OBJECTIVE Type Questions

[**1** mark]

Multiple Choice Questions

1. If a pair of linear equations is consistent, then the lines will be:
(a) parallel
(b) always coincident
(c) intersecting or coincident
(d) always intersecting   [NCERT Exemplar]

Ans. (c) intersecting or coincident

Explanation: The conditions for a pair of linear equations to be consistent are :

(1) $\dfrac{a_1}{a_2} \neq \dfrac{b_1}{b_2}$, which represent intersecting lines.

(2) $\dfrac{a_1}{a_2} = \dfrac{b_1}{b_2} = \dfrac{c_1}{c_2}$, which represent coincident lines.

2. The value of k for which the system of linear equations $x + 2y = 3$, $5x + ky + 7 = 0$ is inconsistent, is:

(a) $-\dfrac{14}{3}$ (b) $\dfrac{2}{5}$

(c) 5   (d) 10

Ans. (d) 10

Explanation:

The system of equations will be inconsistent, if

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

Here, $a_1 = 1, b_1 = 2, c_1 = -3$

$a_2 = 5$ $b_2 = k$, $c_2 = 7$

So, $\dfrac{1}{5} = \dfrac{2}{k} \neq \dfrac{3}{7}$

i.e., $k = 10$

3. On comparing with the general from for a pair of linear equations in two variables x and y, which option is correct for the following pair of equations.

$$10x - 8y = -12$$
$$-3x + 12y - 11 = 0$$

(a) $a_1 = 10$ (b) $a_1 = -8$
  $a_2 = 3$ $a_2 = 12$
  $b_1 = 8$ $b_1 = 10$
  $b_2 = 12$ $b_2 = -3$
  $c_1 = 12$ $c_1 = 12$
  $c_2 = 11$ $c_2 = -11$

(c) $a_1 = 10$ (d) $a_1 = 10$
  $a_2 = -3$ $a_2 = -3$
  $b_1 = -8$ $b_1 = 12$
  $b_2 = 12$ $b_2 = -11$
  $c_1 = 12$ $c_1 = -8$
  $c_2 = -11$ $c_2 = 12$ [Diksha]

Ans. (c) $a_1 = 10$
  $a_2 = -3$
  $b_1 = -8$
  $b_2 = 12$
  $c_1 = 12$
  $c_2 = -11$

Explanation: General form is:
  $a_1x + b_1y + c_1 = 0$
  $a_2x + b_2y + c_2 = 0$
On comparing,
  $a_1 = 10$
  $a_2 = -3$
  $b_1 = -8$
  $b_2 = 12$
  $c_1 = 12$
  $c_2 = -11$

4. The pair of equations $y = 0$ and $y = -7$ has:

(a) one solution

(b) two solutions

(c) infinitely many solutions

(d) no solution   [NCERT Exemplar]

*5. The pair of equations $x = a$ and $y = b$ graphically represents lines which are:

(a) parallel

(b) intersecting at (b, a)

(c) coincident

(d) intersecting at (a, b) [NCERT Exemplar]

Ans. (d) intersecting at (a, b)

Explanation: We know that, $x = a$ is the equation of a straight line parallel to the y-axis at a distance of 'a' units from it.

Similarly, $y = b$ is the equation of a straight line parallel to the x-axis at a distance of 'b' units from it.

So, the pair of equations $x = a$ and $y = b$ graphically represents lines which are intersecting at (a, b) as shown below:
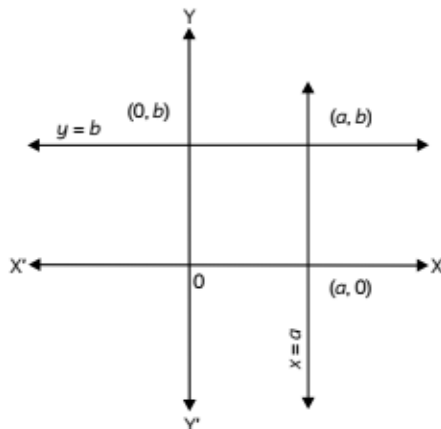
Hence, the two lines are intersecting at (a, b).

6. For which value(s) of p, will the lines represented by the following pair of linear equations be parallel:
$$3x - y - 5 = 0$$
$$6x - 2y - p = 0$$

(a) all real values except 10

(b) 10

(c) $\dfrac{5}{2}$

(d) $\dfrac{1}{2}$ [CBSE SQP 2019]

Ans. (a) all real values except 10

                  [CBSE Marking Scheme SQP 2019]

Explanation : The given pair of linear equations will be parallel, when

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

i.e.

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

$$\Rightarrow \qquad \frac{1}{2} \neq \frac{5}{p}$$

$$\Rightarrow \qquad p \neq 10$$

7. Rahul's house has a rectangular garden in front of it for children to play in. The length of the rectangle exceeds its width by 6 m and its perimeter is 60 m. If length is x and width is y, determine the dimensions of the garden.

(a) $x = 12$ m, $y = 18$ m

(b) $x = 33$ m, $y = 27$ m

(c) $x = 18$ m, $y = 12$ m

(d) None of the above   [Diksha]

8. The pair of equations, $x = 0$ and $x = -4$ has:

(a) a unique solution

(b) no solution

(c) infinitely many solution

(d) only solution $(0, 0)$ [CBSE 2020]

9. One equation of a pair of dependent linear equations is $-5x + 7y = 2$. The second equation can be:

(a) $10x + 14y + 4 = 0$

(b) $-10x - 14y + 4 = 0$

(c) $-10x + 14y + 4 = 0$

(d) $10x - 14y = -4$

Ans. (d) $10x - 14y = -4$

Explanation: In a pair of dependent linear equations, one equation is just a multiple of another equation. Thus, the second equation is
$$k(-5x + 7y - 2) = 0$$
Putting $k = -2$, we get
$$10x - 14y + 4 = 0$$
Or, $10x - 14y = -4$

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

(a) -1 (b) 0

(c) 1   (d) 2

          [CBSE SQP Std. 2022]

* Topics and Questions which are a part of latest CBSE Syllabus but have been removed by NCERT.

Ans. (d) 2

Explanation: Given,

$$3x + y = 1 \qquad \text{...(i)}$$
$$(2k - 1)x + (k - 1)y = 2k + 1 \qquad \text{...(ii)}$$

Both the equation are in the form of
$ax + by + c = 0$

$$a_1 = 3, b_1 = 1, c_1 = 1$$
$$a_2 = (2k - 1), b_2 = (k - 1)$$
$$c_2 = 2k + 1$$

The system of equation is inconsistent, if

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

$$\therefore \quad \frac{3}{2k-1} = \frac{1}{k-1} \neq \frac{1}{2k+1}$$

$$\frac{3}{2k-1} = \frac{1}{k-1}$$

$$3k - 3 = 2k - 1$$
$$k = 2$$

[CBSE Marking Scheme SQP Std. 2022]

⚠ **Caution**

➡ *Students should remember that, while comparing the given equations with standard equation, we should also consider the signs of constant.*

11. ✏ Two lines are given to be parallel. The equation of one of the lines is $3x - 2y = 5$. The equation of the second line can be:

   (a) $9x + 8y = 7$ (b) $-12x - 8y = 7$

   (c) $-12x + 8y = 7$ (d) $12x + 8y = 7$

12. ✏ A pair of linear equations which has a unique solution $x = 2, y = -3$ is:

   (a) $x + y = -1$ and $2x - 3y = -5$

   (b) $2x + 5y = -11$ and $4x + 10y = -22$

   (c) $2x - y = 1$ and $3x + 2y = 0$

   (d) $x - 4y - 14 = 0$ and $5x - y - 13 = 0$

   [NCERT Exemplar]

13. Find the value of k for which the pair of linear equations $3x + 2y = -5$ and $x - ky = 2$ has unique solution.

   (a) $R - \left\{\dfrac{-2}{3}\right\}$ (b) $R - \left\{\dfrac{-1}{3}\right\}$

   (c) $R - \left\{\dfrac{-2}{5}\right\}$ (d) $R - \left\{\dfrac{1}{2}\right\}$

   [Delhi Gov. SQP 2022]

Ans. (a) $R - \left\{\dfrac{-2}{3}\right\}$

Explanation: The given equations are,

$$3x + 2y + 5 = 0 \qquad \text{...(i)}$$
$$\text{and} \qquad x + ky - 2 = 0 \qquad \text{...(ii)}$$

For the unique solution

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

On comparing eq. (i) and (ii) with $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$, we get

$$a_1 = 3 \qquad b_1 = 2 \qquad c_1 = 5$$
$$a_2 = 1 \qquad b_2 = -k \qquad c_2 = -2$$

So,

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

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

$$k = R - \left\{-\frac{2}{3}\right\}$$

14. ✏ If $x = a, y = b$ is the solution of the equations $x - y = 2$ and $x + y = 4$, then the values of a and b, respectively, are:

   (a) 3 and 5   (b) 5 and 3

   (c) 3 and 1   (d) –1 and –3

   [CBSE 2010, NCERT Exemplar]

15. The value of k for which the lines $5x + 7y = 3$ and $15x + 21y = k$ coincide is:

   (a) 9   (b) 5

   (c) 7   (d) 18

   [CBSE Term-1 SQP 2021]

Ans. (a) 9

For lines to coincide: $\dfrac{a_1}{a_2} = \dfrac{b_1}{b_2} = \dfrac{c_1}{c_2}$

So, $\dfrac{5}{15} = \dfrac{7}{21} = \dfrac{-3}{-k}$ i.e., $k = 9$

[CBSE Marking Scheme Term-1 SQP 2021]

Explanation: The lines $5x + 7y = 3$ and $15x + 21y = k$ will coincide,

If $\dfrac{a_1}{a_2} = \dfrac{b_1}{b_2} = \dfrac{c_1}{c_2}$

or, $\dfrac{5}{15} = \dfrac{7}{21} = \dfrac{(-3)}{-k}$

$\Rightarrow \qquad \dfrac{1}{3} = \dfrac{3}{k}$

$\Rightarrow \qquad k = 9$

16. The value of k, for which the pair of linear equations $kx + y = k^2$ and $x + ky = 1$ have infinitely many solutions, is:

(a) ± 1 (b) 1

(c) -1 (d) 2   [CBSE 2020]

Ans. (b) 1

Explanation: The system of given equations will have infinitely many solutions, when

$$\frac{k}{1} = \frac{1}{k} = \frac{-k^2}{-1}$$

$\Rightarrow \quad \dfrac{k}{1} = \dfrac{1}{k} \qquad\qquad \dfrac{1}{k} = \dfrac{k^2}{1}$

$\Rightarrow \quad k^2 = 1 \qquad \Rightarrow \quad k^3 = 1$

$\Rightarrow \quad k = \pm 1 \qquad \Rightarrow \quad k = 1$

Hence, the common solution is $k = 1$.

