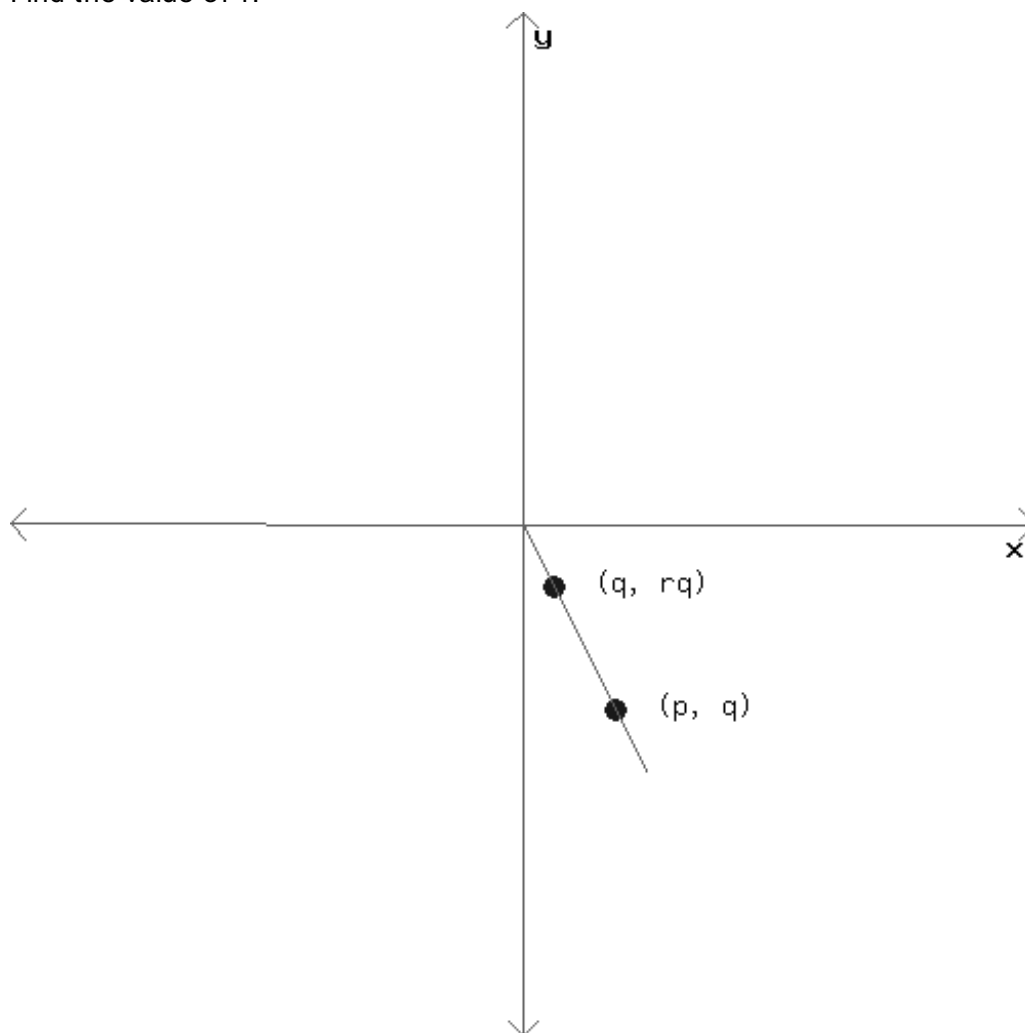


Linear Equations in Two Variables

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Answer the questions

- (1) Find the equation of straight line which is parallel to y-axis, and is at a distance of p from y-axis is
- (2) The Cab fare in Gwalior is Rs. 23 for the first kilometer and Rs. 14 per kilometer for subsequent distance covered. If distance is represented as x , and fare is represented as y , find the linear equation for this relationship.
- (3) Find the value of r .



- (4) The positive solutions of the equation $ex + fy + g = 0$ always lie in which quadrant?

Choose correct answer(s) from given choice

(5) If solutions of a linear equation are $(-10, 10)$, $(0, 0)$ and $(10, -10)$, find the equation.

