>6 sq. units</u>

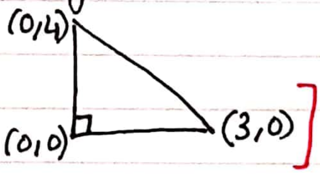
[When the line cut the x-axis, $y=0$

Then $4x-12=0 \Rightarrow 4x=12 \Rightarrow x=3$. Point is $(3,0)$

When the line cut the y-axis, $x=0$

Then $3y-12=0 \Rightarrow 3y=12 \Rightarrow y=4$. Point is $(0,4)$

area $= \frac{1}{2} \times 3 \times 4 = 6$ sq. units//



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14) If $2^{x+y} = 2^{x-y} = \sqrt{8}$, then $x = \underline{3/2}$ and $y = \underline{0}$

$2^{x+y} = 8^{\frac{1}{2}} \Rightarrow 2^{x+y} = 2^{\frac{3}{2}} \Rightarrow x+y = \frac{3}{2} \rightarrow (1)$

$2^{x-y} = 8^{\frac{1}{2}} \Rightarrow 2^{x-y} = 2^{\frac{3}{2}} \Rightarrow x-y = \frac{3}{2} \rightarrow (2)$

$(1)+(2)$, $2x = \frac{6}{2} = 3$

$x = \frac{3}{2}$

From eq: (1), $y = 0$

15) The system of equations $ax+3y=1$, $-12x+ay=2$ has unique solution for all real values of a.