Straight Lines

Summary

1. Distance Formula : $d=\sqrt{(x_1-x_2)^2+(y_1-y_2)^2}$

2. Section Formula : $x=\dfrac{mx_2\pm nx_1}{m\pm n};\ y=\dfrac{my_2\pm ny_1}{m\pm n}$

+ ve for internal division & - ve for external division.

3. Centroid, Incentre & Excentre:

Centroid G$\left(\dfrac{x_1+x_2+x_3}{3},\dfrac{y_1+y_2+y_3}{3}\right)$, Incentre I$\left(\dfrac{ax_1+bx_2+cx_3}{a+b+c},\dfrac{ay_1+by_2+cy_3}{a+b+c}\right)$

Excentre $I_1\left(\dfrac{-ax_1+bx_2+cx_3}{-a+b+c},\dfrac{-ay_1+by_2+cy_3}{-a+b+c}\right)$ and so on.

4. Area of a Triangle:

$$\Delta\ \text{ABC}=\frac{1}{2}\begin{vmatrix}x_1 & y_1 & 1\\ x_2 & y_2 & 1\\ x_3 & y_3 & 1\end{vmatrix}$$

$$\text{Area of polygon}=\frac{1}{2}\left(\begin{vmatrix}x_1 & x_2\\ y_1 & y_2\end{vmatrix}+\begin{vmatrix}x_2 & x_3\\ y_2 & y_3\end{vmatrix}+......+\begin{vmatrix}x_{n-1} & x_n\\ y_{n-1} & y_n\end{vmatrix}+\begin{vmatrix}x_n & x_1\\ y_n & y_1\end{vmatrix}\right)$$

5. Slope Formula:

(i) Line Joining two points $(x_1\ y_1)\&(x_2\ y_2), m=\dfrac{y_1-y_2}{x_1-x_2}$

(ii) Slope of line ax + by + c = 0 is $\dfrac{-\text{coff. of x}}{\text{coff. of y}}=\dfrac{-b}{a}$

6. Condition of collinearity of three points: $\begin{vmatrix}x_1 & y_1 & 1\\ x_2 & y_2 & 1\\ x_3 & y_3 & 1\end{vmatrix}=0$

7. Equation of a Straight Line in various forms:

(i) Point-Slope form : $y-y_1=m(x-x_1)$

(ii) Slope – Intercept form: $y=mx+c$

(iii) Two point form: $y-y_1=\dfrac{y_2-y_1}{x_2-x_1}(x-x_1)$

(iv) Determinant form: $\begin{vmatrix}x & y & 1\\ x_1 & y_1 & 1\\ x_2 & y_2 & 1\end{vmatrix}=0$

(v) Intercept form : $\frac{x}{a}+\frac{y}{b}=1$

(vi) Perpendicular/Normal form : $x\cos\alpha + y\sin\alpha = p$

(vii) Parametric form: $x = x_1 + r\cos\theta,\ \ y = y_1 + r\sin\theta$

(viii) symmetric form $\frac{x-x_1}{\cos\theta} = \frac{y-y_1}{\sin\theta} = r$

(ix) General Form : ax + by + c = 0, x – intercept = $-\frac{c}{a}$ y – intercept = $-\frac{c}{b}$

8. Angle between two straight lines in terms of their slopes: $\tan\theta = \left|\frac{m_1 - m_2}{1 + m_1 m_2}\right|$.

9. Parallel Lines : Two lines $ax + by + c = 0$ and $a'x + b'y + c' = 0$ are parallel if $\frac{a}{a'} = \frac{b}{b'} \neq \frac{c}{c'}$.

Thus any line parallel to $ax + by + c = 0$ is of the type $ax + by + k = 0$, where k is a parameter.

Distance between two parallel lines = $\left|\frac{c_1 - c_2}{\sqrt{a^2 + b^2}}\right|$.

10. Perpendicular Lines:

Two lines ax + by + c = 0 and $a'x + b'y + c' = 0$ are perpendicular if $aa' + bb' = 0$.