17. ⓐ If $ax + by = a^2 - b^2$ and $bx + ay = 0$, then the value of $(x + y)$ is:

(a) $a^2 - b^2$ (b) $b - a$

(c) $a - b$ (d) $a^2 + b^2$

[CBSE 2013]

18. The values of x and y satisfying the two equations $32x + 33y = 34$, $33x + 32y = 31$ respectively are:

(a) $-1, 2$ (b) $-1, 4$

(c) $1, -2$ (d) $-1, -4$

[CBSE Term-1 Std. 2021]

Ans. (a) $-1, 2$

Explanation: We have,

$32x + 33y = 34$ ...(i)

$33x + 32y = 31$ ...(ii)

Adding equation (i) and (ii), we get

$65x + 65y = 65$

or, $\qquad x + y = 1$ ...(iii)

Subtracting eq. (ii) from eq. (i), we get

$-x + y = 3$ ...(iv)

Adding equations (iii) and (iv), we get

$2y = 4$

$\Rightarrow \qquad y = 2$

Putting $y = 2$ in eq. (i), we get

$x = -1$

$\therefore \qquad x = -1, y = 2$

19. In a $\triangle ABC$, $\angle A = x°$, $\angle B = (3x - 2)°$, $\angle C = y°$. Also $\angle C - \angle B = 9°$. The sum of the greatest and the smallest angle of this triangle is:

(a) $107°$ (b) $135°$

(c) $155°$ (d) $145°$

[CBSE Term-1 Std. 2021]

Ans. (a) $107°$

Explanation: We know, sum of angles of a triangle is $180°$.

$\therefore \qquad \angle A + \angle B + \angle C = 180°$

$\Rightarrow \quad x° + (3x - 2)° + y° = 180°$

$\Rightarrow \qquad 4x + y = 182$ ...(i)

Also, $\qquad \angle C - \angle B = 9°$ [Given]

$\Rightarrow \quad y° - (3x - 2)° = 9$

$\Rightarrow \qquad -3x + y = 7$ ...(ii)

Subtracting eq. (ii) from eq. (i), we get

$7x = 175$

$\Rightarrow \qquad x = 25$

Put $x = 25$ in eq. (ii), we get

$-3 \times 25 + y = 7$

$\Rightarrow \qquad y = 7 + 75 = 82°$

So, $\qquad \angle A = x° = 25°$

$\angle B = (3x - 2)° = (3 \times 25 - 2)°$

$= 73°$

$\angle C = y° = 82°$

$\therefore \qquad$ Required sum $= \angle A + \angle C$

$= 25° + 82° = 107°$

*20. Given below is the graph representing two linear equations by lines AB and CD respectively. What is the area of the triangle formed by these two lines and the line $x = 0$?
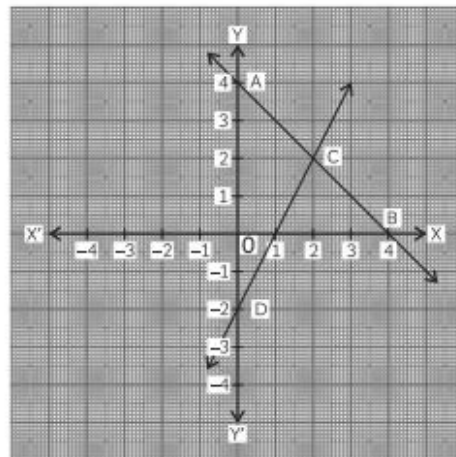
(a) 3 sq. units   (b) 4 sq. units

(c) 6 sq. units   (d) 8 sq. units

[CBSE Term-1 SQP 2021]

Ans. (c) 6 sq. units

Required area is area of triangle ACD $=$

$\dfrac{1}{2} \times 6 \times 2 = 6$ sq. units

[CBSE Marking Scheme Term-1 SQP 2021]

Explanation:

$\therefore$ Required area $=$ Area of $\triangle ACD$

$= \dfrac{1}{2} \times AD \times$ distance of point C from y-axis

$= \dfrac{1}{2} \times (4 - (-2)) \times 2$

$= \dfrac{1}{2} \times 6 \times 2 = 6$

* Topics and Questions which are a part of latest CBSE Syllabus but have been removed by NCERT.

21. The number of solutions of $3^{x+y} = 243$ and $243^{x-y} = 3$ is:

(a) 0   (b) 1

(c) 2   (d) infinite

[CBSE Term-1 SQP 2021]

22. Anushka and her friends went to a carnival on Christmas. The price of one adult ticket was ₹ x and that of a children's ticket was ₹ y. The total cost was a linear equation in two variables.

The pair of linear equations is
$\dfrac{3}{2}x + \dfrac{5}{3}y + 7 = 0$ and $9x + 10y + 14 = 0$.

It is:

(a) consistent

(b) inconsistent

(c) consistent with one solution

(d) consistent with many solutions

[CBSE 2020]

Ans. (b) inconsistent

Explanation:

For the given pair of equations, we have:

$$\frac{a_1}{a_2} = \frac{3/2}{9} = \frac{1}{6}$$

$$\frac{b_1}{b_2} = \frac{5/3}{10} = \frac{1}{6}$$

$$\frac{c_1}{c_2} = \frac{7}{14} = \frac{1}{2}$$

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

Hence, the given pair of linear equations is inconsistent.

23. Kunal and his friends wanted to purchase cricket bats and balls for joining cricket academy to pursue their dreams of becoming cricket players. They went to the sports equipment shop to purchase cricket bats and balls. The price of one cricket bat was ₹ x and that of a cricket ball was ₹ y.

The total cost of bats and balls can be expressed as linear equations in variables x and y. Graphically, the pair of equations represents two lines which are:

These linear equations are $6x - 3y + 10 = 0$ and $2x - y + 9 = 0$.

(a) intersecting at exactly one point.

(b) intersecting at exactly two points.

(c) coincident

(d) parallel

[Mod. CBSE 2013, Mod. NCERT Exemplar]

Ans. (d) parallel

Explanation: For the given pair of linear equations, we have

$$\frac{a_1}{a_2} = \frac{6}{2} = 3 \qquad \text{...(i)}$$

$$\frac{b_1}{b_2} = \frac{-3}{-1} = 3 \qquad \text{...(ii)}$$

$$\frac{c_1}{c_2} = \frac{-10}{-9} = \frac{10}{9} \qquad \text{...(iii)}$$

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

Hence, the given pair of linear equations represent lines which are parallel.

24. The Government of India has the sole right to mint coins. The responsibility for coinage vests with the Government of India in terms

of the Coinage Act, 1906 as amended from time to time. The designing and minting of coins in various denominations is also the responsibility of the Government of India. Coins are minted at the four India Government Mints at Mumbai, Alipore (Kolkata), Saifabad (Hyderabad), Cherlapally (Hyderabad) and Noida (UP).

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 respectively are:

(a) 35 and 15   (b) 35 and 20

(c) 15 and 35   (d) 25 and 25

[NCERT Exemplar]

Ans. (d) 25 and 25

Explanation: Let number of ₹ 1 coins = x and number of ₹ 2 coins = y.

It is given that,

Total number of coins = $x + y = 50$ ...(i)

Also, amount of money with her

$= $ (Number of ₹ 1 coins $\times$ 1)

$\qquad + $ (Number of ₹ 2 coins $\times$ 2)

Now, by the given condition:

$\Rightarrow \qquad x(1) + y(2) = 75$

$\Rightarrow \qquad x + 2y = 75$ ...(ii)

On subtracting eq. (i) from eq. (ii), we get

$\Rightarrow \quad (x + 2y) - (x + y) = (75 - 50)$

$\Rightarrow \qquad\qquad y = 25$

Putting $y = 25$ in eq. (i), we get

$\qquad\qquad x + 25 = 50$

$\Rightarrow \qquad\qquad x = 25$

Hence, Aruna has 25 ₹ 1 coins and 25 ₹ 2 coins.

Fill in the Blanks

25. ⓐ The value of k for which pair of linear equations $3x + 2y = -5$ and $x - ky = 2$ has a unique solution is ....

26. The value of a so that the point (3, a) lies on the line represented by $2x - 3y = 5$, is ....

Ans. $\dfrac{1}{3}$

Explanation: Given : (3, a) lies on $2x - 3y = 5$.

$\Rightarrow \qquad 2 \times 3 - 3a = 5$

$\Rightarrow \qquad\qquad 3a = 6 - 5 = 1$

$\Rightarrow \qquad\qquad a = \dfrac{1}{3}$

27. ⓐ The point where the line $x - y = 8$ will intersect y-axis is ....

28. The value of k for which the pair of linear equations $kx + 3y = k - 2$ and $12x + ky = k$ has no solution is ....

Ans. not equals to 6

Explanation: Since, pair of linear equations has no solution

Then, $\dfrac{k}{12} = \dfrac{3}{k} \neq \dfrac{-(k-2)}{-(k)}$

i.e., $\quad k^2 = 36$

$\Rightarrow \qquad k = \pm 6$

*29. The graphical representation of the pair of equations $x + 2y - 4 = 0$ and $2x + 4y - 12 = 0$ represents ....

Ans. Parallel lines

Explanation: For $x + 2y - 4 = 0$ and $2x + 4y - 12 = 0$, we have

$$\dfrac{a_1}{a_2} = \dfrac{1}{2}, \quad \dfrac{b_1}{b_2} = \dfrac{2}{4} = \dfrac{1}{2}$$

and $\qquad \dfrac{c_1}{c_2} = \dfrac{-4}{-12} = \dfrac{1}{3}$

Here, $\qquad \dfrac{a_1}{a_2} = \dfrac{b_1}{b_2} \neq \dfrac{c_1}{c_2}$

Therefore, lines are parallel or non-intersecting.

