Important Questions for Class 11 Maths Chapter 9 - Straight Lines

Question 1:

Calculate the slope of a line, that passes through the origin, and the mid-point of the segment joining the points P (0, -4) and B (8, 0).

Solution:

Given that,

The coordinates of the mid-point of the line segment joining the points P (0, -4) and B (8, 0) are:

[(0+8)/2 , (-4+0)/2] = (4, -2)
It is known that the slope (m) of a non-vertical line passing through the points (x_1, y_1) and (x_2,

y_2) is given by the formula

m = (y_2 -y_1) / ((x_2 -x_1), where (x_2 is not equal to x_1)

Therefore, the slope of the line passing through the points (0, 0,) and (4, -2) is

m= (-2-0)/(4-0)

m= -2/4

m= -½

Hence, the required slope of the line is -1/2

Question 2:

Find the equation of the line which is at a perpendicular distance of 5 units from the origin and the angle made by the perpendicular with the positive x-axis is 30°.

Solution:

If p is the length of the normal from the origin to a line and ω is the angle made by the normal with the positive direction of the x-axis

Then, the equation of the line for the given condition is written by

$x \cos \omega + y \sin \omega = p$.

Here, $p = 5$ units and $\omega = 30°$

Thus, the required equation of the given line is

$x \cos 30° + y \sin 30° = 5$

$x(\sqrt{3}/2) + y(1/2) = 5$

It becomes

$\sqrt{3}x + y = 10$

Thus, the required equation of a line is $\sqrt{3}x + y = 10$

Question 3:

Find the equation of the line perpendicular to the line $x – 7y + 5 = 0$ and having x-intercept 3

Solution:

The equation of the line is given as $x – 7y + 5 = 0$.

The above equation can be written in the form $y = mx+c$

Thus, the above equation is written as:

$y= (1/7)x + (5/7)$

From the above equation, we can say that,

The slope of a line, $m = 5/7$

The slope of the line perpendicular to the line having a slope of $1/7$ is

$m = -1/(1/7) = -7$

Hence, the equation of a line with slope -7 and intercept 3 is given as:

$y = m (x – d)$

$\Rightarrow y= -7(x-3)$

$\Rightarrow y=-7x + 21$

$7x+ y = 21$

Hence, the equation of a line which is perpendicular to the line $x – 7y + 5 = 0$ with x-intercept 3 is $7x+ y = 21$.

Question 4:

The perpendicular from the origin to the line y = mx + c meets it at the point (-1, 2). Find the values of m and c.

Solution:

The given equation of the line is y = mx + c.

From the given condition, the perpendicular from the origin meets the given line at (-1, 2).

Hence, the line joining the points (0, 0) and (-1, 2) is perpendicular to the given line.

The slope of the line joining (0, 0) and (-1, 2) is

= 2/-1 = -2

Therefore,

m (– 2) = -1 (Since the two lines are perpendicular)

m= ½

Since points (-1, 2) lies on the given line, it satisfies the equation y = mx + c.

Now, substitute the value of m, (x, y) coordinates in the equation:

2 = m(-1) + c

2 = ½(-1) + c

2 = -½ + c

C = 2 + (½)

C = 5/2

Therefore, the value of m and c are ½ and 5/2 respectively.

Question 5:

Find the points on the x-axis whose distance from the line equation (x/3) + (y/4) = 1 is given as 4units.

Solution:

Given that,

The equation of a line = (x/3) + (y/4) = 1

It can be written as:

$4x + 3y - 12 = 0$ ...(1)

Compare the equation (1) with general line equation $Ax + By + C = 0$,

we get the values $A = 4$, $B = 3$, and $C = -12$.

Let (a, 0) be the point on the x-axis whose distance from the given line is 4 units.

we know that the perpendicular distance (d) of a line $Ax + By + C = 0$ from a point (x_1, y_1) is given by

$D = |Ax_1+By_1 + C|/ \sqrt{A^2 + B^2}$

Now, substitute the values in the above formula, we get:

$4 = |4a+0 + -12|/ \sqrt{4^2 + 3^2}$

$\Rightarrow 4 = |4a-12|/5$

$\Rightarrow |4a-12| = 20$

$\Rightarrow \pm (4a-12)= 20$

$\Rightarrow (4a-12)= 20$ or $-(4a-12) =20$

Therefore, it can be written as:

$(4a-12)= 20$

$4a = 20+12$

$4a = 32$

$a = 8$

(or)

$-(4a-12) =20$

$-4a +12 =20$

$-4a = 20-12$

$-4a= 8$

$a= -2$

$\Rightarrow a= 8$ or -2

Hence, the required points on x axis are (-2, 0) and (8, 0).