

3

PAIR OF LINEAR EQUATION IN TWO VARIABLES

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3.1 INTRODUCTION

Equation: A statement in which two algebraic expression are equal is known as equation. Like: $2x + 3 = 0$, $\frac{2y}{3} + 1 = \frac{y}{3}$

Linear equation: An equation involving linear polynomials is called a linear equation. For example

$$\frac{3}{2}x + 4 = 2x - 3$$

Remark: A linear equation in one variables has the standard form $ax + b = 0$, $a \neq 0$, $b \in \mathbb{R}$

Solution (root) of a linear equation: The value of the variable which makes the two sides of the equation equal and satisfies the equation is called the solution of the equation.

Rules for solving an equation:

(i) The same number is added or subtracted to both sides of an equation, the resulting equation is equivalent to the first.

(ii) If both sides of an equation are multiplied by the same non-zero number the resulting equation is equivalent to the first.

Remark: Every linear equation in one variable has only one (unique) solution.

In this chapter we shall study about system of linear equation in two variables, solution of a system of linear equations in two variables.

3.2 LINEAR EQUATION IN TWO VARIABLE

Definition: A linear equation is a rational and integral equation of the first degree. Eg.: $3x + 2y = 7$; $2x - \sqrt{3}y = \sqrt{5}$

The equation is linear equation in two variables if

(i) neither x nor y is under a radical sign.

(ii) neither x nor y is in the denominator.

(iii) the exponent (power) of x and y in each term is one.

In General form:

$ax + by + c = 0$; $a, b, c, \in \mathbb{R}$; $a \neq 0, b \neq 0$ is a linear equation in two variables

(i) $ax + c = 0$; $a \neq 0$

(ii) $by + c = 0$; $b \neq 0$ are linear equation in one variable

Simultaneous equation: A pair of linear equation in two variables is said to form a system of simultaneous equation.

Solution of a linear equation in two variables: The pair of values of x and y which satisfies the given equation is called a solution of the equation.

Graphical method of solution of pair (Simultaneous) of line:

Let us consider a linear equation $ax + by + c = 0$ where $a \neq 0, b \neq 0$

Step-I: Write down $y = -\left(\frac{ax + c}{b}\right)$

Step-II: Substitute any arbitrary value of x in step-I and obtain the corresponding value of y .

Step-III: Plot these points on the graph paper

Step-IV: Join these two points. The line thus obtained is the required graph of $ax + by + c = 0$

Consistent system: A system of simultaneous linear equation is said to be consistent, if it has at least one solution.

Inconsistent system: A system of simultaneous linear equation is said to be in-consistent if it has no solution.

Some Important points:

(i) The graph of $x = a$ is a straight line parallel to y -axis.

(ii) The graph of $y = b$ is a straight line parallel to x -axis

(iii) The graph of $y = 0$ is x -axis and graph of $x = 0$ is y -axis.

If there is no constant term in the equation than the graph of $ax + by = 0$ will pass through the origin.

3.3 ALGEBRIC METHODS OF SOLVING A PAIR OF LINEAR EQUATION

There are three methods for solving the linear equation

(i) Substitution method

(ii) Elimination method

(iii) Cross-multiplication method

3.3.1 Substitution method

Step-I: Obtain the two equation: $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$

Step-II: Find the value of one variable, say y in terms of the other variable.

Step-III: Substitute this value of y in the other equation and reduce it to an equation in one variable.

Illustration 1

Solve the following pair of equations by substitution method:

$$2x + 3y = 9; \quad 3x + 4y = 5$$

Solution

$$\text{Step-I: } 2x + 3y = 9 \quad \dots(i) \qquad y = \left(\frac{9-2x}{3} \right) \quad \dots(ii)$$

Step-II: Substitute the value of x in equation $3x + 4y = 5$

$$\Rightarrow 3x + 4\left(\frac{9-2x}{3}\right) = 5 \quad ; \quad 9x + 36 - 8x = 15$$

$$\{x = -21\}$$

$$x = 15 - 36$$

$$x = -21$$

Step-III: Putting the value of x in equation (ii),

$$y = \left(\frac{9 - 2(-21)}{3} \right)$$

$$y = \frac{9+42}{3} \quad \Rightarrow \quad y = 51/3 \quad [y = 17]$$

Therefore the solution of the given system of equation is $x = -21, y = 17$

3.3.2 Elimination Method

Step-I: Obtain the two equations

Step-II: First multiply both the equation by some suitable non-zero constant to make the coefficient of one variable (either x or y) numerically equal.