30. If $x - y = 2$ and $\dfrac{1}{x + y} = \dfrac{2}{5}$, then $x = $ ....

Ans. $\dfrac{9}{4}$

Explanation : $x - y = 2$ and $\dfrac{1}{x+y} = \dfrac{2}{5}$

$\Rightarrow \qquad x - y = 2$ ...(i)

and $\qquad x + y = \dfrac{5}{2}$ ...(ii)

Adding equations (i) and (ii), we get

$(x - y) + (x + y) = 2 + \dfrac{5}{2}$

$\Rightarrow \qquad\qquad 2x = \dfrac{9}{2}$

$\Rightarrow \qquad\qquad x = \dfrac{9}{4}$

31. ✎ The value of p for which the pair of linear equations $(p - 3)x + 3y = p$; $px + py = 12$ have infinitely many solutions, is ....

32. If $x = a$, $y = b$ is the solution of the pair of equations $x - y = 2$ and $x + y = 4$ then the value of $3a + 4b$ is ....

Ans. 13

   Explanation: $x - y = 2$ ...(i)

   $\qquad\qquad x + y = 4$ ...(ii)

   On adding equations (i) and (ii), we get

   $\qquad\qquad 2x = 6 \Rightarrow x = 3$

   On putting $x = 3$ in equation (i), we get

   $\qquad\qquad 3 - y = 2 \Rightarrow y = 1$

   $\therefore x = a = 3$ and $y = b = 1$

   Now, $\qquad 3a + 4b = 3 \times 3 + 4 \times 1 = 9 + 4 = 13$

True/False

33. For the pair of equations $\lambda x + 3y = -7$; $2x + 6y = 14$ to have infinitely many solutions, the value of λ, should be 1. Is this statement true? Give reasons.

Ans. False, for no value of λ, the given pair of linear equations has infinitely many solutions.

   Explanation: The given pair of linear equations is

   $\qquad \lambda x + 3y + 7 = 0$

   and $\quad 2x + 6y - 14 = 0$

   Comparing with $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$, we have

   $\qquad\qquad a_1 = \lambda, b_1 = 3, c_1 = 7;$

   $\qquad\qquad a_2 = 2, b_2 = 6, c_2 = -14;$

   $\dfrac{a_1}{a_2} = \dfrac{\lambda}{2}; \dfrac{b_1}{b_2} = \dfrac{3}{6} = \dfrac{1}{2}; \dfrac{c_1}{c_2} = \dfrac{7}{-14} = -\dfrac{1}{2}$

   For infinitely many solutions,

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

   $\Rightarrow \qquad \dfrac{\lambda}{2} = \dfrac{1}{2}$ and $\dfrac{\lambda}{2} = -\dfrac{1}{2}$

   $\Rightarrow \qquad \lambda = 1$ and $\lambda = -1$

   Since, λ does not have a unique value, so for no value of λ, the given pair of linear equations has infinitely many solutions.

34. ✎ For all real values of c, the pair of equations $x - 2y = 8$; $5x - 10y = c$ have a unique solution. Justify whether it is true or false. [NCERT Exemplar]

Assertion Reason

Direction for questions 35 to 39: In question number 35 to 39, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option as:

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

35. **Assertion (A):** If the pair of lines are coincident, then we say that pair of lines are consistent and it has a unique solution.

   Reason (R): If the pair of lines are parallel, then the pairs has no solution and is called inconsistent pair of equations.

Ans. (d) Assertion (A) is false but reason (R) is true.

   Explanation: If the pair of lines are coincident, then the system of linear equations is said to be consistent and has infinitely many solutions and if the pair of lines are parallel, then the system of linear equations is said to be inconsistent and has no solution.

   Hence, the assertion is false but the reason is true.

36. **Assertion (A):** If the lines $3x + 2ky - 2 = 0$ and $2x + 5y + 1 = 0$ are parallel, then the value of k is $\dfrac{15}{4}$.

   Reason (R): The condition for parallel lines is $\dfrac{a_1}{a_2} = \dfrac{b_1}{b_2} \neq \dfrac{c_1}{c_2}$.

Ans. (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

   Explanation: Condition for the lines to be parallel is

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

   Here the equations are

   $3x + 2ky = 2$ and $2x + 5y + 1 = 0$

   So, $a_1 = 3, b_1 = 2k, c_1 = -2$ and $a_2 = 2, b_2 = 5, c_2 = 1$

   $\therefore \dfrac{a_1}{a_2} = \dfrac{3}{2}, \dfrac{b_1}{b_2} = \dfrac{2k}{5}$ and $\dfrac{c_1}{c_2} = \dfrac{-2}{1} = -2$

   $\therefore \qquad\qquad \dfrac{2k}{5} = \dfrac{3}{2}$

   $\therefore \qquad\qquad k = \dfrac{15}{4}$

   Hence, both assertion and reason are true and reason is the correct explanation of the assertion.

37. Assertion (A): The value of k for which the system of linear equations $3x - 4y = 7$ and $6x - 8y = k$ have infinite number of solution is 14.

Reason (R): The graph of linear equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ gives a pair of parallel lines if $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$.

38. Assertion (A): The linear equations $x - 2y - 3 = 0$ and $3x + 4y - 20 = 0$ have exactly one solution.

Reason (R): The linear equation $2x + 3y - 9 = 0$ and $4x + 6y - 18 = 0$ have a unique solution.

Ans. (c) Assertion (A) is true but reason (R) is false.

Explanation: Let $x - 2y - 3 = 0$ ...(i)

And, $3x + 4y - 20 = 0$ ...(ii)

Multiply eq. (i) by 3, we get

$3(x - 2y - 3) = 3 \times 0$

$\Rightarrow \quad 3x - 6y - 9 = 0$ ...(iii)

Subtracting equation (iii) from equation (ii), we get,

$3x + 4y - 20 - (3x - 6y - 9) = 0$

$\Rightarrow \quad 10y - 11 = 0$

$\Rightarrow \quad y = \frac{11}{10}$

Substituting the value of y in equation (i), we get,

$x - 2 \times \frac{11}{10} - 3 = 0$

$\Rightarrow \quad x = \frac{22}{10} + 3$

$= \frac{26}{5}$

Thus, the pair of linear equations gives exactly one solution (unique solution).

Now,

Let $2x + 3y - 9 = 0$ ...(iv)

And, $4x + 6y - 18 = 0$ ...(v)

Multiply the equation by (iv) by 2, we get

$2(2x + 3y - 9) = 2 \times 0$

$\Rightarrow \quad 4x + 6y - 18 = 0$ ...(iii)

As, equation (v) and (vi) are same, thus, the two linear equations are coincident possessing infinitely many solutions.

Hence, the assertion is true but the reason is false.

39. Assertion (A): The value of k for which the system of linear equations $kx - y = 2$ and $6x - 2y = 3$ has a unique solution is 3.

Reason (R): The graph of linear equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ gives a pair of intersecting lines, if $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$.

Ans. (d) Assertion (A) is false but reason (R) is true.

Explanation: The given pair of linear equations are:

$kx - y - 2 = 0$ ...(i)

$6x - 2y - 3 = 0$ ...(ii)

Compare the above equations with $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$, we get

$a_1 = k, b_1 = -1, c_1 = -2;$

$a_2 = 6, b_2 = -2, c_2 = -3;$

Now,

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

[Given they have unique solution]

$\frac{k}{6} \neq \frac{-1}{-2}$

$\frac{k}{6} \neq \frac{1}{2}$

$k \neq \frac{6}{2}$

$k \neq 3$

The graph of linear equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ gives a pair of intersecting lines if $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$.

Hence, the assertion is false but the reason is true.

CASE BASED Questions (CBQs)

[**4** & **5** marks]

Read the following passages and answer the questions that follow:

40. A book store shopkeeper gives books on rent for reading. He has variety of books in his store related to fiction, stories and quizzes etc. He takes a fixed charge for the first two days and an additional charge for subsequent day. Amruta paid ₹ 22 for a book and kept for 6 days; while Radhika paid ₹ 16 for keeping the book for 4 days.

Assume that the fixed charge be ₹ x and additional charge (per day) be ₹ y.

(A) The situation of amount paid by Radhika, is algebraically represented by:
(a) $x - 4y = 16$ (b) $x + 4y = 16$
(c) $x - 2y = 16$ (d) $x + 2y = 16$

(B) ✍ The situation of amount paid by Amruta, is algebraically represented by:
(a) $x - 2y = 11$ (b) $x - 2y = 22$
(c) $x + 4y = 22$ (d) $x - 4y = 11$

(C) What are the fixed charges for a book ?
(a) ₹9   (b) ₹10
(c) ₹13   (d) ₹15

(D) ✍ What are the additional charges for each subsequent day for a book ?
(a) ₹6   (b) ₹5
(c) ₹4   (d) ₹3

(E) What is the total amount paid by both, if both of them have kept the book for 2 more days ?
(a) ₹35   (b) ₹52
(c) ₹50   (d) ₹58

[CBSE Term-1 SQP 2021]

Ans. (A) *(d) $x + 2y = 16$*

[CBSE Marking Scheme Term-1 SQP 2021]
Explanation: Here, Radhika kept book for 4 days and paid ₹16.
Since, there are fixed charges for first two days.
∴ $x + (4 - 2)y = 16$
or, $x + 2y = 16$

(C) *(b) ₹10*

[CBSE Marking Scheme Term-1 SQP 2021]

Explanation: From A and B, we have
$x + 2y = 16$ ...(i)
$x + 4y = 22$ ...(ii)
Solving equations (i) and (ii), we get
     $y = 3, x = 10$
∴   Fixed charges = ₹x = ₹10

(E) *(c) ₹50*

[CBSE Marking Scheme Term-1 SQP 2021]

Explanation: New amount paid by Radhika = ₹$(16 + 2y)$
and new amount paid by Amruta = ₹$(22 + 2y)$
∴   Sum = ₹$(16 + 2y)$ + ₹$(22 + 2y)$
            = ₹$(38 + 4y)$
            = ₹$(38 + 4 \times 3)$
            = ₹$(38 + 12)$
            = ₹50

41. Raman went to a local mela during Dussehra. He ate several rural delicacies such as jalebis, chaat, etc. He also wanted to play the ring game in which a ring is thrown on the items displayed on the table and the balloon shooting game.