11. Position of the points (x_1, y_1) and (x_2, y_2) relative of the line ax + by + c = 0 :

In general two points (x_1, y_1) and (x_2, y_2) will lie on same side or opposite side of ax + by + c = 0 according as $ax_1 + by_1 + c$ and $ax_2 + by_2 + c$ are of same or opposite sign respectively.

12. The ratio in which a given line divides the line segment joining two points:

ratio $m : n$ is given by $\frac{m}{n} = -\frac{ax_1 + by_1 + c}{ax_2 + by_2 + c}$

13. Length of perpendicular from a point on a line: $\left|\frac{ax_1 + by_1 + c}{\sqrt{a^2 + b^2}}\right|$

14. Reflection of a point about a line:

(i) Foot of the perpendicular from a point on the line is $\frac{x - x_1}{a} = \frac{y - y_1}{b} = -\frac{ax_1 + by_1 + c}{a^2 + b^2}$

(ii) image of (x_1, y_1) in the line $ax + by + c = 0$ is $\frac{x - x_1}{a} = \frac{y - y_1}{b} = -2\frac{ax_1 + by_1 + c}{a^2 + b^2}$.

15. Bisectors of the angles between two lines: $\frac{ax + by + c}{\sqrt{a^2 + b^2}} = \pm\frac{a'x + b'y + c'}{\sqrt{a'^2 + b'^2}}$

16. Methods to discriminate between the acute angle bisector & the obtuse angle bisector:

If $aa' + bb' < 0,\ cc' > 0$, then the equation of the bisector of acute angle is

$$\frac{ax+by+c}{\sqrt{a^2+b^2}}=+\frac{a'x+b'y+c'}{\sqrt{a'^2+b'^2}}$$

If $aa'+bb'>0,\ cc'>0$, then the equation of the bisector of obtuse angle is

$$\frac{ax+by+c}{\sqrt{a^2+b^2}}=+\frac{a'x+b'y+c'}{\sqrt{a'^2+b'^2}}$$

17. Discriminate between the bisector of the angle containing a point:

To discriminate between the bisector of the angle containing the origin & that of the angle not containing
the origin. Rewrite the equations, $ax+by+c=0$ & $a'x+b'y+c'=0$ such that the constant terms c,c' are positive. Then ; $\frac{ax+by+c}{\sqrt{a^2+b^2}}=+\frac{a'x+b'y+c'}{\sqrt{a'^2+b'^2}}$ gives the equation of the bisector of the angle containing the origin & $\frac{ax+by+c}{\sqrt{a^2+b^2}}=-\frac{a'x+b'y+c'}{\sqrt{a'^2+b'^2}}$ gives the equation of the bisector of the angle not containing the origin. In general equation of the bisector which contains the point (α,β) is

$\frac{ax+by+c}{\sqrt{a^2+b^2}}=\frac{a'x+b'y+c'}{\sqrt{a'^2+b'^2}}$ or $\frac{ax+by+c}{\sqrt{a^2+b^2}}=-\frac{a'x+b'y+c'}{\sqrt{a'^2+b'^2}}$ according as $a\alpha+b\beta+c$ and $a'\alpha+b'\beta+c'$ having same sign or otherwise.

18. Condition of Concurrency: of three straight lines $a_ix+b_iy+c_i=0,\ i=1,2,3$ is

$$\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}=0.$$

19. Family Of Straight Lines:

The equation of a family of straight lines passing through the point of intersection of the lines, $L_1\equiv a_1x+b_1y+c_1=0$ & $L_2\equiv a_2x+b_2y+c_2=0$ is given by $L_1+kL_2=0$

20. A Pair of straight lines through origin: $ax^2 + 2hxy + by^2 = 0$

If θ is the cute angle between the pair of straight lines, then tan θ = $\left|\frac{2\sqrt{h^2-ab}}{a+b}\right|$.

21. General equation of second degree representing a pair of Straight lines:

$ax^2+2hxy+by^2+2gx+2fy+c=0$ represents a pair of straight lines if :

$abc+2fgh-af^2-bg^2-ch^2=0$, i.e. if $\begin{vmatrix} a & h & g \\ h & b & f \\ g & f & c \end{vmatrix}=0$.

