1. Show that the locus of the mid-point of the distance between the axes of the variable line $x \cos\theta + y \sin\theta = p$ is $\frac{1}{x^2} + \frac{1}{y^2} = \frac{4}{p^2}$ where p is a constant.
2. If the line joining two points A(2, 0) and B(3, 1) is rotated about A in anti-clock wise direction through an angle of 15°. Find the equation of the line in new position. Ans : $\sqrt{3}x - y - 2\sqrt{3} = 0$
3. If the slope of a line passing through the point A(3, 2) is 3/4 , then find points on the line which are 5 units away from the point A. ans : (-1, -1) ; (7, 5)
4. If one diagonal of a square is along the line $8x - 15y = 0$ and one of its vertex is at (1, 2), then find the equation of sides of the square passing through this vertex. Ans 23x – 7y – 9 = 0, 7x + 23y – 53 = 0
5. The two lines $a_1x + b_1y = c_1$ and $a'x + b'y = c'$ are perpendicular iff'..........
6. Find the reflection of the point (4, – 13) about the line $5x + y + 6 = 0$ ans : (-1, -14)
7. A point moves such that its distance from the point (4, 0) is half that of its distance from the line $x = 16$. Find the locus of the point. Ans: $3x^2 + 4y^2 = 192$
8. Find the points on the line $x + y = 4$ which lie at a unit distance from the line $4x + 3y = 10$.Ans: (3, 1), (– 7, 11)
9. Show that the tangent of an angle between the lines $\frac{x}{a} + \frac{y}{b} = 1$ and $\frac{x}{a} - \frac{y}{b} = 1$ is $\frac{2ab}{a^2 - b^2}$.
10. Find the equation of a straight line on which length of perpendicular from the origin is four units and the line makes an angle of 120° with the positive direction of x-axis. Ans: $\sqrt{3}x + y = 8$
11. Find the equation of one of the sides of an isosceles right angled triangle whose hypotenuse is given by $3x + 4y = 4$ and the opposite vertex of the hypotenuse is (2, 2). Ans: $x - 7y - 12 = 0$
12. If the equation of the base of an equilateral triangle is $x + y = 2$ and the vertex is (2, – 1), then find the length of the side of the triangle.
 [**Hint**: Find length of perpendicular (p) from (2, – 1) to the line and use p = l sin60°, where l is the length of side of the triangle]. Ans: $\sqrt{\frac{2}{3}}$
13. A variable line passes through a fixed point P. The algebraic sum of the perpendiculars drawn from the points (2, 0), (0, 2) and (1, 1) on the line is zero. Find the coordinates of the point P. [**Hint:** Let the slope of the line be m. Then the equation of the line passing through the fixed point P ($x1$, $y1$) is $y - y1 = m(x - x1)$. Taking the algebraic sum of perpendicular distances equal to zero, we get $y - 1 = m(x - 1)$. Thus ($x1$, $y1$) is (1, 1).]
14. In what direction should a line be drawn through the point (1, 2) so that its point of intersection with the line $x + y = 4$ is at a distance $\frac{\sqrt{6}}{3}$ from the given point. Ans: 15° or 75°
15. A straight line moves so that the sum of the reciprocals of its intercepts made on axes is constant. Show that the line passes through a fixed point. [**Hint:** $\frac{x}{a} + \frac{y}{b} = 1$ where $\frac{1}{a} + \frac{1}{b} = k$, a constant . so $\frac{k}{a} + \frac{k}{b} = 1$ ⇒line passes through the fixed point (k, k).]
16. Find the equation of the line which passes through the point (– 4, 3) and the portion of the line intercepted between the axes is divided internally in the ratio 5 : 3 by this point. Ans : $9x - 20y + 96 = 0$
17. Find the equations of the lines through the point of intersection of the lines $x - y + 1 = 0$ and $2x - 3y + 5 = 0$ and whose distance from the point (3, 2) is 7/5. Ans: $3x - 4y + 6 = 0$ and $4x - 3y + 1 = 0$
18. If the sum of the distances of a moving point in a plane from the axes is 1, then find the locus of the point. [**Hint**: Given that $|x| + |y| = 1$, which gives four sides of a square.]
19. P1, P2 are points on either of the two lines $y - \sqrt{3}|x| = 2$ at a distance of 5 units from their point of intersection. Find the coordinates of the foot of perpendiculars drawn from P1, P2 on the bisector of the angle between the given lines.[**Hint**: Lines are $y = 3x + 2$ and $y = -3x + 2$ according as $x \geq 0$ or $x < 0$. y-axis is the bisector of the angles between the lines. P1, P2 are the points on these lines at a distance of 5 units from the point of intersection of these lines which have a point on y-axis as common foot of perpendiculars from these points. The y-coordinate of the foot of the perpendicular is given by 2 + 5 cos30°.]
20. If p is the length of perpendicular from the origin on the line $\frac{x}{a} + \frac{y}{b} = 1$ and a^2 , p^2, b^2 are in A.P., then show that $a^4 + b^4 = 0$.
21. A line cutting off intercept – 3 from the y-axis and the tangent of angle to the x- axis is 3/5 , its equation is.....

