📘 Class 9 Maths – Ganita Manjari Part II

Chapter 13: Two Variables, One Line

Exercise Set 13.2 – Complete Questions with Solutions

Q1. Verify if the ordered pair (4, 3) is a solution of $5x - 6y = 2$. Explain your reasoning.

Solution:

Given:

$x = 4$, $y = 3$

Substitute in:

$5x - 6y = 2$

$5(4) - 6(3)$

$= 20 - 18$

$= 2$

The result is equal to the right-hand side.

Answer: Yes, (4, 3) is a solution of $5x - 6y = 2$.

Q2. Find any two solutions for each of the following equations:

(i) $7x - 3y = 21$

Let $x = 3$.

$7(3) - 3y = 21$

$21 - 3y = 21$

$3y = 0$

$y = 0$

First solution:

(3, 0)

Now let $x = 0$.

$7(0) - 3y = 21$

$-3y = 21$

$y = -7$

Second solution:

(0, −7)

Answer: (3, 0) and (0, −7)

(ii) $2x + 3y = 5$

Let $x = 1$.

$2(1) + 3y = 5$

$2 + 3y = 5$

$3y = 3$

$y = 1$

First solution:

(1, 1)

Now let $x = -1$.

$2(-1) + 3y = 5$

$-2 + 3y = 5$

$3y = 7$

$y = 7/3$

Second solution:

$(-1, 7/3)$

Answer: $(1, 1)$ and $(-1, 7/3)$

Q3. In the equations given below, m and n are unknown constants: $2mx + 3y = 7$; $4x + ny = -10$. If $(2, -1)$ is the solution of both equations, find the values of m and n.

Solution:

Given:

$x = 2, y = -1$

First equation:

$2mx + 3y = 7$

$2m(2) + 3(-1) = 7$

$4m - 3 = 7$

$4m = 10$

$m = 5/2$

Second equation:

$4x + ny = -10$

$4(2) + n(-1) = -10$

$8 - n = -10$

$-n = -18$

$n = 18$

Answer:

$m = 5/2$ and $n = 18$

Q4. Find two solutions which lie in different quadrants for each of the following linear equations. Identify the quadrants in which the points lie.

(i) $5x + 3y = 7$

Take $x = 2$:

$5(2) + 3y = 7$

$10 + 3y = 7$

$3y = -3$

$y = -1$

Solution:

$(2, -1)$ → Quadrant IV

Take $x = -1$:

$5(-1) + 3y = 7$

$-5 + 3y = 7$

$3y = 12$

$y = 4$

Solution:

$(-1, 4)$ → Quadrant II

Answer:

$(2, -1)$ → Quadrant IV
$(-1, 4)$ → Quadrant II

(ii) $5x - 3y = 7$

Take $x = 2$:

$5(2) - 3y = 7$

$10 - 3y = 7$

$-3y = -3$

$y = 1$

Solution:

$(2, 1)$ → Quadrant I

Take $x = -1$:

$5(-1) - 3y = 7$

$-5 - 3y = 7$

$-3y = 12$

$y = -4$

Solution:

$(-1, -4)$ → Quadrant III

Answer:

(2, 1) → Quadrant I
(−1, −4) → Quadrant III

(iii) $-5x + 3y = 7$

Take $x = 1$:

$-5(1) + 3y = 7$

$-5 + 3y = 7$

$3y = 12$

$y = 4$

Solution:

(1, 4) → Quadrant I

Take $x = -2$:

$-5(-2) + 3y = 7$

$10 + 3y = 7$

$3y = -3$

$y = -1$

Solution:

(−2, −1) → Quadrant III

Answer:

(1, 4) → Quadrant I
(−2, −1) → Quadrant III

(iv) $-5x - 3y = 7$

Take $x = 1$:

$-5(1) - 3y = 7$

$-5 - 3y = 7$

$-3y = 12$

$y = -4$

Solution:

(1, −4) → Quadrant IV

Take $x = -2$:

$-5(-2) - 3y = 7$

$10 - 3y = 7$

$-3y = -3$

$y = 1$

Solution:

(−2, 1) → Quadrant II

Answer:

(1, −4) → Quadrant IV
(−2, 1) → Quadrant II

Verification by graph

Plot each pair of solutions on graph paper. The two points for each equation will lie on the same straight line.