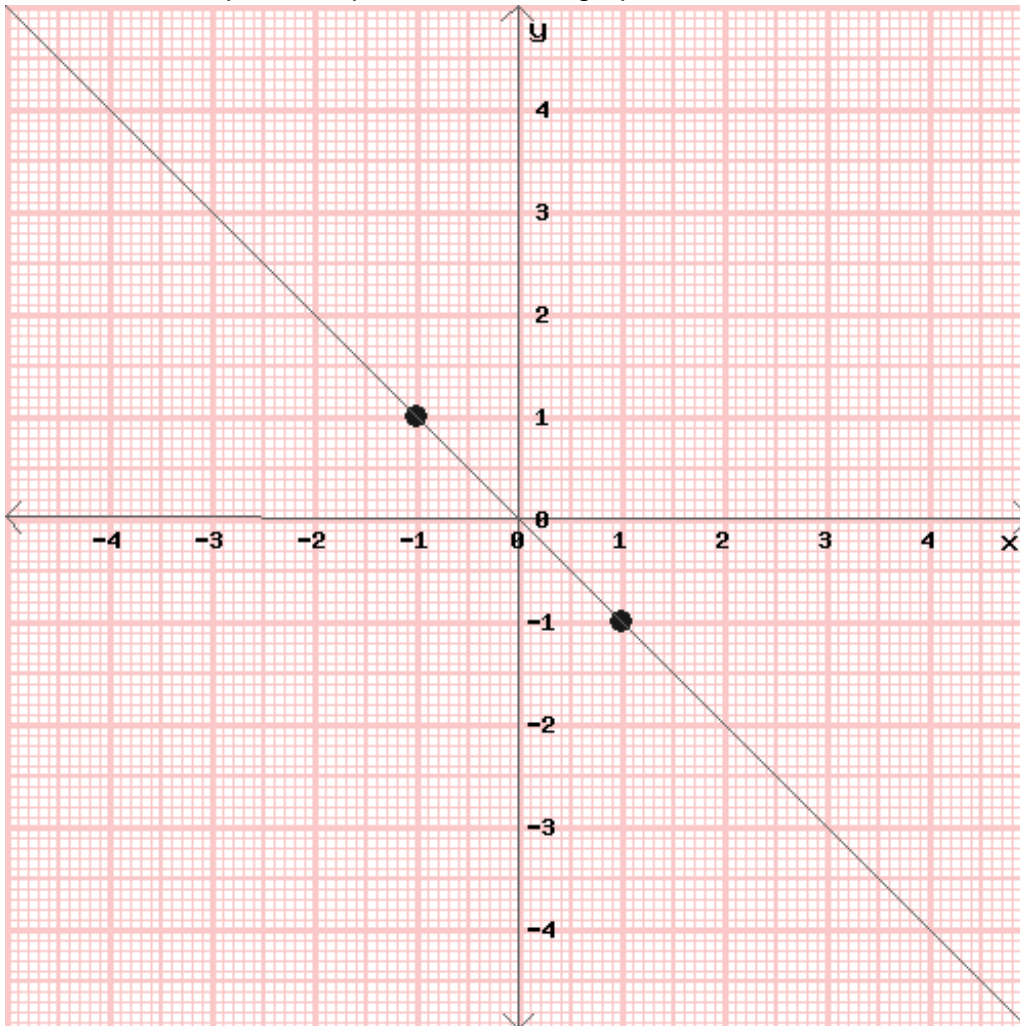
a. $x - 10y = 0$

b. $-10x + y = 0$

c. $x - y = 0$

d. $x + y = 0$

(6) Find the linear equation represented in the graph below.



a. $y = -x + 1$

b. $y = -x$

c. $y = x$

d. $y = 0$

(7) A line passes through points $(3, 10)$ and $(-3, -14)$. Find the x-intercept of the line.

a. 1.5

b. 0.5

c. 0

d. 1

(8) The graph of equation for the line $x = a$ is a line

a. making an intercept a on the y-axis

b. parallel to x-axis at a distance a units from the origin

c. making an intercept a on both the axes

d. parallel to y-axis at a distance a units from the origin

(9) A point on line $x = y$ is of the form

a. $(a, -a)$

b. (a, a)

c. $(a, 0)$

d. $(0, a)$

(10) Equation $2x + 7y = 9$ has a unique solution if x and y are

a. Positive Real Numbers

b. Real Numbers

c. Rational Numbers

d. Natural Numbers

(11) The equation of x -axis is

a. $x + y = 0$

b. $x = 0$

c. $y = 0$

d. $x = y$

(12) If $3x + 2y = 7$ then which of the following x and y values is true?

a. $x=8, y=\frac{-2}{2}$

b. $x=4, y=\frac{-2}{2}$

c. $x=3, y=\frac{-2}{2}$

d. $x=8, y=\frac{-1}{2}$

(13) If point $(2, 2)$ lies on the graph of linear equation $px + 4y = 14$, find the value of p .

a. 3

b. 5

c. 4

d. 1

(14) If a number is subtracted from both side of a equation, then solution of the equation

a. Changes

b. Will also decrease by same number

c. Remains the same

d. May or may not change depending on the equation

(15) A line passe through points $(3, -4)$ and $(2, -3)$. Find the y -intercept of the line.