22. Slope of a line which cuts off intercepts of equal lengths on the axes is….
23. The equation of the straight line passing through the point (3, 2) and perpendicular to the line $y = x$ is…..
24. The equation of the line passing through the point (1, 2) and perpendicular to the line $x + y + 1 = 0$ is……
25. The tangent of angle between the lines whose intercepts on the axes are $a, -b$ and $b, -a$, respectively, is…………
26. If the line $\frac{x}{a} + \frac{y}{b} = 1$ passes through the points (2, –3) and (4, –5), then (a, b) is……
27. The equations of the lines which pass through the point (3, –2) and are inclined at 60° to the line $\sqrt{3}\, x + y = 1$ is…..
28. The equations of the lines passing through the point (1, 0) and at a distance $\frac{\sqrt{3}}{2}$ from the origin, are………
29. The distance between the lines $y = mx + c_1$ and $y = mx + c_2$ is…………
30. The coordinates of the foot of perpendiculars from the point (2, 3) on the line $y = 3x + 4$ is given by…………
31. If the coordinates of the mid point of the portion of a line intercepted between the coordinate axes is (3, 2), then the equation of the line will be……
32. Equations of diagonals of the square formed by the lines $x = 0$, $y = 0$, $x = 1$ and $y = 1$ are……………
33. For specifying a straight line, how many geometrical parameters should be known?
34. The point (4, 1) undergoes the following two successive transformations :
    (i) Reflection about the line $y = x$
    (ii) Translation through a distance 2 units along the positive x-axis.
    Then the final coordinates of the point are………..
35. A point equidistant from the lines $4x + 3y + 10 = 0$, $5x - 12y + 26 = 0$ and $7x + 24y - 50 = 0$ is
    (A) (1, –1) (B) (1, 1) (C) (0, 0) (D) (0, 1)
36. The ratio in which the line $3x + 4y + 2 = 0$ divides the distance between the lines $3x + 4y + 5 = 0$ and $3x + 4y - 5 = 0$ is (A) 1 : 2 (B) 3 : 7 (C) 2 : 3 (D) 2 : 5
37. One vertex of the equilateral triangle with centroid at the origin and one side as $x + y - 2 = 0$ is
    (A) (–1, –1) (B) (2, 2) (C) (–2, –2) (D) (2, –2)
    [**Hint**: Let ABC be the equilateral triangle with vertex A (h, k) and let D (α, β) be the point on BC. Then $(2\alpha + h)/3 = 0$ *and* $(2\beta + k)/3 = 0$ Also $\alpha + \beta - 2 = 0$ and $\{(k - 0)/(h - 0)\} \times (-1) = -1$].
38. If a, b, c are in A.P., then the straight lines $ax + by + c = 0$ will always pass through ____.
39. The line which cuts off equal intercept from the axes and pass through the point (1, –2) is ____.
40. Equations of the lines through the point (3, 2) and making an angle of 45° with the line $x - 2y = 3$ are ____.
41. The points (3, 4) and (2, – 6) are situated on the ____ of the line $3x - 4y - 8 = 0$.
42. A point moves so that square of its distance from the point (3, –2) is numerically equal to its distance from the line $5x - 12y = 3$. The equation of its locus is ____.
43. Locus of the mid-points of the portion of the line $x \sin\alpha + y \cos\alpha = p$ intercepted between the axes is ____.

State whether the statements are true or false. Justify.

44. If the vertices of a triangle have integral coordinates, then the triangle can not be equilateral.
45. The points A (– 2, 1), B (0, 5), C (– 1, 2) are collinear.
46. Equation of the line passing through the point $(a \cos^3\theta, a \sin^3\theta)$ and perpendicular to the line $x \sec\theta + y \operatorname{cosec}\theta = a$ is $x \cos\theta - y \sin\theta = a \sin 2\theta$.
47. The straight line $5x + 4y = 0$ passes through the point of intersection of the straight lines $x + 2y - 10 = 0$ and $2x + y + 5 = 0$.
48. The vertex of an equilateral triangle is (2, 3) and the equation of the opposite side is $x + y = 2$. Then the other two sides are $y - 3 = (2 \pm 3)(x - 2)$.
49. The equation of the line joining the point (3, 5) to the point of intersection of the lines $4x + y - 1 = 0$ and $7x - 3y - 35 = 0$ is equidistant from the points (0, 0) and (8, 34).
50. The lines $ax + 2y + 1 = 0$, $bx + 3y + 1 = 0$ and $cx + 4y + 1 = 0$ are concurrent if a, b, c are in G.P.
51. Line joining the points (3, – 4) and (– 2, 6) is perpendicular to the line joining the points (–3, 6) and (9, –18).
52. The line $\frac{x}{a} + \frac{y}{b} = 1$ moves in such a way that $\frac{1}{a^2} + \frac{1}{b^2} = \frac{1}{c^2}$, where c is a constant. The locus of the foot of the perpendicular from the origin on the given line is $x^2 + y^2 = c^2$.