Step-III: Add or subtract one equation from the other, then one variable gets eliminated.

Step-IV: Solve the equation in one variable.

Step-V: Substitute the value of x (or y) in any one of the given equation and find the value of another variable.

Illustration 2

Solve the system of linear equations by Elimination method

$$(i) \quad 4x - y = 5 \qquad (ii) \quad 3x + 2y = 12$$

Solution

Equation (i) is multiplied by '2' and adding to the equation (ii) then

$$8x - 2y = 10$$

$$3x + 2y = 12$$

$$\hline 11x = 22 \quad \Rightarrow \quad x = 2$$

Putting the value of x in equation (ii)

$$3 \times 2 + 2y = 12 \Rightarrow 6 + 2y = 12$$

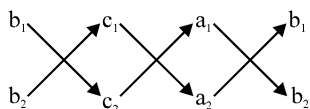
$$2y = 6 \Rightarrow y = 3$$

Hence the solution of the given system if $x = 2, y = 3$

3.3.3 Cross Multiplication Method

Step-I: Obtain the two equation: $a_1x + b_1y + c_1 = 0; a_2x + b_2y + c_2 = 0$

Step-II:



The down arrows (\searrow) shows the term with a plus sign and up arrows (\swarrow) shows the term with a negative sign.

Then the solution is given by

$$\frac{x}{b_1c_2 - b_2c_1} = \frac{y}{c_1a_2 - c_2a_1} = \frac{1}{a_1b_2 - a_2b_1}; \quad \frac{x}{b_1c_2 - b_2c_1} = \frac{-y}{a_1c_2 - c_1a_2} = \frac{1}{a_1b_2 - a_2b_1}$$

Illustration 3

Solve the system of equation by cross multiplication method

$$\frac{x}{a} + \frac{y}{b} = a + b, \quad \frac{x}{a^2} + \frac{y}{b^2} = 2$$

Solution

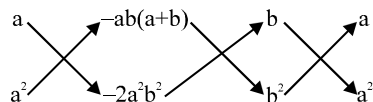
The given equation are

$$\frac{x}{a} + \frac{y}{b} = a + b \Rightarrow bx + ay = ab(a+b); \quad bx + ay - ab(a+b) = 0 \quad \dots(i)$$

$$\frac{x}{a^2} + \frac{y}{b^2} = 2 \Rightarrow b^2x + a^2y = 2a^2b^2; \quad b^2x + a^2y - 2a^2b^2 = 0 \quad \dots(ii)$$

From equation (i) and (ii),

$$bx + ay - ab(a+b) = 0; \quad b^2x + a^2y - 2a^2b^2 = 0$$



$$\frac{x}{-2a^3b^2 + a^2b(a+b)} = \frac{y}{-ab^3(a+b) + 2a^2b^3} = \frac{1}{a^2b - ab^2}$$

$$\frac{x}{-a^3b(2a-a-b)} = \frac{y}{ab^3\{2a-a-b\}} = \frac{1}{ab(a-b)}$$

$$x = \frac{a^3b(a-b)}{ab(a-b)} = a^2, \quad y = \frac{ab^3(a-b)}{ab(a-b)} = b^2$$

Hence the solution of the given system of linear equation be $x = a^2$ and $y = b^2$

3.4 SOME IMPORTANT POINTS

3.4.1 Graphical method

(i) $\frac{a_1}{b_1} \neq \frac{b_1}{b_2}$ then graph will represent *two intersecting lines* and system has **unique solution**.