The cost of three balloon shooting games exceeds the cost of four ring games by ₹ 4. Also, the total cost of three balloon shooting games and four ring games is ₹ 20.

(A) Taking the cost of one ring game to be ₹ x and that of one balloon game as ₹ y, the pair of linear equations describing the above situations are:
(a) $-4x - 3y = -4$ and $4x + 3y = 20$
(b) $4x - 3y = 4$ and $4x + 3y = 20$
(c) $4x - 3y = -4$ and $4x + 3y = 20$
(d) $4x + 3y = -4$ and $4x + 3y = 20$

(B) ⓐ The cost of one ring game and one balloon game is:
(a) ₹ 2 and ₹ 4   (b) ₹ 4 and ₹ 2
(c) ₹ 8 and ₹ 2   (d) ₹ 6 and ₹ 3

* (C) The points where the line represented by the equation $4x - 3y = -4$ intersects the x-axis and y-axis, respectively, are given by:
(a) $(1, 0), \left(0, \dfrac{4}{3}\right)$ (b) $(-1, 0), \left(0, \dfrac{4}{3}\right)$
(c) $(-1, 0), \left(0, -\dfrac{4}{3}\right)$ (d) $(1, 0), \left(0, -\dfrac{4}{3}\right)$

* (D) ⓔ The area of the triangle formed by the two lines and the x-axis is:
(a) 4 sq. units   (b) 6 sq. units
(c) 8 sq. units   (d) 12 sq. units

(E) The value of k for which the pair of linear equations $-x + y = -1$, $x + ky = 5$ will be inconsistent, is :
(a) $k = 1$ (b) $k = -1$
(c) $k \neq -1$ (d) $k \neq 1$

Ans. (A) (c) $4x - 3y = -4$ and $4x + 3y = 20$
Explanation: Given: The cost of one ring game = ₹ x and cost of one balloon game = ₹ y.
According to the question,
$3y = 4x + 4$ or $4x - 3y = -4$ ...(i)
And $4x + 3y = 20$ ...(ii)

(C) (b) $(-1, 0), \left(0, \dfrac{4}{3}\right)$

Explanation: The line represented by the equation $4x - 3y = -4$ will intersect the x-axis for $y = 0$.
So, $4x = -4$ or $x = -1$.
Therefore, point is $(-1, 0)$.
The line will intersect the y-axis for $x = 0$.
So, $-3y = -4$
$\Rightarrow \quad y = \dfrac{4}{3}$.
Therefore, point is $\left(0, \dfrac{4}{3}\right)$.

(E) (b) $k = -1$

Explanation: For the pair of linear equations to be inconsistent is:
$$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$$
$$\Rightarrow \frac{-1}{1} = \frac{1}{k} \neq \frac{-1}{5}$$
$$\Rightarrow \quad k = -1$$

42. Mr. Jose decided to go to an amusement park along with his family. The cost of a entry ticket is ₹ 25.00 for children and ₹ 50.00 for adults. On that particular day, attendance at the circus is 2,000 and the total gate revenue is ₹ 70,000.

(A) ⓒ If we let the number of children and adults who bought ticket on that day as x and y respectively, form the pair of linear equations describing the above situation.

(B) ⓐ Find the number of children and adults who bought tickets on that particular day.

* (C) Find the points where the lines represented by the equations $2x - 3y + 4 = 0$ and $x + 2y - 5 = 0$ respectively intersect the x-axis.

Ans. (C) On x-axis $y = 0$.
So, substituting $y = 0$ in the equations $2x - 3y + 4 = 0$ and $x + 2y - 5 = 0$, we get
$2x - 3(0) + 4 = 0$
$\Rightarrow \qquad 2x + 4 = 0$
$\Rightarrow \qquad x = -2$
and, $\qquad x + 2(0) - 5 = 0$
$\Rightarrow \qquad x - 5 = 0$
$\Rightarrow \qquad x = 5$
Hence, the given system of equations will intersect x-axis at points $(-2, 0)$ and $(5, 0)$, respectively.

43. Amrita was very fond of reading books. So, she went to the National Book fair at Pragati Maidan in New Delhi to get some story books and text books.

* Topics and Questions which are a part of latest CBSE Syllabus but have been removed by NCERT.

When her friends asked her how many of each she had bought, she answered, four times the number of text books is six more than thrice the number of story books. Also, seven times the number of text books added to thrice the number of story books gives 27.

(A) ⓐ Taking the number of text books and story books bought by Amrita as x and y respectively, the pair of linear equations formed in this case is:
(a) $4x + 3y = 6$; $7x + 3y = 27$
(b) $4x - 3y = -6$; $7x + 3y = 27$
(c) $4x - 3y = 6$; $7x + 3y = 27$
(d) $4x - 3y = -6$; $7x - 3y = 27$

(B) The number of text books and story books bought by Amrita from the fair are:
(a) Text books = 4, Story books = 3
(b) Text books = 4, Story books = 6
(c) Text books = 6, Story books = 4
(d) Text books = 3, Story books = 2

* (C) ⓐ The area of the triangle formed by the graphs of the two equations obtained and the y-axis is:
(a) 9 sq. units   (b) 11 sq. units
(c) 16.5 sq. units   (d) 18 sq. units

(D) The value of k for which the system of equations $kx + 3y = k - 3$; $12x + ky = k$ has no solution is:
(a) $k = 6$ (b) $k = -6$
(c) $k = 6$ and $k = -6$ (d) $k = 1$

(E) The linear equation $2x - y = 4$ intersects the y-axis at the point:
(a) (0, −4)   (b) (2, −8)
(c) (0, 4)   (d) (4, 0)

Ans. (B) (d) Text books = 3, Story books = 2

Explanation: In order to find the number of text books and story books bought by Amrita from the fair, we have to solve the two linear equations

$$4x - 3y = 6 \qquad \text{...(i)}$$
and $\qquad 7x + 3y = 27 \qquad$ ...(ii)

Adding equations (i) and (ii) we get

$$11x = 33$$
$$\Rightarrow \qquad x = 3$$

Putting $x = 3$ in equation (i), we get

$$4(3) - 3y = 6$$
$$3y = 6$$
$$y = 2$$

Therefore, number of text books = 3, number of story books = 2

(D) (b) $k = -6$

Explanation: For no solution,

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

$$\Rightarrow \qquad \frac{k}{12} = \frac{3}{k} \neq \frac{k-3}{k}$$

Simplifying the equation, $k^2 = 36$
$$\Rightarrow \qquad k = \pm 6.$$

Substituting the values of k in $\frac{3}{k} \neq \frac{k-3}{k}$, we

find that if we put $k = 6$, then it does not satisfy the given in equation.
However, if we put $k = -6$, then it satisfies the given in equation.
Therefore, $k = -6$ is the correct answer.

(E) (a) (0, −4)

Explanation: Putting $x = 0$ in $2x - y = 4$ we get $y = -4$. Therefore, the point where the line represented by the linear equation $2x - y = 4$ intersects the y-axis is given by (0, −4).

44. A test consists of 'True' or 'False' questions. One mark is awarded for every correct answer while $\frac{1}{4}$ mark is deducted for every wrong answer. A student knew answers to some of the questions. Rest of the questions he attempted by guessing. He answered 120 questions and got 90 marks.

Type of Question	Marks given for correct answer	Marks deducted for wrong answer
True/False	1	0.25

(A) If answer to all questions he attempted by guessing were wrong, then how many questions did he answer correctly ?

(B) If answer to all questions he attempted by guessing were wrong and answered 80 correctly, then how many marks did he got?

(C) ⓐ If answer to all questions be attempted by guessing were wrong then how many questions he answered correctly to score 95 marks ?   [CBSE Question Bank 2022]

Ans. (A) Let the number of questions he answered correctly be x and number of questions he answered by guessing be y.
Then, $\qquad x + y = 120 \qquad$ ...(i)

and $\qquad x + y \times \left(-\frac{1}{4}\right) = 90$

$\Rightarrow \qquad x - \dfrac{y}{4} = 90$

$\Rightarrow \qquad 4x - y = 360 \qquad \text{...(ii)}$

Solving equations (i) and (ii), we get

$\qquad x = 96$

and $\qquad y = 24$

Hence, he answered 96 questions correctly.

(B) Given, total question = 120

Questions that were answered correctly = 80

Thus, questions answered by guessing

$= 120 - 80 = 40$

Now, total marks = question answered

correctly $\times\ 1 - \dfrac{1}{4} \times$ questions answered

incorrectly

$= 80 \times 1 - \dfrac{1}{4} \times 40$

$= 70$

Thus, he got 70 marks.

VERY SHORT ANSWER Type Questions (VSA)

[1 mark]

45. Frame a pair of linear equations in two variables if the two numbers have a difference of 6 and an average of 4. [British Council 2022]

Ans. The required pair of linear equations are:

$\qquad x - y = 6$

and $\qquad \dfrac{(x + y)}{2} = 4$

$\Rightarrow \qquad x + y = 8$

46. Write the relationship between the coefficients, if the following pair of equations is inconsistent.
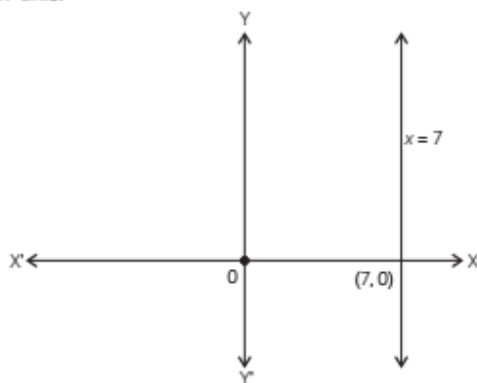
$ax + by + c = 0;\quad a'x + b'y + c' = 0.$

Ans. The required relationship is:

$$\dfrac{a}{a'} = \dfrac{b}{b'} \neq \dfrac{c}{c'}$$

*47. The line represented by $x = 7$ is parallel to the x-axis. Justify whether the statement is true or not. [NCERT Exemplar]

Ans. *False*

The line represented by $x = 7$ is not parallel to the x-axis as the graph of this equation is a line parallel to the y-axis and perpendicular to the x-axis.

Hence, the given statement is not true.