Straight Lines

Practice Questions

1. A straight line through a fixed point (2, 3) intersects the coordinate axes at distinct points P and Q. If O is the origin and the rectangle OPRQ is completed, then the locus of R is: (2018)

(a) $3x + 2y = 6xy$

(b) $3x + 2y = 6$

(c) $2x + 3y = xy$

(d) $3x + 2y = xy$

2. In a triangle ABC, coordinates of A are (1, 2) and the equations of the medians through B and C are respectively, $x + y = 5$ and $x = 4$. Then area of ΔABC (in sq. units) is: (2018)

(a) 4

(b) 5

(c) 9

(d) 12

3. The locus of the point of intersection of the lines, $\sqrt{2}x - y + 4\sqrt{2}k = 0$ and $\sqrt{2}kx + ky - 4\sqrt{2}k = 0$ (k is any non-zero real parameter), is: (2018)

(a) an ellipse whose eccentricity is $\frac{1}{\sqrt{3}}$.

(b) an ellipse with length of its major axis $8\sqrt{2}$.

(c) a hyperbola whose eccentricity is $\sqrt{3}$.

(d) a hyperbola with length of its transverse axis $8\sqrt{2}$.

4. Let k be an integer such that the triangle with vertices $(k, -3k)$, $(5, k)$ and $(-k, 2)$ has area 28 sq units. Then, the orthocenter of this triangle is at the point (2017)

(a) $\left(2, -\frac{1}{2}\right)$

(b) $\left(1, \frac{3}{4}\right)$

(c) $\left(1, -\frac{3}{4}\right)$

(d) $\left(2, \frac{1}{2}\right)$

5. Let a, b, c and d be non-zero numbers. If the point of intersection of the lines $4ax + 2ay + c = 0$ and $5bx + 2by + d = 0$ lies in the fourth quadrant and is equidistant from the two axes, then (2014)

(a) $2bc - 3ad = 0$

(b) $2bc + 3ad = 0$

(c) $2ad - 3bc = 0$
(d) $3bc + 2ad = 0$

6. If PS is the median of the triangle with vertices P (2, 2), Q (6, –1) and R (7, 3), then equation of the line passing through (1, –1) and parallel to PS is (2014)
(a) $4x - 7y - 11 = 0$
(b) $2x + 9y + 7 = 0$
(c) $4x + 7y + 3 = 0$
(d) $2x - 9y - 11 = 0$

7. The *x*-coordinate of the in center of the triangle that has the coordinates of mid-points of its sides as (0, 1), (1, 1) and (1, 0) is (2013)
(a) $2 + \sqrt{2}$
(b) $2 - \sqrt{2}$
(c) $1 + \sqrt{2}$
(d) $1 - \sqrt{2}$

8. A straight line L through the point (3, –2) is inclined at an angle 60° to the line $\sqrt{3}x + y = 1$. If L also intersects the X-axis, then the equation of L is (2011)
(a) $y + \sqrt{3}x + 2 - 3\sqrt{3} = 0$
(b) $y - \sqrt{3}x + 2 + 3\sqrt{3} = 0$
(c) $\sqrt{3}y - x + 3 + 2\sqrt{3} = 0$
(d) $\sqrt{3}y + x - 3 + 2\sqrt{3} = 0$

9. The locus of the orthocenter of the triangle formed by the lines $(1 + p)x - py + p(1 + p) = 0$, $(1 + q)x - qy + q(1 + q) = 0$ and $y = 0$, where $p \neq q$, is (2009)
(a) a hyperbola
(b) a parabola
(c) an ellipse
(d) a straight line

10. Let O (0, 0), P (3, 4) and Q (6, 0) be the vertices of a Δ OPQ. The point R inside the Δ OPQ is such that the triangles OPR, PQR and OQR are of equal area. The coordinates of R are (2007)
(a) $\left(\frac{4}{3}, 3\right)$

(b) $\left(3, \frac{2}{3}\right)$
(c) $\left(3, \frac{4}{3}\right)$
(d) $\left(\frac{4}{3}, \frac{2}{3}\right)$

11. Orthocenter of triangle with vertices (0, 0), (3, 4) and (4, 0) is (2003)

(a) $\left(3, \frac{5}{4}\right)$
(b) (3, 12)
(c) $\left(3, \frac{3}{4}\right)$
(d) (3, 9)