(ii) $\frac{a_1}{b_1} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ then graph will represent *two parallel lines* and system has **no common solution**

(iii) $\frac{a_1}{b_1} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ then graph will represent *two coinciding lines* and system has **infinitely many solutions**

3.4.2 Algebraic method

(i) $\frac{a_1}{b_1} \neq \frac{b_1}{b_2}$ then system has a *unique solution* and is known as **consistent**

(ii) $\frac{a_1}{b_1} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ then system has *no solution* and is known as **inconsistent**

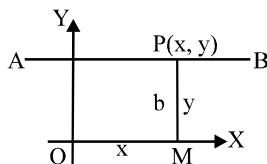
(iii) $\frac{a_1}{b_1} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ then system has *infinitely many solutions* and is known as **dependant consistent**.

3.5 DEFINITION OF A STRAIGHT LINE

A straight line is the simplest geometric curve such that every point on the line segment joining any two points on it lies on it.

(i) **A straight line parallel to x -axis at a given distance from it.**

AB is a straight line parallel to x -axis at a distance b from it. Draw PM perpendicular to the x -axis then $OM = x$ and $MP = y$



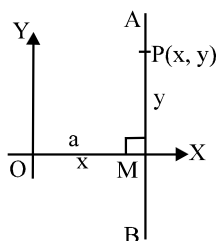
The straight line can be considered as the locus of a moving point $P(x, y)$ whose distance from x -axis is equal to b from all positions of P .

So, $MP = b$, we get $y = b$

The equation of the x -axis is $y = 0$. Since $b = 0$ in this case

(ii) **A straight line parallel to the y -axis at a given distance from it.**

AB is a straight line parallel to y axis at a distance a from it



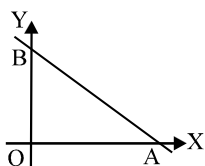
Let PM be the perpendicular from P to the x -axis. Then $OM = x$ and $MP = y$. Using condition $OM = a$, we get $x = a$.

The equation of the y -axis is $x = 0$ since $a = 0$ in this case.

Important: The equation of a line parallel to the x -axis does not contain x and the equation of a line parallel to y -axis does not contain y .

3.5.1 Intercept Definition

If a straight line meets the x -axis at A and y axis at B then



(i) OA (i.e. the distance of A from the origin) is called the intercept made by the line on the x -axis or simply x -intercept.

(ii) OB (i.e. the distance of B from the origin) is called the intercept made by the line on the y-axis or simply y-intercept.

(iii) The two together OA and OB are called the intercepts made by the line on the coordinate axis.

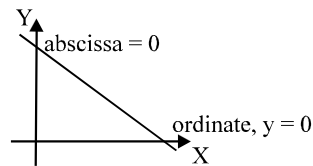
Rules for the signs of the intercepts

(i) The intercept on the x-axis is positive if measured to the right of the origin and negative if measured to the left of the origin.

(ii) The intercept on the y-axis is positive if it is measured above the origin and negative if measured below the origin

(iii) Rule to find intercepts of a line on the axis.

We know that a line cuts the x-axis at a point whose ordinate is zero and cuts the y-axis at a point whose abscissa is zero. Hence,

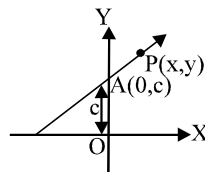


(a) To get the x-intercept we put $y = 0$ in the equation of the line and find value of x .

(b) To get the y-intercept we put $x = 0$ in the equation of the line and find the value of y .

3.5.2 Special forms of equation of the straight line

(i) **Slope intercept form:** To find the equation of the straight line whose gradient is m and whose intercept on the y axis is c .



Let l be the line whose intercept OA on the y-axis is c and whose slope is m .

Since, intercept on y-axis = $AO = c$

Therefore, the coordinate of A are $(0, c)$

Let $P(x, y)$ be any point on the line

Then, Slope, $AP = \frac{y - c}{x - 0}$

$$m = \frac{y - c}{x} \quad \Rightarrow \quad y = mx + c$$

which is the required equation

As it involves slope and y intercept of the straight line. It is some times referred to as slope intercept form.