a. -2

b. -3

c. 1

d. -1



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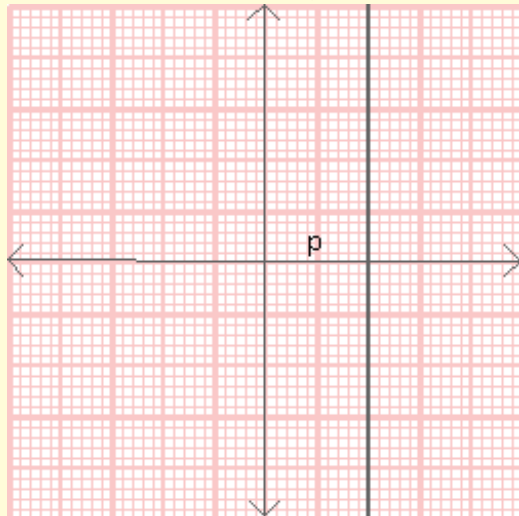
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Answers

(1) $x = p$

If a line is parallel to the y-axis, then x value of it is constant for all values of y.

Take a look at the image to see this case



Further, if the line is distance p away from the y-axis, it also means that this constant value of x is p .

So the equation for that line is $x=p$

(2) $y = 14x + 9$

Step 1

We are given the following facts

- The fare for the first kilometer is Rs. 23
- The fare per kilometer after that is Rs. 14

Step 2

We can see that the fare will be dependent on the distance

So we set y on the left hand side

$y =$ Some linear function of x

Step 3

We know that after the first kilometer, the rate is Rs. 14 per kilometer.

So if we travel x kilometers, we will get charged Rs. 23 for the first kilometer, and Rs. 14 for $x - 1$ kilometers.

Step 4

This means the equation is $y = 23 + ((x - 1) \times 14)$

Step 5

Simplifying, we get $y = 14x + 9$

(3) q/p **Step 1**Equation of line $y = mx + c$ Since it goes through center, c is 0, hence equation is $y = m x$ **Step 2**For first point $x = q$ and $y = rq$, hence

$$rq = m q$$

$$m = r \text{ _____ (1)}$$

Step 3For second point $x = p$ and $y = q$, hence

$$q = m p$$

$$m = q/p \text{ _____ (1)}$$

Step 4On comparing two equations, $r = q/p$

(4) First quadrant

(5) d. $x + y = 0$

The points (a,b) that solve a linear equation would satisfy $ax+by=c$, where a,b,c are constants.

Substituting $(0,0)$ we see that $c = 0$.

Substituting the other two points $(-10,10)$ and $(10,-10)$, we get the following equations

$$-10x + 10y = 0 \text{ and } 10x + (-10y) = 0$$

From these two equations, we can therefore eliminate the variables and see that the answer is $x + y = 0$

(6) b. $y = -x$

The general equation of a line is $y=mx+c$

So we have to find m and c

To find c , note from the equation that c is the value of y when $x=0$ (i.e. the equation becomes $y=m*0 + c$, or $y=c$).

Look at the graph to see if this is a vertical line. If it is not (we'll see the case where it is later in this tip), then what the value of y is when the equation crosses the vertical axis

We see that the value of y at this point is 0. So $c=0$

The next part is finding m

The best way to consider m is to think of it as the **slope** of the line.

Think of it as the change in y for a given change in x .

Consider the two equations,

$$y_1 = mx_1 + c, \text{ and}$$

$$y_2 = mx_2 + c$$

Now we subtract the first equation from the second

$$\text{We get } y_1 - y_2 = mx_1 + c - (mx_2 + c)$$

Simplifying,

$$(y_1 - y_2) = m(x_1 - x_2)$$

$$\text{or } m = (y_1 - y_2)/(x_1 - x_2)$$

Now, substitute the two points seen in the graph.

$$m = (-1 - (1))/(1 - (-1))$$

Also, note that this is the reason why we don't apply this when the line is vertical, because the denominator would be 0, and the equation is meaningless

This is solved to get the value of m , and get the answer $m=-1$

Now, if the line is a vertical one, then you can solve it by inspection.

So the answer is $y= -x$.