48. ⓐ When will the system $kx - y = 2$ and $6x - 2y = 3$ has a unique solution only? [Diksha]

49. For what values of p does the pair of equations $4x + py + 8 = 0$ and $2x + 2y + 2 = 0$ has unique solution? [CBSE SQP 2020]

Ans. $\dfrac{a_1}{a_2} \neq \dfrac{b_1}{b_2}$ is the condition for the given pair of equations to have unique solution.

$$\dfrac{4}{2} \neq \dfrac{p}{2}$$

$$p \neq 4$$

Therefore, for all real values of p except 4, the given pair of equations will have a unique solution.

[CBSE Marking Scheme SQP 2020]

50. For what value of k, the pair of linear equations $3x + y = 3$ and $6x + ky = 8$ does not have a solution. [CBSE SQP 2020]

Ans. Here,

$$\dfrac{3}{6} = \dfrac{1}{k} \neq \dfrac{3}{8}$$

$$\dfrac{3}{6} = \dfrac{1}{k}$$

$$k = 2$$

[CBSE Marking Scheme SQP 2020]

Explanation : Given, pair of linear equations is :

$\qquad 3x + y = 3$

and $\qquad 6x + ky = 8$

Here, $a_1 = 3,\quad b_1 = 1,\quad c_1 = -3$

and $\quad a_2 = 6,\quad b_2 = k,\quad c_2 = -8$

Condition for no solution is,

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

$\Rightarrow \qquad \dfrac{3}{6} = \dfrac{1}{k} \neq \dfrac{-3}{-8}$

Then, $\qquad k = \dfrac{6}{3} = 2$

Hence, the value of k is 2.

* Topics and Questions which are a part of latest CBSE Syllabus but have been removed by NCERT.

51. Find the solution of $x + y = 3$ and $7x + 6y = 2$.

52. Sanya went with her friends to the food court at the Dwarka City centre to celebrate her birthday. Her friends decided to eat pizzas and ice creams. The cost of one pizza was ₹ x and cost of one ice cream was ₹ y. The total cost depended on the number of pizzas and ice creams were ordered.

On comparing the ratios of the coefficients, find out whether the pair of equations $x - 2y = 0$ and $3x + 4y - 20 = 0$ is consistent or inconsistent. **[CBSE SQP 2020]**

Ans.

$$x - 2y = 0$$
$$3x + 4y - 20 = 0$$
$$\frac{1}{3} \neq -\frac{2}{4}$$

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

is one condition for consistency.
Therefore, the pair of equations is consistent.

[CBSE Marking Scheme SQP 2020]

53. Tanya went to a book shop to get some story books and text books. When her friends asked her how many of each she had bought, she answered, if the number of story books is represented by x and number of text books is represented by y, then twice the number of story books when added to thrice the number of text books gives 5. Later, she said that four times the number of story books added to six times the number of text books gives 7.

What type of straight lines will be represented by the system of equations $2x + 3y = 5$ and $4x + 6y = 7$? **[CBSE SQP 2020]**

Ans. Here,

$$\frac{a_1}{a_2} = \frac{2}{4} = \frac{1}{2}$$

$$\frac{b_1}{b_2} = \frac{3}{6} = \frac{1}{2}$$

and
$$\frac{c_1}{c_2} = \frac{-5}{-7}$$

$$\frac{1}{2} = \frac{1}{2} \neq \frac{5}{7}$$

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

is the condition for which the given system of equations will represent parallel lines.

So, the given system of linear equations will represent a pair of parallel lines.

[CBSE Marking Scheme SQP 2020]

SHORT ANSWER Type-I Questions (SA-I)

[**2** marks]

54. Find the value(s) of k for which the pair of equations $kx + 2y = 3$ and $3x + 6y = 10$ has a unique solution. **[CBSE 2019]**

Ans. Given: pair of linear equations is,
$$kx + 2y = 3$$
$$3x + 6y = 10$$

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

Here, $a_1 = k, b_1 = 2, a_2 = 3, b_2 = 6$

$\therefore \qquad \frac{k}{3} \neq \frac{2}{6}$

$\therefore \qquad k \neq 1$

Hence, the pair of equations has a unique solution for all real values of k except 1.

55. ✏️ The larger of two supplementary angles exceeds the smaller by 18°. Find the angles.
[CBSE 2019]

56. In a $\triangle ABC$, $\angle A = x°$, $\angle B = 3x°$ and $\angle C = y°$. If $3y° - 5x° = 30°$, prove that the triangle is right angled. [Diksha]

Ans. We know that,

$$\angle A + \angle B + \angle C = 180°$$

[∵ Sum of interior angles of a triangle ABC is 180°]

$\Rightarrow \qquad x + 3x + y = 180°$

$\Rightarrow \qquad 4x + y = 180° \qquad$ ...(i)

and $\qquad 3y - 5x = 30° \qquad$ [Given] ...(ii)

Multiply equation (i) by 3, we get

$$12x + 3y = 540° \qquad \text{...(iii)}$$

Subtracting equation (ii) from equation (iii), we get

$$17x = 510$$

$\Rightarrow \qquad x = 30°$

Putting the value of x in equation (i), we get

$$4 \times 30° + y = 180°$$

$\Rightarrow \qquad y = 60°$

$\therefore \qquad \angle A = 30°,$

$\qquad \angle B = 3 \times 30° = 90°$

And $\qquad \angle C = 60°$

Since, $\angle B = 90°$, hence, $\triangle ABC$ is a right angled triangle at B.
Hence proved.

57. ✏️ If $49x + 51y = 499$, $51x + 49y = 501$, then find the value of x and y. [CBSE SQP 2022]

58. Find c if the system of equations $cx + 3y + (3 - c) = 0$; $12x + cy - c = 0$ has infinitely many solutions. [CBSE 2019]

Ans. Given system of equations is :

$$cx + 3y + (3 - c) = 0$$

and $\quad 12x + cy - c = 0$

Condition for equations to have infinitely many solutions is:

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

Here, $\qquad a_1 = c, b_1 = 3, c_1 = 3 - c$

$\qquad a_2 = 12, b_2 = c, c_2 = -c$

$\therefore \qquad \dfrac{c}{12} = \dfrac{3}{c} = \dfrac{3 - c}{-c}$

$\Rightarrow \qquad c^2 = 36$

$\Rightarrow \qquad c = 6 \text{ or } c = -6 \qquad$ ...(i)

Also, $\qquad -3c = 3c - c^2$

$\Rightarrow \qquad c = 6 \text{ or } c = 0 \qquad$ ...(ii)

From (i) and (ii), we get, $c = 6$.
Hence, the value of c is 6.

59. ✏️ For what value of k, does the system of linear equations

$$2x + 3y = 7$$

$$(k - 1)x + (k + 2)y = 3k$$

have an infinite number of solutions?
[CBSE 2019]

60. ✏️ If $2x + y = 23$ and $4x - y = 19$, find the values of $5y - 2x$ and $\dfrac{y}{x} - 2$.
[NCERT Exemplar]

61. Write an equation for a line passing through the point representing the solution of pair of linear equations $x + y = 2$ and $2x - y = 1$. How many such lines can we find?
[NCERT Exemplar]

Ans. The given equations are

$$x + y = 2 \qquad \text{...(i)}$$

$$2x - y = 1 \qquad \text{...(ii)}$$

Adding eq. (i) and (ii), we have

$$3x = 3 \Rightarrow x = 1$$

Putting $x = 1$ in eq. (i), we have

$$1 + y = 2$$

$\Rightarrow \qquad y = 1$

So, the solution is $x = 1$ and $y = 1$ and the point that represents the solution is (1, 1).
We know that an infinite number of lines can pass through a given point, say (1, 1).
One such equation of a line is $3x - 2y = 1$.

62. A fraction becomes $\dfrac{1}{3}$ when 1 is subtracted from the numerator and it becomes $\dfrac{1}{4}$ when 8 is added to its denominator. Find the fraction. [CBSE 2020]

Ans. Let the fraction be $\dfrac{a}{b}$.

Then, according to the question,

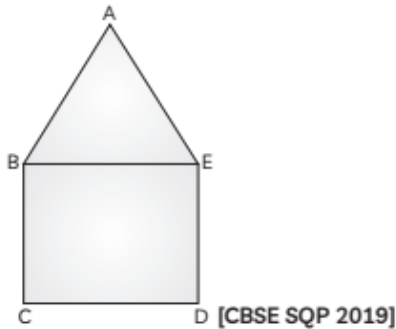$$\frac{a-1}{b} = \frac{1}{3} \text{ and } \frac{a}{b+8} = \frac{1}{4}$$

$\Rightarrow \qquad 3a - b = 3 \text{ and } 4a - b = 8$

On solving these equations, we get

$$a = 5, b = 12.$$

So, the fraction is $\dfrac{5}{12}$.

63. In the figure, ABCDE is a pentagon with BE || CD and BC || DE. BC is perpendicular to CD. AB = 5 cm, AE = 5 cm, BE = 7 cm, BC = $x - y$ and CD = $x + y$. If the perimeter of ABCDE is 27 cm, find the values of x and y, given $x, y \ne 0$.

[CBSE SQP 2019]

Ans. $x + y = 7$ and $2(x - y) + x + y + 5 + 5 = 27$

∴ $x + y = 7$ and $3x - y = 17$

Solving, we get, $x = 6$ and $y = 1$

[CBSE Marking Scheme SQP 2019]

Explanation : In quadrilateral BCDE, we have BE ∥ CD and BC ∥ DE.

∴ BCDE is a rectangle.

∴ $\qquad$ BC = DE = $x - y$ $\qquad$ ...(i)

and, $\qquad$ CD = BE

⇒ $\qquad$ $x + y = 7$ $\qquad$ ...(ii)

Also, perimeter of ABCDE = 27 cm

⇒ AB + BC + CD + DE + AE = 27

⇒ $5 + (x - y) + 7 + (x - y) + 5 = 27$

[Using (i) and (ii)]

⇒ $\qquad$ $2(x - y) = 10$

⇒ $\qquad$ $x - y = 5$ $\qquad$ ...(iii)

Adding equations (ii) and (iii), we get

$\qquad$ $2x = 12$

⇒ $\qquad$ $x = 6$

Putting $x = 6$ in equation (ii), we get

$\qquad$ $6 + y = 7$

⇒ $\qquad$ $y = 1$

∴ $\qquad$ $x = 6$ and $y = 1$

SHORT ANSWER Type-II Questions (SA-II)

[**3** marks]

64. ✏️ For which value(s) of λ do the pair of linear equations $\lambda x + y - \lambda^2 = 0$ and $x + \lambda y - 1 = 0$ have:

(A) no solution?