For example, The equation of the line having slope = -3 and intercept on y axis is = 7 is

$$y = mx + c; \quad y = -3x + 7$$

(ii) **Point Slope form:** To find the equation of the straight line passing through a given point (x_1, y_1) and having a gradient m

$$y - y_1 = m(x - x_1)$$

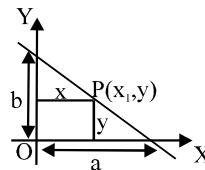
(iii) **Two points form:** To find the equation of the straight line passing through two given points (x_1, y_1) and (x_2, y_2)

$$y - y_1 = \frac{y_2 - y_1}{x_2 - x_1}(x - x_1) \text{ which is required equation}$$

(iv) **The Intercept form of a line:** A line which cuts off intercept a and b respectively from x -axis and y -axis is

$$\frac{x}{a} + \frac{y}{b} = 1$$

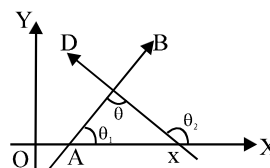
This is the equation of the line in the intercept form.



3.5.3 Angle between two lines:

$$\tan \theta = \left| \frac{m_2 - m_1}{1 + m_1 m_2} \right|$$

$$m_1 = \tan \theta_1, m_2 = \tan \theta_2$$



Condition for two lines to be perpendicular:

If $y = m_1x + c_1$ and $y = m_2x + c_2$ are two lines are perpendicular then

$$m_1 \times m_2 = -1$$

When two lines are perpendicular the product of their slopes is -1 . If m is the slope of a line then slope of line perpendicular to it.

Condition for two lines to be parallel:

$$m_1 = m_2$$

Thus when two lines are parallel their slopes are equal.

Illustration 5

State the equation of the line which has y-intercept -1 and parallel to $y = 5x - 7$.

Solution

Intercept $= -1$, $m = 5$

So equation, $y = 5x - 1$

Try yourself

- State the equation of the line which has the y-intercept
(i) 2 and slope 7 (ii) 2 and is inclined at 45° to the x-axis
- Find the slope of a line which passes through $(3, 2)$ and $(-1, 5)$
- What is the value of y so that line through $(3, y)$ and $(2, 7)$ are parallel to the line through $(-1, 4)$ and $(0, 6)$
- Find the equation of the straight line that passes through the point $(3, 4)$ and perpendicular to the line $3x + 2y + 5 = 0$.

EXERCISE-I

- Solve the following system of linear equations graphically:
 $x - y = 1$, $2x + y = 8$. Shade the area bounded by these two lines and y-axis. Also, determine this area.
- Solve the following system of equations:-
 (i) $\frac{a^2}{x} - \frac{b^2}{y} = 0$, $\frac{a^2b}{x} + \frac{b^2a}{y} = a + b, x, y \neq 0$
- For each of the following system of equation determine the value of k for which the given system of equation has a unique solution
 (i) $2x + 3y - 5 = 0$, $kx - 6y - 8 = 0$
- For what value of k, will the following system of equations have infinitely many solutions ?
 (i) $2x + 3y = 4$, $(k + 2)x + 6y = 3k + 2$
- For what value of k will the following system of linear equations has no solution ?
 (i) $(3k + 1)x + 3y - 2 = 0$
 $(k^2 + 1)x + (k - 1)y - 5 = 0$
- Solve the following system of equations in x and y:
 (i) $(a - b)x + (a + b)y = a^2 - 2ab - b^2$, $(a + b)(x + y) = a^2 + b^2$
 (ii) $2(ax - by) + a + 4b = 0$, $(bx + ay) + b - 4a = 0$
 (iii) $mx - ny = m^2 + n^2$
 $x + y = 2m$
- A two digit number is such that the product of its digits is 20. If 9 is added to the number, the digits interchange their places. Find the number.
- The sum of the numerator and the denominator of a fraction is equal to 7. Four times the numerator is 8 less than 5 times the denominator. Find the fraction.
- In a cyclic quadrilateral ABCD. If $\angle A = (2x + 4)^\circ$, $\angle B = (y + 3)^\circ$, $\angle C = (2y + 10)^\circ$ and $\angle D = (4x - 5)^\circ$, find the angles A, B, C and D.
- X takes 3 hours more than Y to walk 30 km. But if X doubles his speed, he is ahead of Y by $1\frac{1}{2}$ hours. Find their speeds of walking.
- A number consists of three digits whose sum is 17. The middle digit exceeds the sum of the other two digits by 1. If the digit of the number are reversed the number is diminished by 396. Find the number.
- In an examination, one mark is awarded for one correct answer and $\frac{1}{4}$ mark is deducted for each wrong answer. A student who answered a total of 120 question, got 90 marks. How many question did he answer correctly?

