

Class 10 Maths – Chapter 3: Pair of Linear Equations in Two Variables

1-Mark Questions

1. (2024)

The pair of linear equations $x+2y+5=0$ and $-3x=6y-1$ has:

- (a) unique solution
- (b) exactly two solutions
- (c) infinitely many solutions
- (d) no solutions

Answer: (d) No solution

Explanation:

Rewriting the second equation:

$$3x+6y-1=0 \Rightarrow 3x+6y-1=0$$

Comparing the coefficients:

$$a_1=1, b_1=2, c_1=5 \quad a_2=3, b_2=6, c_2=-1$$

$$\frac{a_1}{a_2} = \frac{1}{3}, \frac{b_1}{b_2} = \frac{2}{6} = \frac{1}{3}, \frac{c_1}{c_2} = \frac{5}{-1} \neq \frac{1}{3}$$

For no solution, the condition is:

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2} \Rightarrow \frac{1}{3} = \frac{2}{6} \neq \frac{5}{-1}$$

$$3 \times 1 = 6 \times 2 \neq -1 \times 5 \Rightarrow 3 \neq 12 \neq -5$$

Hence, the system has no solutions.

2. (2024)

If $2x+y=13$ and $4x-y=17$, find the value of $x-y$.

Answer: 2

Explanation:

Adding the two equations:

$$(2x+y)+(4x-y)=13+17 \Rightarrow 6x=30 \Rightarrow x=5$$

$$6x=30 \Rightarrow x=5$$

$$x=5$$

Substituting $x=5$ into $2x+y=13$:

$$2(5)+y=13 \Rightarrow 10+y=13 \Rightarrow y=3$$

$$10+y=13 \Rightarrow y=3$$

$$y=3$$

$$x-y=5-3=2$$

3. (2024)

The value of k for which the pair of linear equations $5x+2y-7=0$ and $2x+ky+1=0$ do not have a solution is:

- (a) 5
- (b) $\frac{4}{5}$

(c) $\frac{5}{4}$

(d) $\frac{5}{2}$

Answer: (b) $\frac{4}{5}$

Explanation:

For no solution, the condition is:

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

$$\frac{5}{2} \neq \frac{2}{k}$$

Comparing the coefficients:

$$\frac{5}{2} = \frac{2}{k} \Rightarrow k = \frac{4}{5}$$

$$\frac{5}{2} = \frac{2}{k} \Rightarrow k = \frac{4}{5}$$

For no solution,

$$\frac{5}{2} = \frac{2}{k} \Rightarrow k = \frac{4}{5}$$

$$k = \frac{4}{5}$$

2-Mark Questions

4. (2024)

Solve the following pair of linear equations for x and y:

$$x + 2y = 9$$

$$y - 2x = 2$$

Answer: $x = 1, y = 4$

Explanation:

$$\text{Equation (i): } x + 2y = 9$$

$$\text{Equation (ii): } y - 2x = 2$$

Multiplying equation (i) by 2:

$$2x + 4y = 18$$

Adding to equation (ii):

$$(2x + 4y) + (y - 2x) = 18 + 2$$

$$5y = 20$$

$$y = 4$$

Substituting $y = 4$ into equation (i):

$$x + 2(4) = 9$$

$$x = 1$$

5. (2024)

Check whether the point $(-4, 3)$ lies on both the lines represented by the linear equations $x + y + 1 = 0$ and $x - y = 1$.

Answer: No

Explanation:

$$\text{Substituting } x = -4 \text{ and } y = 3 \text{ into } x + y + 1 = 0:$$
$$-4 + 3 + 1 = 0 \quad \text{True}$$

$$\text{Substituting into } x - y = 1:$$

$$-4 - 3 = -7 \neq 1 \quad \text{False}$$

Hence, $(-4, 3)$ does not lie on both lines.