(B) infinitely many solutions?

(C) a unique solution? $\qquad$ [NCERT Exemplar]

65. A train covered a certain distance at a uniform speed. If the train would have been 6 km/h faster, it would have taken 4 hours less than the scheduled time. And, if the train were slower by 6 km/hr ; it would have taken 6 hours more than the scheduled time. Find the length of the journey.

[CBSE SQP Std. 2022]

Ans. Let the actual speed of the train be x km/hr and let the actual time taken be y hours.

Distance covered is xy km

If the speed is increased by 6 km/hr, then time of journey is reduced by 4 hours i.e., when speed is $(x + 6)$ km/hr, time of journey is $(y - 4)$ hours.

∴ Distance covered = $(x + 6) (y - 4)$

⇒ $\qquad$ $xy = (x + 6)(y - 4)$

⇒ $\quad$ $-4x + 6y - 24 = 0$

⇒ $\quad$ $-2x + 3y - 12 = 0$ $\qquad$ ...(i)

Similarly $\qquad$ $xy = (x - 6)(y + 6)$

⇒ $\quad$ $6x - 6y - 36 = 0$

⇒ $\qquad$ $x - y - 6 = 0$ $\qquad$ ...(ii)

Solving (i) and (ii) we get $x = 30$ and $y = 24$

Putting the values of x and y in equation (i), we obtain

Distance = (30×24) km = 720 km.

Hence, the length of the journey is 720 km.

[CBSE Marking Scheme SQP Std. 2022]

66. ✏️ For which values of a and b will the following pair of linear equations have infinitely many solutions?

$$x + 2y = 1$$

$$(a - b)x + (a + b)y = a + b - 2$$

[CBSE 2013, 11]

67. Write a pair of linear equations which has the unique solution $x = -1$, $y = 3$. How many such pairs can you write? $\qquad$ [NCERT]

Ans. We know that the condition for the pair of linear equations to have a unique solution is

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

Let the equations be

$$a_1 x + b_1 y + c_1 = 0$$

$$a_2 x + b_2 y + c_2 = 0$$

It is given that, $x = -1$ and $y = 3$ is the unique solution of these two equations, then it must satisfy the above equations.

⇒ $\qquad$ $a_1(-1) + b_1(3) + c_1 = 0$

⇒ $\qquad$ $-a_1 + 3b_1 + c_1 = 0$ $\qquad$ ...(i)

and $\qquad$ $a_2(-1) + b_2(3) + c_2 = 0$

⇒ $\qquad$ $-a_2 + 3b_2 + c_2 = 0$ $\qquad$ ...(ii)

The restricted values of a_1, a_2 and b_1, b_2 are only

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} \qquad \text{...(iii)}$$

So, all the real values of a_1, a_2, b_1, b_2 except those which satisfy eq. (iii), satisfy eq. (i), and eq. (ii) will have the solution $x = -1$ and $y = 3$.

Hence, infinitely many pairs of linear equations are possible. One such pair of linear equations are $x + y - 2 = 0$ and $2x - y + 5 = 0$.

68. Anuj had some chocolates, and he divided them into two lots A and B. He sold the first lot at the rate of ₹2 for 3 chocolates and the second lot at the rate of ₹1 per chocolate, and got a total of ₹400. If he had sold the first lot at the rate of ₹1 per chocolate, and the second lot at the rate of ₹4 for 5 chocolates, his total collection would have been ₹460. Find the total number of chocolates he had.   [CBSE SQP Std. 2022]

Ans. Let the number of chocolates in lot A be x
And let the number of chocolates in lot B be y
∴ total number of chocolates = $x + y$

Price of 1 chocolate = ₹ $\frac{2}{3}$, so for x chocolates = $\frac{2}{3}x$

and price of y chocolates at the rate of ₹ 1 per chocolate = y.

∴ by the given condition $\frac{2}{3}x + y = 400$

$\Rightarrow \qquad 2x + 3y = 1200 \qquad \text{...(i)}$

Similarly $x + \frac{4}{5}y = 460$

$\Rightarrow \qquad 5x + 4y = 2300 \qquad \text{...(ii)}$

Solving (i) and (ii) we get
$\qquad x = 300$ and $y = 200$
∴ $\qquad x + y = 300 + 200 = 500$

So, Anuj had 500 chocolates.

[CBSE Marking Scheme SQP Std. 2022]

69. Ⓐ Find the solution of the pair of equations
$\frac{x}{10} + \frac{y}{5} - 1 = 0$ and $\frac{x}{8} + \frac{y}{6} = 15$. Hence, find λ,
if $y = \lambda x + 5$.   [NCERT Exemplar]

*70. By the graphical method, find whether the following pair of equations is consistent or not. If consistent, solve them.
$3x + y + 4 = 0$ and $6x - 2y + 4 = 0$
[NCERT Exemplar]

Ans. The given pair of equations is
$\qquad 3x + y + 4 = 0 \qquad \text{...(i)}$
and $\qquad 6x - 2y + 4 = 0 \qquad \text{...(ii)}$
From equation (i), we have
$\qquad y = -4 - 3x$
When $x = 0$, then $y = -4$

When $x = -1$, then $y = -1$
When $x = -2$, then $y = 2$

So, the table for equation (i) is:

x	0	−1	−2
y	−4	−1	2

Similarly, from equation (ii), we have
$\qquad y = 3x + 2$
When $x = 0$, then $y = 2$
When $x = -1$, then $y = -1$
When $x = 1$, then $y = 5$

So, the table for equation (ii) is :

x	0	−1	1
y	2	−1	5

Plotting these points on a same graph paper.
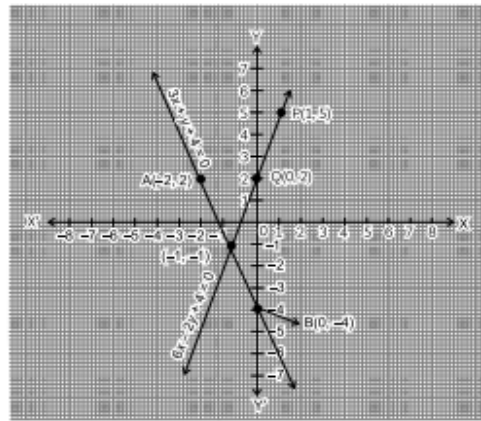
The two lines intersect at a point (−1, −1).

Thus, the pair of linear equations is consistent and has solution $x = -1$, $y = -1$. Since, the lines are intersecting the pair of equations is consistent.

*71. By graphical method, find whether the following pair of linear equations is consistent or not. If consistent, solve them.
$x - 2y = 6$ and $3x - 6y = 0$ [NCERT Exemplar]

Ans. The given pair of equations is
$x - 2y = 6$ and $3x - 6y = 0$
∴ $\qquad x - 2y = 6$

x	0	6
y	−3	0

and $\qquad 3x - 6y = 0$

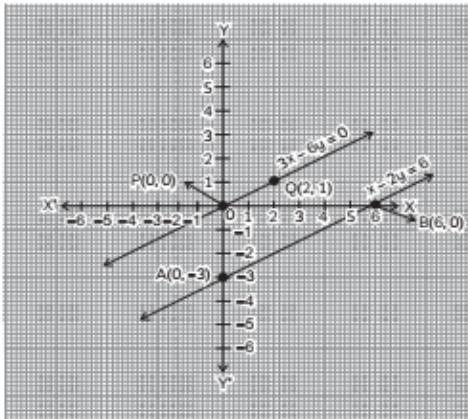| x	0	2
y	0	1

Plotting the points A (0, − 3) & B (6, 0), we get line AB.
And, plotting the points P (0, 0) & Q (2, 1), we get line PQ.

* Topics and Questions which are a part of latest CBSE Syllabus but have been removed by NCERT.

Since, the lines are parallel, the pair of equations is inconsistent.

72. @ By graphical method, find whether the following pair of linear equations is consistent or not. If consistent, solve them.
$$x + y = 3 \text{ and } 3x + 3y = 9$$
[CBSE 2014, NCERT Exemplar]

73. The present age of a father is three years more than three times the age of his son. Three years hence, the father's age will be 10 years more than twice the age of the son. Determine their present ages. [CBSE 2020]

Ans. Let 'x' (in years) be the present age of the father and 'y' (in years) be the present age of the son.

Then, according to the question,
$$x = 3y + 3$$
or
$$x - 3y = 3 \qquad ...(i)$$
After 3 years,

Father's age $= x + 3$,

son's age $= y + 3$

So, according to the question,
$$x + 3 = 2(y + 3) + 10$$
or
$$x - 2y = 13 \qquad ...(ii)$$
On solving equations (i) and (ii), we get:
$$y = 10$$
and
$$x = 33.$$

Thus, the father's present age is 33 years and the son's present age is 10 years.

74. @ Meena went to a bank to withdraw ₹ 2,000. She asked the cashier to give her ₹50 and ₹100 notes only. Meena got 25 notes in all. Find how many notes of ₹50 and ₹100 she received. [CBSE SQP 2020, NCERT]

75. @ The graph of a line represented by the equation $ax + y + 8 = 0$ is shown in the figure below.
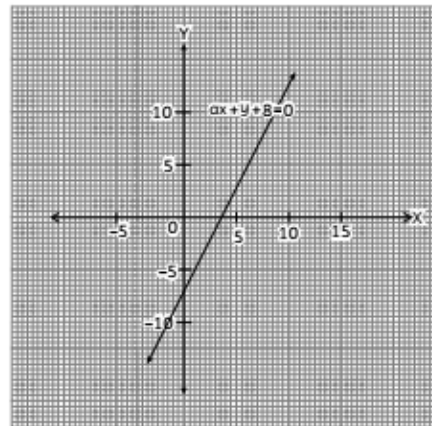
(A) Find the value of a.