EXERCISE-II

- A and B together can do a piece of work in 30 days. If A's one day work is $1\frac{1}{2}$ times the one day's work of B. Find in how many days can each do the work.

2. The sum of a two digit number and the number obtained by reversing the order of its digits is 121 and the 2 digits differ by 3. Find the number.
3. A railway half ticket costs half the full fare and the reservation charge is the same on half-ticket as on to full ticket to Ahemdabad. If the cost of 1 full fare reservation ticket is Rs. 216 and one full and one half reserved first class tickets cost Rs. 327. What is the basic first class full fare and what is the reservation charge.
4. A man invested Rs. 30,000 in two types of bonds on one he earns 5% and on the other he gets 7%. If his total earnings are Rs. 2000, find his invest in each type of bond.
5. A chemist has one solution which is 50% acid and a second which is 25% acid. How much of each should be mixed to make 10 litres of a 40% acid solution?
6. A person invested some amount at the rate of 10% simple interest and some other amount at the rate of 12% simple interest. He received yearly interest of Rs. 130. But if he had interchanged the amounts invested, he would have received Rs. 4 more as interest. How much amount did he invest at different rates?
7. Two years ago, a father was five times as old as his son. Two years later, his age will be 8 more than three times the age of the son. Find the present ages of father and son.
8. A part of monthly hostel charges in a college are fixed and the remaining depend on the number of days one has taken food in the mess. When a student A takes food 20 days, he has to pay Rs1000 as hostel charges whereas a student B, who takes food for 26 days, pays Rs 1180 as hostel charges. Find the fixed charge and the cost of food per day.
9. Places A and B are 80 km apart from each other on a highway. A car starts from A and other from B at the same time. If they move in the same direction, they meet in 8 hours and if they move in opposite directions, they meet in 1 hours and 20 minutes. Find the speeds of the cars.
10. A boat goes 12 km upstream and 40 km downstream in 8 hours. It can go 16 km upstream and 32 km down stream in the same time. Find the speed of the boat in still water and the speed of the stream.

EXERCISE-III

SECTION-A

● **Multiple choice question with one correct answers**

1. The pair of equations $3^{x+y} = 81$, $81^{x-y} = 3$ has
 (A) no solution (B) the solution $x = 2\frac{1}{2}$, $y = 2\frac{1}{2}$
 (C) the solution $x = 2$, $y = 2$ (D) the solution $x = 2\frac{1}{8}$, $y = 1\frac{7}{8}$
2. The points (7,2) and (-1,0) lie on a line
 (A) $7y = 3x - 7$ (B) $4y = x + 1$ (C) $y = 7x + 7$ (D) $x = 4y + 1$
3. The condition for which the system of equations $kx - y = 2$ and $6x - 2y = 3$ has a unique solution is
 (A) $k = 3$ (B) $k \neq 3$ (C) $k \neq 0$ (D) $k = 0$
4. The equations $ax + b = 0$ and $cx + d = 0$ are constant if
 (A) $ad = bc$ (B) $ad + bc = 0$ (C) $ab - cd = 0$ (D) $ab + cd = 0$