Q5. Consider the graph of the equation 3x − 7y = 21 shown below. Does the point C (2, 3) lie on the line? Does it satisfy the

equation? Can points that do not lie on the line satisfy the equation?

Solution:

The equation is:

$3x - 7y = 21$

Given:

C = (2, 3)

Substitute $x = 2$ and $y = 3$:

$3(2) - 7(3)$

$= 6 - 21$

$= -15$

But:

$-15 \neq 21$

Therefore, C does not satisfy the equation.

From the graph also, C(2, 3) does not lie on the given line.

Answers:

Does C(2, 3) lie on the line?

No.

Does C(2, 3) satisfy the equation?

No.

Can points that do not lie on the line satisfy the equation?

No.

Every point that satisfies the equation lies on its graph. Conversely, every point on the graph satisfies the equation.

Q6. State whether the following sentences are True or False. Justify your answer.

(i) A linear equation in two variables has only one solution.

False.

A linear equation in two variables generally has infinitely many solutions.

For example:

$2x + 3y = 7$

has infinitely many possible values of x and y satisfying the equation.

(ii) The graph of a linear equation in two variables always passes through the origin.

False.

Consider:

$2x + 3y = 7$

At the origin (0, 0):

$2(0) + 3(0) = 0$

But:

$0 \neq 7$

Therefore, the origin does not lie on this line.

(iii) A linear equation in two variables can never have rational solutions.

False.

For example:

$2x + 3y = 5$

has the rational solution:

(1, 1)

because:

$2(1) + 3(1) = 5$.

(iv) x = 3 is a valid linear equation in two variables.

True.

It can be written as:

$\mathbf{x + 0y = 3}$

Therefore, it is a linear equation in two variables.

(v) The equation 2x + 3y = 7 has infinitely many solutions.

True.

For every suitable value of x, a corresponding value of y can be obtained.

For example:

$x = 2$ gives $y = 1$

$x = 5$ gives $y = -1$

and many other solutions are possible.

Therefore, it has infinitely many solutions.

(vi) The point (1, 2) is a solution of the equation 2x + 3y = 7.

Substitute $x = 1$ and $y = 2$:

$2(1) + 3(2)$

$= 2 + 6$

$= 8$

But:

$8 \neq 7$

Therefore, (1, 2) is not a solution.

Answer: False

Q7.

(i) Compare the solutions of the equations 3x + 4y = 7 and 6x + 8y = 14. Argue that they have the same set of solutions, that is, every solution of one is also a solution of the other.

Given:

$\mathbf{3x + 4y = 7}$ …(1)

$\mathbf{6x + 8y = 14}$ …(2)

Divide equation (2) by 2:

$(6x + 8y)/2 = 14/2$

Therefore:

$3x + 4y = 7$

This is exactly equation (1).

Hence, the two equations are equivalent.

Therefore, every solution of the first equation satisfies the second equation, and every solution of the second equation satisfies the first equation.

Answer:

Both equations have the same set of solutions.

(ii) Show that the equations $ax + by = c$ and $kax + kby = kc$, with $k \neq 0$, have the same set of solutions.

Given:

$ax + by = c$ …(1)

and

$kax + kby = kc$ …(2)

where $k \neq 0$.

Starting with equation (2):

$kax + kby = kc$

Divide both sides by k:

$(kax + kby)/k = kc/k$

Therefore:

$ax + by = c$

This is equation (1).

Hence, the two equations are equivalent.

Therefore, every solution of one equation is also a solution of the other.

Answer:

$ax + by = c$ and $kax + kby = kc$ have the same set of solutions, provided $k \neq 0$.