12. The number of integer values of *m*, for which the *x*-coordinate of the point of intersection of the lines $3x + 4y = 9$ and $y = mx + 1$ is also an integer, is (2001)
(a) 2
(b) 0
(c) 4
(d) 1

13. A straight line through the origin O meets the parallel lines $4x + 2y = 9$ and $2x + y + 6 = 0$ at points P and Q respectively. Then, the point O divides the segment PQ in the ratio (2000)
(a) 1 : 2
(b) 3 : 4
(c) 2 : 1
(d) 4 : 3

14. The incentre of the triangle with vertices $\left(1, \sqrt{3}\right)$, (0, 0) and (2, 0) is (2000)

(a) $\left(1, \frac{\sqrt{3}}{2}\right)$

(b) $\left(\frac{2}{3}, \frac{1}{\sqrt{3}}\right)$
(c) $\left(\frac{2}{3}, \frac{\sqrt{3}}{2}\right)$
(d) $\left(1, \frac{1}{\sqrt{3}}\right)$

15. If A_0, A_1, A_2, A_3, A_4 and A_5 be a regular hexagon inscribed in a circle of unit radius. Then, the product of the lengths of the line segments A_0A_1, A_0A_2 and A_0A_4 is (1998)
(a) 3/4
(b) $3\sqrt{3}$
(c) 3
(d) $\frac{3\sqrt{3}}{2}$

16. If the vertices P, Q, R of a Δ PQR are rational points, which of the following points of the Δ PQR is/are always rational point(s) (1998)
(A rational point is a point both of whose coordinates are rational numbers)
(a) centroid
(b) incentre
(c) circumcentre
(d) orthocentre

17. If P (1, 2), Q (4, 6), R (5, 7) and S (a, b) are the vertices of a parallelogram PQRS, then (1998)
(a) a = 2, b = 4
(b) a = 3, b = 4
(c) a = 2, b = 3
(d) a = 3, b = 5

18. The diagonals of a parallelogram PQRS are along the lines x + 3y = 4 and 6x – 2y = 7. Then, PQRS must be a (1998)
(a) rectangle
(b) square
(c) cyclic quadrilateral
(d) rhombus

19. The graph of the function $\cos x \cos (x + 2) - \cos^2 (x + 1)$ is (1997)
(a) a straight line passing through $(0, -\sin^2 1)$ with slope 2
(b) a straight line passing through (0, 0)
(c) a parabola with vertex $(1, -\sin^2 1)$

(d) a straight line passing through the point $\left(\frac{\pi}{2}, -\sin^2 1\right)$ and parallel to the X-axis

20. The orthocenter of the triangle formed by the lines xy = 0 and x + y = 1, is (1995)
(a) $\left(\frac{1}{2}, \frac{1}{2}\right)$
(b) $\left(\frac{1}{3}, \frac{1}{3}\right)$
(c) (0, 0)
(d) $\left(\frac{1}{4}, \frac{1}{4}\right)$

21. If the sum of the distance of a point from two perpendicular lines in a plane is 1, then its locus is (1992)
(a) square
(b) circle
(c) straight line
(d) two intersecting lines

22. Line L has intercepts a and b on the coordinate axes. When, the axes are rotated through a given angle, keeping the origin fixed, the same line L has intercepts p and q, then (1990)
(a) $a^2 + b^2 = p^2 + q^2$
(b) $\frac{1}{a^2} + \frac{1}{b^2} = \frac{1}{p^2} + \frac{1}{q^2}$
(c) $a^2 + p^2 = b^2 + q^2$
(d) $\frac{1}{a^2} + \frac{1}{p^2} = \frac{1}{b^2} + \frac{1}{q^2}$

23. If P = (1, 0), Q = (-1, 0) and R = (2, 0) are three given points, then locus of the points satisfying the relation $SQ^2 + SR^2 = 2\ SP^2$, is (1988)
(a) a straight line parallel to X-axis
(b) a circle passing through the origin
(c) a circle with the centre at the origin
(d) a straight line parallel to Y-axis

24. The point (4, 1) undergoes the following three transformations successively
I. Reflection about the line y = x.
II. Transformation through a distance 2 units along the positive direction of X-axis.

