EXERCISE 9.3

1. Reduce the following equations into slope - intercept form and find their slopes and the y - intercepts.

   (i) $x + 7y = 0$, (ii) $6x + 3y - 5 = 0$, (iii) $y = 0$.

2. Reduce the following equations into intercept form and find their intercepts on the axes.

(i) $3x + 2y - 12 = 0$, (ii) $4x - 3y = 6$, (iii) $3y + 2 = 0$.

3. Find the distance of the point $(-1, 1)$ from the line $12(x + 6) = 5(y - 2)$.

4. Find the points on the x-axis, whose distances from the line $\frac{x}{3}+\frac{y}{4}=1$ are 4 units.

5. Find the distance between parallel lines

(i) $15x + 8y - 34 = 0$ and $15x + 8y + 31 = 0$ (ii) $l(x + y) + p = 0$ and $l(x + y) - r = 0$.

6. Find equation of the line parallel to the line $3x - 4y + 2 = 0$ and passing through the point $(-2, 3)$.

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

8. Find angles between the lines $\sqrt{3}x + y = 1$ and $x + \sqrt{3}y = 1$.

9. The line through the points $(h, 3)$ and $(4, 1)$ intersects the line $7x - 9y - 19 = 0$. at right angle. Find the value of h.

10. Prove that the line through the point (x_1, y_1) and parallel to the line $Ax + By + C = 0$ is

$$A(x - x_1) + B(y - y_1) = 0.$$

11. Two lines passing through the point $(2, 3)$ intersects each other at an angle of 60°. If slope of one line is 2, find equation of the other line.

12. Find the equation of the right bisector of the line segment joining the points $(3, 4)$ and $(-1, 2)$.

13. Find the coordinates of the foot of perpendicular from the point $(-1, 3)$ to the line $3x - 4y - 16 = 0$.

14. 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.

15. If p and q are the lengths of perpendiculars from the origin to the lines $x \cos\theta - y \sin\theta = k \cos 2\theta$ and $x \sec\theta + y \operatorname{cosec}\theta = k$, respectively, prove that $p^2 + 4q^2 = k^2$.

16. In the triangle ABC with vertices A (2, 3), B (4, –1) and C (1, 2), find the equation and length of altitude from the vertex A.

17. If p is the length of perpendicular from the origin to the line whose intercepts on the axes are a and b, then show that $\frac{1}{p^2} = \frac{1}{a^2} + \frac{1}{b^2}$.

Miscellaneous Exercise on Chapter 9

1. Find the values of k for which the line $(k-3)\,x - (4 - k^2)\,y + k^2 - 7k + 6 = 0$ is
   (a) Parallel to the x-axis,
   (b) Parallel to the y-axis,
   (c) Passing through the origin.

2. Find the equations of the lines, which cut-off intercepts on the axes whose sum and product are 1 and – 6, respectively.

3. What are the points on the y-axis whose distance from the line $\frac{x}{3}+\frac{y}{4}=1$ is 4 units.

4. Find perpendicular distance from the origin to the line joining the points $(\cos\theta, \sin\theta)$ and $(\cos\phi, \sin\phi)$.

5. Find the equation of the line parallel to y-axis and drawn through the point of intersection of the lines $x - 7y + 5 = 0$ and $3x + y = 0$.

6. Find the equation of a line drawn perpendicular to the line $\frac{x}{4}+\frac{y}{6}=1$ through the point, where it meets the y-axis.

7. Find the area of the triangle formed by the lines $y - x = 0$, $x + y = 0$ and $x - k = 0$.

8. Find the value of p so that the three lines $3x + y - 2 = 0$, $px + 2y - 3 = 0$ and $2x - y - 3 = 0$ may intersect at one point.

9. If three lines whose equations are $y = m_1x + c_1$, $y = m_2x + c_2$ and $y = m_3x + c_3$ are concurrent, then show that $m_1(c_2 - c_3) + m_2(c_3 - c_1) + m_3(c_1 - c_2) = 0$.

10. Find the equation of the lines through the point (3, 2) which make an angle of 45° with the line $x - 2y = 3$.

11. Find the equation of the line passing through the point of intersection of the lines $4x + 7y - 3 = 0$ and $2x - 3y + 1 = 0$ that has equal intercepts on the axes.

12. Show that the equation of the line passing through the origin and making an angle θ with the line $y = mx + c$ *is* $\dfrac{y}{x} = \dfrac{m \pm \tan\,,}{1 \mp m\tan\,,}$.

13. In what ratio, the line joining $(-1, 1)$ and $(5, 7)$ is divided by the line $x + y = 4$?

14. Find the distance of the line $4x + 7y + 5 = 0$ from the point $(1, 2)$ along the line $2x - y = 0$.

15. Find the direction in which a straight line must be drawn through the point $(-1, 2)$ so that its point of intersection with the line $x + y = 4$ may be at a distance of 3 units from this point.

16. The hypotenuse of a right angled triangle has its ends at the points (1, 3) and (– 4, 1). Find an equation of the legs (perpendicular sides) of the triangle which are parallel to the axes.

17. Find the image of the point $(3, 8)$ with respect to the line $x + 3y = 7$ assuming the line to be a plane mirror.

18. If the lines $y = 3x + 1$ and $2y = x + 3$ are equally inclined to the line $y = mx + 4$, find the value of m.

19. If sum of the perpendicular distances of a variable point P (x, y) from the lines $x + y - 5 = 0$ and $3x - 2y + 7 = 0$ is always 10. Show that P must move on a line.

20. Find equation of the line which is equidistant from parallel lines $9x + 6y - 7 = 0$ and $3x + 2y + 6 = 0$.

21. A ray of light passing through the point $(1, 2)$ reflects on the x-axis at point A and the reflected ray passes through the point $(5, 3)$. Find the coordinates of A.

22. Prove that the product of the lengths of the perpendiculars drawn from the points $\left(\sqrt{a^2-b^2},0\right)$ and $\left(-\sqrt{a^2-b^2},0\right)$ to the line $\frac{x}{a}\cos\theta+\frac{y}{b}\sin\theta=1$ is b^2.

23. A person standing at the junction (crossing) of two straight paths represented by the equations $2x - 3y + 4 = 0$ and $3x + 4y - 5 = 0$ wants to reach the path whose equation is $6x - 7y + 8 = 0$ in the least time. Find equation of the path that he should follow.


THANK
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