(B) Find the point of intersection of this line with the line represented by the equation
$$4x - 3y - 14 = 0.$$

76. The angles of a triangle are x, y and 40°. The difference between the two angles x and y is 30°. Find x and y. [NCERT Exemplar]

Ans. It is given that x, y and 40° are the angles of a triangle.

We know that the sum of all angles of a triangle is 180°.
$$\Rightarrow \qquad x + y + 40° = 180°$$
$$\Rightarrow \qquad x + y = 140° \qquad ...(i)$$
Also, it is given that the difference of the angles x and y is 30°.
$$\Rightarrow \qquad x - y = 30° \qquad ...(ii)$$
Adding eq. (i) and (ii), we get
$$(x + y) + (x - y) = 140° + 30°$$
$$\Rightarrow \qquad 2x = 170°$$
$$\Rightarrow \qquad x = 85°$$
Putting the value of x in eq. (i), we get
$$\Rightarrow \qquad 85° + y = 140°$$
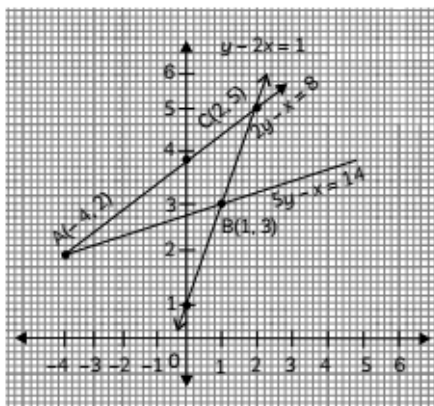$$\Rightarrow \qquad y = 140° - 85°$$
$$\Rightarrow \qquad y = 55°$$
Hence, the required values of x and y are 85° and 55° respectively.

*****77.** Determine graphically the coordinates of the vertices of a triangle, the equations of whose sides are given by $2y - x = 8$, $5y - x = 14$ and $y - 2x = 1$. [CBSE 2020]

Ans. $2y - x = 8$

x	0	2
y	4	5

$5y - x = 14$

x	1	6
y	3	4

$y - 2x = 1$

x	0	1
y	1	3

* Topics and Questions which are a part of latest CBSE Syllabus but have been removed by NCERT.

From the graph, the three equations of line form a triangle ABC whose vertices are A (– 4, 2), B (– 1, 3) and C (2, 5).

78. A part of monthly hostel charges in a college hostel are fixed and the remaining depends on the number of days one has their meals in the mess. When a student A takes food for 25 days, he has to pay ₹4,500, whereas a student B who takes food for 30 days, has to pay ₹5,200. Find the fixed charges per month and the cost of food per day.

[CBSE 2019]

Ans. Let, the fixed charges per month = ₹ x

Cost of food per day per month = ₹ y

According to the given conditions,

$$x + 25y = 4500 \quad \text{...(i)}$$
and, $$x + 30y = 5200 \quad \text{...(ii)}$$

On subtracting equation (i) from equation (ii), we get

$$x + 30y = 5200$$
$$x + 25y = 4500$$
$$\underline{-\quad-\quad\quad-}$$
$$\overline{5y = 700}$$

$$\Rightarrow \qquad y = \frac{700}{5}$$

$$= 140$$

Put the value of y in equation (i), we get

$$x + 25 \times 140 = 4500$$
$$\Rightarrow \qquad x + 3500 = 4500$$
$$\Rightarrow \qquad x = 1000$$

Hence, the fixed charges per month is ₹1,000 and the cost of food per day is ₹140.

79. There are some students in two examination halls A and B. To make the number of students equal in each hall, 10 students are sent from A to B. But, if 20 students are sent from B to A, the number of students in A becomes double the number of students in B. Find the number of students in the two halls. [NCERT Exemplar]

80. In a competitive examination, one mark is awarded for each correct answer, while $\frac{1}{2}$ mark is deducted for every wrong answer. Rahul answered 120 questions and got 90 marks. How many questions did he answer correctly? [CBSE 2011, NCERT Exemplar]

Ans. Let the number of answers marked correctly by Rahul be x and the number of questions marked wrong be y.

So, according to the question,

$$x + y = 120 \quad \text{...(i)}$$
and, $$x - \frac{1}{2}y = 90 \quad \text{...(ii)}$$

Subtracting equation (ii) from equation (i), we get

$$\frac{3}{2}y = 30$$
$$\Rightarrow \qquad y = 20$$

Putting $y = 20$ in equation (i), we get

$$x + 20 = 120$$
$$\Rightarrow \qquad x = 100$$

Hence, Rahul answered 100 questions correctly.

*81. A father's age is three times the sum of the ages of his two children. After 5 years, his age will be two times the sum of their ages. Find the present age of the father.

[CBSE 2019]

Ans. Let the sum of the present ages of two children be x years and father's present age be y years. According to the given condition:

$$y = 3x$$
or $$y - 3x = 0 \quad \text{...(i)}$$

After 5 years:

Father's age = $(y + 5)$ years

Sum of the ages of children = $(x + 5 + 5)$ years.

Then, $$y + 5 = 2(x + 10)$$
or $$y - 2x - 15 = 0 \quad \text{...(ii)}$$

On subtracting equation (i) from equation (ii), we get:

$$y - 2x - 15 = 0$$
$$y - 3x \qquad = 0$$
$$\underline{-\quad+\qquad\qquad}$$
$$\overline{x - 15 = 0}$$

$$\Rightarrow \qquad x = 15$$

If we put the value of x in equation (i), we get

$$y - 3 \times 15 = 0$$
$$\Rightarrow \qquad y = 45$$

Hence, the present age of father is 45 years.

* Topics and Questions which are a part of latest CBSE Syllabus but have been removed by NCERT.

82. ✍ Solve the following system of equations:

$$\frac{21}{x} + \frac{47}{y} = 110$$

$$\frac{47}{x} + \frac{21}{y} = 162, \quad x, y \neq 0 \quad \text{[CBSE SQP 2019]}$$

83. A man wished to give ₹12 to each person and found that he fell short of ₹6 when he wanted to give to all the persons present. He, therefore, distributed ₹9 to each person and found that ₹9 was left over. How much money did he have and how many persons were there? **[Diksha]**

Ans. Let, number of persons = x

Money share per person = ₹y

Therefore, total money = ₹xy

According to the question,

$$12 \times x = xy + 6$$

$$\Rightarrow \qquad 12x - 6 = xy \qquad \text{...(i)}$$

and $\qquad\qquad 9x = xy - 9$

$$\Rightarrow \qquad 9x + 9 = xy \qquad \text{...(ii)}$$

Equating (i) and (ii), we get

$$12x - 6 = 9x + 9$$

$$3x = 15$$

$$\Rightarrow \qquad x = 5$$

Put the value of x in equation (i), we get

$$12 \times 5 - 6 = x \times y$$

$$\Rightarrow \qquad xy = 54$$

So, he have ₹ 54 and there were 5 persons.

*84. ✍ A computer animation below shows a cat moving in a straight line.

Its height, h metres, above the ground, is given by $8s - 3h = -9$, where s is the time in seconds after it starts moving. In the same animation, a mouse starts to move at the same time as the cat and its movement is given by $-3s + h = 1$.

Cat $8s - 3h = -9$

(Intersection point)
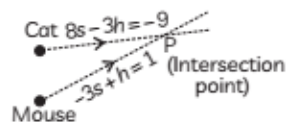
Mouse

(A) Draw the graph of the two equations on the same sheet of graph paper.

(B) Will the cat be able to catch the mouse?

(C) If yes, after how much time and at what height?

85. Find the solution of the following pair of equations:

$$\frac{3}{x} + \frac{8}{y} = -1; \quad \frac{1}{x} - \frac{2}{y} = 2, x, y \neq 0$$

[CBSE 2019]

Ans. Given, pair of equations is:

$$\frac{3}{x} + \frac{8}{y} = -1 \qquad \text{...(i)}$$

and, $\qquad \frac{1}{x} - \frac{2}{y} = 2 \qquad \text{...(ii)}$

If we multiply equation (ii) by 3 and then subtract it from equation (i), we get

$$\frac{3}{x} + \frac{8}{y} = -1$$

$$\frac{3}{x} - \frac{6}{y} = 6$$

$$\underline{\quad - \quad + \qquad - \quad}$$

$$\frac{14}{y} = -7$$

$$\Rightarrow \qquad\qquad y = -2$$

Put the value of $y = -2$ in equation (i), we get

$$\frac{3}{x} + \left(\frac{8}{-2}\right) = -1$$

$$\Rightarrow \qquad\qquad \frac{3}{x} = -1 + 4$$

$$\Rightarrow \qquad\qquad x = 1$$

Hence, the values of x and y are 1 and -2 respectively.

86. If we add 1 to the numerator and subtract 1 from the denominator, a fraction reduces to 1. It becomes $\frac{1}{2}$, if we only add 1 to the denominator. What is the fraction?

[CBSE 2020]

Ans. Let the fraction be $\frac{p}{q}$.

According to the question,

$$\frac{p+1}{q-1} = 1 \text{ and } \frac{p}{q+1} = \frac{1}{2}$$

$$\Rightarrow \qquad p - q = -2 \text{ and } 2p - q = 1$$

Subtracting the two equations, we get

$$(p - q) - (2p - q) = -2 - 1$$

$$\Rightarrow \qquad\qquad -p = -3$$

$$\Rightarrow \qquad\qquad p = 3$$

Putting $p = 3$ in the equation $p - q = -2$, we get

$$3 - q = -2$$

$$\Rightarrow \qquad\qquad q = 5$$

$$\therefore \qquad\qquad p = 3 \text{ and } q = 5$$

Thus, the required fraction is $\frac{3}{5}$.

87. Solve for x and y:

$$\frac{5}{x-1} + \frac{1}{y-2} = 2 \text{ and } \frac{6}{x-1} - \frac{3}{y-2} = 1$$

* Topics and Questions which are a part of latest CBSE Syllabus but have been removed by NCERT.