3-Mark Questions

6. (2024)

Solve the following system of linear equations and verify your answer:

$$7x - 2y = 5 \quad 7x - 2y = 5$$

$$8x + 7y = 15 \quad 8x + 7y = 15$$

Answer: $x=1, y=1$ $x=1, y=1$

Explanation:

Multiplying the first equation by 7 and the second by 2:

$$49x - 14y = 35 \quad 16x + 14y = 30$$

$$16x + 14y = 30$$

Adding the equations:

$$65x = 65 \quad 65x = 65$$

$$x=1 \quad x=1$$

Substituting $x=1$ into $7x - 2y = 5$:

$$7(1) - 2y = 5 \quad -2y = -2$$

$$-2y = -2 \quad y=1$$

$$y=1 \quad y=1$$

4-Mark Questions

1. (2024)

A motorboat whose speed is 18 km/hr in still water takes 1 hour more to go 24 km upstream than to return downstream to the same spot. Find the speed of the stream.

Answer:

Let the speed of the stream be x km/hr.

Speed of the motorboat upstream = $(18 - x)$ km/hr.

Speed of the motorboat downstream = $(18 + x)$ km/hr.

Time taken to go upstream = $\frac{24}{18 - x}$ hours.

Time taken to go downstream = $\frac{24}{18 + x}$ hours.

According to the given condition:

$$\frac{24}{18 - x} - \frac{24}{18 + x} = 1$$

Solving this equation will give the value of x , which represents the speed of the stream.

2. (2023)

The sum of the numerator and the denominator of a fraction is 18. If the denominator is increased by 2, the fraction reduces to $\frac{1}{3}$. Find the fraction.

Answer:

Let the numerator be x and the denominator be y .

According to the given conditions:

$$x + y = 18 \quad (1) \quad \frac{x}{y+2} = \frac{1}{3} \quad (2)$$

From equation (2), cross-multiply to get:

$$3x=y+2 \quad 3x = y + 2 \quad 3x=y+2$$

Substituting $y=18-x$ from equation (1) into this:

$$3x=(18-x)+2 \quad 3x = (18 - x) + 2 \quad 3x=(18-x)+2$$

Solving this equation will give the values of x and y , and thus the fraction.

3. (2022)

Two numbers are in the ratio 5:6. If 8 is subtracted from each of the numbers, the ratio becomes 4:5. Find the numbers.

Answer:

Let the two numbers be $5x$ and $6x$.

According to the given condition:

$$\frac{5x-8}{6x-8} = \frac{4}{5} \quad 5x-8=4(6x-8) \quad 5x-8=24x-32$$

Cross-multiply and solve for x .

Then, calculate the two numbers as $5x$ and $6x$.

4. (2021)

A man has only 20 paisa coins and 25 paisa coins in his purse. If he has 50 coins in all totaling ₹11.25, how many coins of each kind does he have?

Answer:

Let the number of 20 paisa coins be x and the number of 25 paisa coins be y .

According to the given conditions:

$$\begin{aligned} x+y &= 50 \quad (1) \quad x + y = 50 \\ 0.20x + 0.25y &= 11.25 \quad (2) \quad 0.20x + 0.25y = 11.25 \end{aligned}$$

Multiply equation (2) by 100 to eliminate decimals:

$$20x + 25y = 1125 \quad 20x + 25y = 1125 \quad 20x+25y=1125$$

Now, solve the system of equations (1) and (3) to find x and y .

5. (2020)

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.

Answer:

Let the present ages of the children be x and y .

The father's present age is $2(x+y)$.

After 20 years, the children's ages will be $x+20$ and $y+20$, and the father's age will be $2(x+y)+20$.

According to the given condition:

$$\begin{aligned} 2(x+y)+20 &= (x+20) + (y+20) \\ 2(x+y)+20 &= (x+20) + (y+20) \end{aligned}$$

Solve this equation to find $x+y$ and $yx+y$, and then calculate the father's age as $2(x+y)2(x+y)2(x+y)$.