III. Rotation through an angle $\frac{\pi}{4}$ about the origin in the counter clockwise direction.

Then, the final position of the point is given by the coordinates (1980)

(a) $\left(\frac{1}{\sqrt{2}}, \frac{7}{\sqrt{2}}\right)$

(b) $\left(-\sqrt{2}, 7\sqrt{2}\right)$

(c) $\left(-\frac{1}{\sqrt{2}}, \frac{7}{\sqrt{2}}\right)$

(d) $\left(\sqrt{2}, 7\sqrt{2}\right)$

25. The points (–a, b), (0, 0), (a, b) and (a^2, a^3) are (1979)

(a) collinear
(b) vertices of a rectangle
(c) vertices of a parallelogram
(d) None of the above

26. A ray of light along $x+\sqrt{3}y=\sqrt{3}$ gets reflected upon reaching X-axis, the equation of the reflected ray is (2013)

(a) $y = x+\sqrt{3}$

(b) $\sqrt{3}y = x-\sqrt{3}$

(c) $y=\sqrt{3}x-\sqrt{3}$

(d) $\sqrt{3}y = x-1$

27. Consider three points $P=\{-\sin(\beta-\alpha)-\cos\beta\}$, $Q=\{\cos(\beta-\alpha),\sin\beta\}$ and $R=\{\cos(\beta-\alpha+\theta)\sin(\beta-\theta)\}$, where $0<\alpha,\beta,\theta<\frac{\pi}{4}$. Then, (2008)

(a) P lies on the line segment RQ
(b) Q lies on the line segment PR
(c) R lies on the line segment QP
(d) P, Q, R are non-colinear

28. Let $P=(-1,0)$ and $Q=(0,0)$ and $R=\left(3,3\sqrt{3}\right)$ be three point. Then, the equation of the bisector of the angle PQR is (2001)

(a) $\frac{\sqrt{3}}{2}x+y=0$

(b) $x+\sqrt{3}y=0$

(c) $\sqrt{3}x+y=0$

(d) $x+\frac{\sqrt{3}}{2}y=0$

29. Two sides of a rhombus are along the lines, x – y + 1 = 0 and 7x – y – 5 = 0. If its diagonals intersect at (– 1, – 2), then which one of the following is a vertex of this rhombus? (2016)

(a) (–3, –9)
(b) (–3, –8)
(c) $\left(\frac{1}{3},-\frac{8}{9}\right)$
(d) $\left(-\frac{10}{3},-\frac{7}{3}\right)$

30. Area of the parallelogram formed by the lines y = mx, y = mx + 1, y = nx and y = nx + 1 equals (2001)

(a) $\frac{|m+n|}{(m-n)^2}$
(b) $\frac{2}{|m+n|}$
(c) $\frac{1}{|m+n|}$
(d) $\frac{1}{|m-n|}$

31. The points $\left(0,\frac{8}{3}\right)$, (1,3) and (82, 30) are vertices of (1986)

(a) an obtuse angled triangle
(b) an acute angled triangle
(c) a right angled triangle
(d) None of the above

32. The straight lines x + y = 0, 3x + y – 4 = 0, x + 3y – 4 = 0 form a triangle which is (1983)

(a) isosceles
(b) equilateral
(c) right angled
(d) None of the above

33. Given the four lines with the equations
$x+2y-3=0, 3x+4y-7=0,$
$2x+3y-4=0, 4x+5y-6=0,$ then
(a) they are all concurrent
(b) they are the sides of a quadrilateral
(c) only three lines are concurrent
(d) none of the above

34. Let *a* and *b* be non-zero and real numbers. Then, the equation
$\left(ax^2+by^2+c\right)\left(x^2-5xy+6y^2\right)=0$ represents (2008)
(a) four straight lines, when $c = 0$ and *a*, *b* are of the same sign
(b) two straight lines and a circle, when $a = b$ and *c* is of sign opposite to that of *a*
(c) two straight lines and a hyperbola, when *a* and *b* are of the same sign and *c* is of sign opposite to that of *a*
(d) a circle and an ellipse, when *a* and *b* are of the same sign and *c* is of sign opposite to that of *a*