(7) b. 0.5

Step 1Equation of line $y = m x + c$ **Step 2**

Substitute first point in the equation

$$10 = 3 m + c$$

$$m = (10 - c)/3 \quad (1)$$

Step 3

Substitute second point in the equation

$$-14 = -3 m + c$$

$$m = (-14 - c)/-3 \quad (2)$$

Step 4On equating value of m from both equations,

$$(10 - c)/3 = (-14 - c)/-3$$

$$-30 + 3c = -42 - 3c$$

$$6 c = -12$$

$$c = -2$$

Step 5

$$m = (10 - c)/3 = 4$$

Step 6Equation of line : $y = 4 x + c$

Now when line intersect with x axis, value of y will be 0

$$0 = 4x + (-2)$$

$$x = 0.5$$

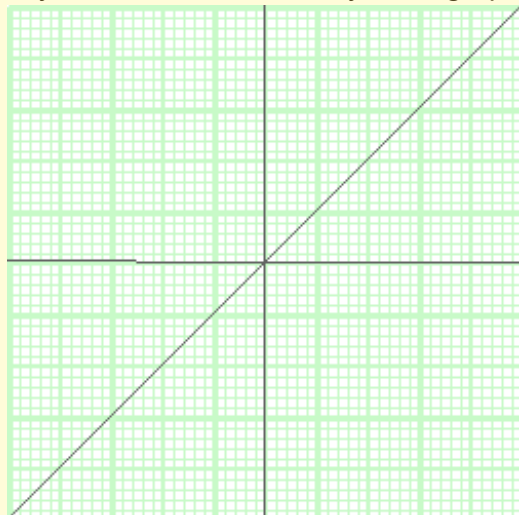
(8) d. parallel to y-axis at a distance a units from the origin

If the equation for the line is $x = a$, this implies that the value of x is always a irrespective of the value of y .

What this means is that this line is parallel to y-axis at a distance a units from the origin.

(9) b. (a, a)

Try and trace the line $x = y$ in the graph shown here



You can see that any point on the line defined by the equation $x = y$ will always have the value of x the same as y .

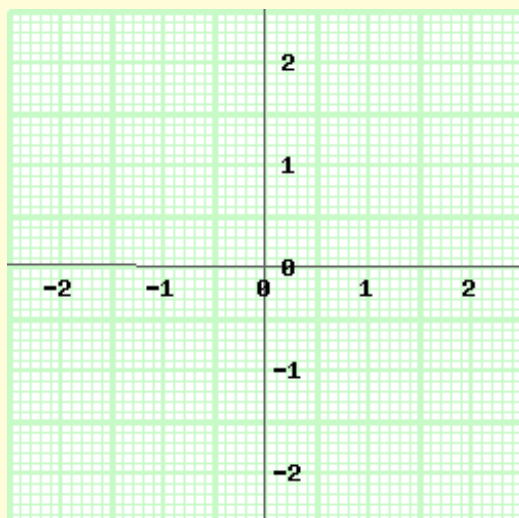
Therefore a point on the line will have the form of (a, a)

(10) d. Natural Numbers

A general equation in two variables has infinitely many solutions if there is no restriction placed on the values of the two variables (x and y here). However, it may have a unique solution if certain constraints are placed on it. Here we can see by observation that if x and y are constrained to be natural numbers, then it has a solution for $x=y=1$, and this is the only possible solution for natural numbers.

(11) c. $y = 0$

Take a look at a graph



You can see that for the x -axis, the value of y is always 0. So the equation is $y=0$

(12) c. $x=3, y=\frac{-2}{2}$

Step 1

Remember that for equations in two variables, you need two equations to get the unique answer. Here we are given just one equation, so this information is not enough for us to solve for a unique answer. However, we are given four choices here, so we can quickly substitute the four options to see which one satisfies the equation

Step 2

Among given four option we can see that only $x=3, y=\frac{-2}{2}$ satisfies given equation,

$$3x + 2y = 7$$

$$\Rightarrow 3 \times 3 + 2 \times \frac{-2}{2} = 7$$

$$\Rightarrow 7 = 7$$

(13) a. 3

We know the following facts

- The equation of the line is $p x + 4y = 14$
- The point (2,2) lies on the line

Substitute $x=2$ and $y=2$ in the equation

$$p \times 2 + 4 \times 2 = 14$$

Solve this to find that the value of p is 3.

(14) c. Remains the same

Think of this in simple terms.

If two values (let it be anything - weights, lengths, coins, equations etc.) are equal, and you add or remove some amount from both of them, the resulting values will also be equal.

That is the principle here, and the answer is that the solution to the equation will remain the same.

(15) d. -1

Step 1Equation of line $y = m x + c$ **Step 2**

Substitute first point in the equation

$$-4 = 3 m + c$$

$$m = (-4 - c)/3 \text{ _____ (1)}$$

Step 3

Substitute second point in the equation

$$-3 = 2 m + c$$

$$m = (-3 - c)/2 \text{ _____ (2)}$$

Step 4On equating value of m from both equations,

$$(-4 - c)/3 = (-3 - c)/2$$

$$-8 - 2c = -9 - 3c$$

$$1 c = -1$$

$$c = -1$$