5. The solution to the system of equation $|x+y|=1$ and $x-y=0$ is given by
 (A) $x = y = 1/2$ (B) $x = y = -1/2$
 (C) $x = 1, y = 0$ (D) $x = y = 1/2$ or $x = y = -1/2$
6. The value of $x + y$ in the solution of equations $\frac{x}{4} + \frac{y}{3} = \frac{5}{12}$ and $\frac{x}{2} + y = 1$ is
 (A) $1/2$ (B) $3/2$ (C) 2 (D) $5/2$
7. Simplify $|x-3| + 2|x+1| = 4$
 (A) 1 (B) -1 (C) 3 (D) many solution
8. If $1 + \frac{1}{x} = \frac{x+1}{x}$, what does x equal to ?
 (A) 1 or 2 only (B) $+1$ only (C) $+1$ & -1 only (D) any number except.
9. If $4x + 5y = 82$, $3x + 2z = 54$, $5y + 4z = 110$, what is the value of $5x + 2y + z$?
 (A) 50 (B) 65 (C) 75 (D) 100

SECTION-B

- Assertion & Reason**

Instructions: In the following questions as Assertion (A) is given followed by a Reason (R). Mark your responses from the following options.

- (A) Both Assertion and Reason are true and Reason is the correct explanation of 'Assertion'
 (B) Both Assertion and Reason are true and Reason is not the correct explanation of 'Assertion'
 (C) Assertion is true but Reason is false
 (D) Assertion is false but Reason is true
1. **A :** The graph of equation $y + 8 = x + 8$ passes through origin.
B : The graph of a linear equation with its constant term = 0 always passes through origin
2. **A :** The equation $2x + 3y = 3(2 + y)$ has a unique solution.
B : The linear equation in two variables has a unique solution.

EXERCISE-IV

SECTION-A

- Multiple choice question with one correct answers**

1. The total number of integer pairs (x,y) satisfying the equation $x + y = xy$ is
 (A) 0 (B) 1 (C) 2 (D) None of these
2. x and y are 2 different digits. If the sum of the two numbers formed by using both digits is a perfect square, then find $x + y$
 (A) 10 (B) 11 (C) 12 (D) 13

3. Two candles of the same length are lighted at the same time. the first is consumed in 6 hours and the second in 4 hours. Assuming each candle burns at a constant rate, in how many hours after being lighted was the first candle twice the length of the second.
 (A) 1 hour (B) 2 hour (C) 3 hours (D) 5 hours
4. A boat travels with speed of 15 km/hour in still water. In a river flowing at 5 km/hour the boat travels. Some distance downstream and then returns. The ratio of average speed to the speed in still water is
 (A) 8 : 3 (B) 3 : 8 (C) 8 : 9 (D) 9 : 8
5. Evaluate: $|3| + |-2-3| -3 - |-7|$
 (A) -2 (B) 2 (C) 10 (D) -10
6. Find the equation of the line which is parallel to $3x - 2y + 5 = 0$ and passes through point (5 -6)
 (A) $3x - 2y + 27 = 0$ (B) $2x - 3y + 27 = 0$ (C) $3x - 2y - 27 = 0$ (D) $3x + y + 27 = 0$
7. State whether the two lines through (5,6) and (2,3) through (9,-2) and (6-5) are
 (A) parallel (B) perpendicular
 (C) neither parallel nor perpendicular (D) none of these
8. What can be said regarding a line of its slope is zero if slope zero x on
 (A) The line is x-axis (B) it is parallel to x-axis
 (C) It passes through origin (D) none of these
9. Find the equation of line which cuts off an intercept 4 on the positive direction of x-axis and an intercept 3 cm the negative direction of y-axis.
 (A) $3x - 4y = 12$ (B) $3x + 4y = 12$ (C) $4x - 3y = 12$ (D) $4x + 3y = 12$
10. What can be said regarding a line of its slop is ∞ .
 (A) The line is y-axis. (B) The line is x-axis (C) Parallel to x-axis (D) None of these
11. Find the set of value of z satisfyiy $\left| \frac{5-x}{3} \right| < 2$:
 (A) $1 < x < 11$ (B) $-1 < x < 11$ (C) $x < 11$ (D) None of these
12. If a and b are real no's the equation $3x - 5 + a = bx + 1$ has a unique solution x
 (A) For all a and b (B) if $a \neq 2b$ (C) if $a \neq b$ (D) if $b \neq 3$