Ans. Given equations are,

$$\frac{5}{x-1}+\frac{1}{y-2}=2 \qquad ...(i)$$

and,

$$\frac{6}{x-1}-\frac{3}{y-2}=1 \qquad ...(ii)$$

Multiplying eq.(i) by 3 and then adding eq. (ii) to it, we get

$$\frac{15}{x-1}+\frac{3}{y-2}+\left(\frac{6}{x-1}-\frac{3}{y-2}\right)=6+1$$

$$\Rightarrow \qquad \frac{21}{x-1}=7$$

$$\Rightarrow \qquad x-1=3$$

$$\Rightarrow \qquad x=4$$

Putting $x=4$ in eq.(i), we get

$$\frac{5}{4-1}+\frac{1}{y-2}=2$$

$$\Rightarrow \qquad \frac{1}{y-2}=2-\frac{5}{3}=\frac{1}{3}$$

$$\Rightarrow \qquad y-2=3$$

$$\Rightarrow \qquad y=5$$

$$\therefore \qquad x=4, y=5.$$

88. Solve for x and y:

$$\frac{x+1}{2}+\frac{y-1}{3}=8 \text{ and } \frac{x-1}{3}+\frac{y+1}{2}=9$$

Ans. We have,

$$\frac{x+1}{2}+\frac{y-1}{3}=8$$

$$\Rightarrow \quad 3(x+1)+2(y-1)=8\times6$$

$$\Rightarrow \qquad 3x+2y=47 \qquad ...(i)$$

and

$$\frac{x-1}{3}+\frac{y+1}{2}=9$$

$$\Rightarrow \quad 2(x-1)+3(y+1)=9\times6$$

$$\Rightarrow \qquad 2x+3y=53 \qquad ...(ii)$$

Adding equations (i) and (ii), we get

$$5x+5y=100$$

$$\Rightarrow \qquad x+y=20 \qquad ...(iii)$$

Subtracting eq. (ii) from eq. (i), we get

$$x-y=-6 \qquad ...(iv)$$

Adding equations (iii) and (iv), we get

$$2x=14$$

$$\Rightarrow \qquad x=7$$

Putting $x=7$ in eq. (iii), we get

$$7+y=20$$

$$\Rightarrow \qquad y=13$$

$$\therefore \qquad x=7, y=13.$$

89. Solve for x and y:

$$\frac{ax}{b}-\frac{by}{a}=a+b \text{ and } ax-by=2ab$$

Ans. We have,

$$\frac{ax}{b}-\frac{by}{a}=a+b$$

$$\Rightarrow \qquad a^2x-b^2y=ab(a+b)$$

$$\Rightarrow \qquad a^2x-b^2y=a^2b+ab^2 \qquad ...(i)$$

and $\qquad ax-by=2ab \qquad ...(ii)$

Multiplying eq. (ii) by b and then subtracting eq. (i) from it, we get

$$abx-b^2y=2ab^2$$
$$a^2x-b^2y=a^2b+ab^2$$
$$\underline{\quad-\qquad+\qquad\qquad-\quad}$$
$$(ab-a^2)x=ab^2-a^2b$$

$$\Rightarrow \qquad a(b-a)x=ab(b-a)$$

$$\Rightarrow \qquad x=b$$

Putting $x=b$ in eq. (ii), we get

$$ab-by=2ab$$

$$\Rightarrow \qquad -by=ab$$

$$\Rightarrow \qquad y=-a$$

$$\therefore x=b, y=-a.$$

90. Ⓐ Sumit is 3 times as old as his son. Five years later, he shall be two and a half times as old as his son. How old is Sumit at present? **[CBSE 2019]**

91. A two-digit number is 4 times the sum of its digits. It is also equal to 3 times the product of its digits. Find the number. **[CBSE 2016]**

Ans. Let the digit at unit's place be x and at ten's place be y.

Then, the number is $10y+x$.

According to the question,

$$(10y+x)=4(x+y)$$

$$\Rightarrow \qquad 10y+x=4x+4y$$

$$\Rightarrow \qquad 6y-3x=0$$

$$\Rightarrow \qquad -x+2y=0$$

$$\Rightarrow \qquad x=2y \qquad ...(i)$$

and $\qquad 10y+x=3xy$

$$\therefore \qquad 10y+2y=3\times2y\times y \quad \text{[from (i)]}$$

$\Rightarrow \qquad 12y = 6y^2$

$\Rightarrow \qquad y = 2 \qquad [\because y \neq 0]$

Putting the value of y in eq. (i), we get

$\qquad x = 4$

Hence, the number is $10 \times 2 + 4$ i.e. 24.

92. ✍ A and B each has a certain number of mangoes. A says to B, "If you give 30 of your mangoes, I will have twice as many as left with you." B replies "If you give me 10, I will have thrice as many as left with you." How many mangoes does each have? **[Diksha]**

93. The sum of the digits of a two-digit number is 9. If 27 is subtracted from the number, its digits are interchanged. Find the product of the digits of the number.

[CBSE Question Bank 2022]

Ans. Let the digit in tens place be x and unit place be y.

Sum of digits is, $x + y = 9$ ...(i)

The two-digit number is of the form $10x + y$

When 27 is added,

the number gets reversed $= 10y + x$

So, $\qquad 10x + y + 27 = 10y + x$

$10x - x + y - 10y + 27 = 0$

$\qquad 9x - 9y + 27 = 0$

Dividing by 9,

$\qquad x - y + 3 = 0$

$\qquad\quad x - y = -3$ ...(ii)

On solving eqn. (i) and (ii), we get

$\qquad x = 3, y = 6$

So, the product of the digits $= 3 \times 6$

$\qquad = 18$

LONG ANSWER Type Questions (LA)

[**4** & **5** marks]

94. ✍ Determine, algebraically, the vertices of the triangle formed by the lines $3x - y = 3$, $2x - 3y = 2$ and $x + 2y = 8$. **[NCERT Exemplar]**

*__**95.** ✍ Draw the graphs of the equations $x = 3$, $x = 5$ and $2x - y - 4 = 0$. Also, find the area of the quadrilateral formed by the lines and the x–axis. **[NCERT Exemplar]**

96. A shopkeeper sells a saree at a profit of 8% and a sweater at a discount of 10%, thereby getting a sum ₹1,008. If she had sold the saree at a profit of 10% and the sweater at a discount of 8%, she would have got ₹1,028. Find the cost of the saree and the list price (price before discount) of the sweater.

[NCERT Exemplar]

Ans. Let the cost price of a saree = ₹x

and the list price of a sweater = ₹y

Case I :

(S.P. of saree at 8% profit) + (S.P. of a sweater at 10% discount) = ₹1008

$\Rightarrow (100 + 8)\%$ of $x + (100 - 10)\%$ of $y = 1008$

$\Rightarrow 108\%$ of $x + 90\%$ of $y = 1008$

$\Rightarrow \qquad \dfrac{108}{100}x + \dfrac{90}{100}y = 1008$

$\Rightarrow \qquad \dfrac{108x + 90y}{100} = 1008$

$\Rightarrow \qquad 108x + 90y = 100800$

$\Rightarrow \qquad 6x + 5y = 5600$ ...(i)

Case II:

(S.P. of saree at 10% profit) + (S.P. of a sweater at 8% discount) = ₹1028

$\Rightarrow (100 + 10)\%$ of $x + (100 - 8)\%$ of $y = 1028$

$\Rightarrow \qquad 110\%$ of $x + 92\%$ of $y = 1028$

$\Rightarrow \qquad 110x + 92y = 102800$

$\Rightarrow \qquad 55x + 46y = 51400$

...(ii)

Eq.(i) × 46 – eq. (ii) × 5, we get

$\Rightarrow (276x + 230y) - (275x + 230y)$

$\qquad = 257600 - 257000$

$\Rightarrow \qquad x = 600$

Putting the value of x in eq. (i) we get

$\qquad 6(600) + 5y = 5600$

$\Rightarrow \qquad 5y = 5600 - 3600$

$\Rightarrow \qquad y = \dfrac{2000}{5}$

$\Rightarrow \qquad y = 400$

Hence, the cost price of a saree and the list price (price before discount) of a sweater are ₹ 600 and ₹ 400, respectively.

97. ✍ Ruhi invested a certain amount of money in two schemes A and B, which offer interest at the rate of 8% per annum and 9% per annum, respectively. She received ₹1860 as annual interest. However, had she inter-

* Topics and Questions which are a part of latest CBSE Syllabus but have been removed by NCERT.

changed the amount of investments in the two schemes, she would have received ₹20 more as annual interest. How much money did she invest in each scheme?

98. ⓔ Vijay had some bananas and he divided them into two lots A and B. He sold the first lot at the rate of ₹2 for 3 bananas and the second lot at the rate of ₹1 per banana and got a total of ₹400. If he had sold the first lot at the rate of ₹1 per banana and the second lot at the rate of ₹4 for 5 bananas, his total collection would have been ₹460. Find the total number of bananas he had.

[Delhi Gov. QB 2022]

99. A train covered a certain distance at a uniform speed. If the train would have been 6 km/hr faster, it would have taken 4 hour less than the scheduled time and if the train were slower by 6 km/hr, it would have taken 6 hours more than the scheduled time. Find the length of the journey. [CBSE 2020]

Ans. Let the original uniform speed of the train be x km/hr and the total length of journey be l km. Then, scheduled time taken by the train to cover

a distance of l km $= \dfrac{l}{x}$ hours.

Now,

$$\frac{l}{x+6} = \frac{l}{x} - 4$$

$$\Rightarrow \quad \frac{l}{x} - \frac{l}{x+6} = 4$$

$$\Rightarrow \quad \left(\frac{x+6-x}{x(x+6)}\right)l = 4$$

$$\Rightarrow \quad \frac{6l}{x(x+6)} = 4$$

or, $\qquad l = \dfrac{2x(x+6)}{3}$ ...(i)

Also, $\qquad \dfrac{l}{x-6} = \dfrac{l}{x} + 6$

$$\Rightarrow \quad \frac{l}{x-6} - \frac{l}{x} = 6$$

$$\Rightarrow \quad \left(\frac{x-x+6}{(x-6)x}\right)l = 6$$

$$\Rightarrow \quad \frac{6l}{(x-6)x} = 6$$

$$\Rightarrow \quad l = x(x-6) \qquad ....(ii)$$

From equations (i) and (ii), we have

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

$$\Rightarrow \quad 2x + 12 = 3x - 18$$

$$\Rightarrow \quad x = 30$$

Putting the value of x in eq. (ii), we get

$$l = 30(30-6)$$
$$= 30 \times 24$$
$$= 720$$

Hence, the length of the journey is 720 km