SECTION-B

- Multiple choice question with one or more than one correct answers

1. The equations $2x + y - 5 = 0$ and $6x + 3y - 15 = 0$ shows
 (A) Coincident lines (B) Infinite number of solution
 (C) Unique solution (D) no solution
2. If $p > q$ and $r < 0$, which of the following is/are true:-
 (A) $pr < qr$ (B) $p + r > q + r$ (C) $p - r < q - r$ (D) $2p + r < 2q + r$
3. If u is between 0 and 1, but $u \neq 0$ or 1 which of the following increases as u increases ?
 (A) $1 - u^2$ (B) $u - 1$ (C) $\frac{1}{u^2}$ (D) u^2

4. Simplify $x^2 + |x - 1| = 1$
 (A) 1 (B) -1 (C) 0 (D) 2
5. The simultaneous equations $2x + 3y = 5$, $4x + 6y = 10$ represents.
 (A) several solutions (B) only two solutions (C) parallel lines (D) coincident lines
6. Consider the following statements : The system of equations $2x - y = 4$, $px - y = q$, which of the following statements is/are true for above system of equations:-
 (A) has a unique solution if $p \neq 2$ (B) represents parallel lines if $p = 2$
 (C) has infinitely many solutions if $p = 2, q = 4$ (D) has no solution if $p \neq 2$

SECTION-C

• **Comprehension**

Draw the graph of the linear function whose table is given below

x	-3	-2	-1	0	1
y	5	—	3	-	1

1. Write down the linear relation between x and y
 (A) $x + y = 2$ (B) $x - y = 2$ (C) $2x - y = 2$ (D) $x - 2y = 2$
2. Find the missing numbers from the graph
 (A) (4,2) (B) (3,4) (C) (1,2) (D) None of these
3. Find the slope of the above graph
 (A) -2 (B) 1 (C) -1 (D) None of these

Answers

TRY YOURSELF

1. (i) $y = 7x + 2$ (ii) $y = x + 2$ 2. $m = -3/4$ 3. $y = 9$
 4. $2x - 3y + 6 = 0$

EXERCISE-I

1. 13.5 sq. units. 2. (i) $x = a^2, y = b^2$ 3. (i) $k \neq -4$
 4. (i) $k = 2$ 5. (i) $k = -2$
 6. (i) $x = a + b, y = \frac{-2ab}{a+b}$ (ii) $x = -\frac{1}{2}, y = 2$ (iii) $\begin{matrix} x = m + n \\ y = m - n \end{matrix}$
 7. 45 8. $3/4$
 9. $\angle A = 70, \angle B = 53, \angle C = 110, \angle D = 127$ 10. $x = 10/3$ km/h, $y = 5$ km/h
 11. 692 12. 96

EXERCISE-II

1. A can do this work in 50 days, B can do this work in 75 days 2. 47 or 74
 3. 210 and 6 4. 25000, 5000 5. 6, 4
 6. 500, 700 7. Father's age = 42 years, Sons age = 10 years
 8. Fixed charge = Rs. 400, Cost of food per day = Rs 30 9. 35 km/hr, 25km/hr.
 10. 6 km/hr., 2 km/hr.

EXERCISE-III

Section-A

1. (D) 2. (B) 3. (B) 4. (A) 5. (D) 6. (B)
 7. (C) 8. (D) 9. (C)

Section-C

1. (A) 2. (C)

EXERCISE-IV**Section-A**

1. (C) 2. (B) 3. (C) 4. (C) 5. (A) 6. (C)
7. (A) 8. (A) 9. (A) 10. (A) 11. (B) 12. (D)

Section-B

1. (A,B) 2. (A,B) 3. (B,D) 4. (A,C) 5. (A,D) 6. (A,C)

Section-C

1. (A) 2. (A) 3. (C)