35. Area of triangle formed by the lines x + y = 3 and angle bisectors of the pair of straight lines $x^2 – y^2 + 2y = 1$ is (2004)
(a) 2 sq units
(b) 4 sq units
(c) 6 sq units
(d) 8 sq units

36. Let PQR be a right angles isosceles triangle, right angled at P (2, 1). If the equation of the line QR is 2x + y = 3, then the equation representing the pair of lines PQ and PR is (1999)
(a) $3x^2 – 3y^2 + 8xy + 20x + 10y + 25 = 0$
(b) $3x^2 – 3y^2 + 8xy – 20x – 10y + 25 = 0$
(c) $3x^2 – 3y^2 + 8xy + 10x + 15y + 20 = 0$
(d) $3x^2 – 3y^2 – 8xy – 10x – 15y – 20 = 0$

37. If two curves whose equations are $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ and $a'x^2 + 2h'xy + b'y^2 + 2g'x + 2f'y + c' = 0$ intersect in four concyclic points, then:
(a) $\frac{a-a'}{h}=\frac{b-b'}{h'}$
(b) $\frac{a-b}{h}=\frac{a'-b'}{h'}$

(c) $\frac{a-b}{h'}=\frac{a'-b'}{h}$

(d) $\frac{a-b}{hgf}=\frac{a'-b'}{h'g'f'}$

38. If a straight line through the point P (3, 5) makes an angle $\frac{\pi}{6}$ with x-axis and meets the lines 2x + y + 5 = 0 & 3x – 2y + 7 = 0 at Q & R then $\frac{PQ}{PR}=$

(a) $\frac{3\sqrt{3}-2}{2\sqrt{3}+1}$

(b) $\frac{3\sqrt{3}+1}{3\sqrt{3}-2}$

(c) $\frac{2\left(12\sqrt{3}-8\right)}{6\sqrt{3}+3}$

(d) $\frac{6\sqrt{3}+3}{\left(12\sqrt{3}-8\right)}$

39. The equations of two equal sides AB & AC of an isosceles ΔABC are x + y = 5 & 7x – y = 3 respectively, the equation of the side BC if ar ΔABC is 5 units is

(a) 3x + y + 2 = 0

(b) 3x + y + 12 = 0

(c) x – 3y + 1 = 0

(d) x + 3y + 20 = 0

40. A triangle is formed by joining three points A (8, 2), B (– 4, – 4) and C (16, 1) on rectangular hyperbola xy = 16. If orthocenter of the triangle ABC is (h, k) then product hk is equal to

(a) 4

(b) 8

(c) 16

(d) 32

41. The triangle with vertex (1, 5), (– 3, 1) & (– 2, 1) is

(a) isosceles triangle
(b) equilateral triangle
(c) right angle triangle
(d) None of these

42. In which ratio x-axis divides the line segment joining (1, 2) & (2, 3)
(a) 3 : 2
(b) 2 : 3
(c) – 3 : 2
(d) – 2 : 3

43. Harmonic conjugate of (0, 0) wrt to (– 1, 0) and (2, 0) is
(a) (4, 0)
(b) (– 4, 0)
(c) (3, 0)
(d) (– 3, 0)

44. If $A(\cos\theta_1, \sin\theta_1), B(\cos\theta_2, \sin\theta_2) \& C(\cos\theta_3, \sin\theta_3)$, then orthocenter of ΔABC is
(a) $\left(\frac{\sum\cos\theta_1}{2}, \frac{\sum\sin\theta_1}{2}\right)$
(b) $\left(\frac{\sum\cos\theta_1}{3}, \frac{\sum\sin\theta_1}{3}\right)$
(c) $\left(\sum\cos\theta_1, \sum\sin\theta_1\right)$
(d) Data insufficient

45. Equation of median through vertex B of ΔABC where A (0, 0), B (0, 1) & C (1, 0) is
(a) y + 2x = 1
(b) 2y + 2x = 1
(c) x + y = 1
(d) 3x + 2y = 2
46. Normal form of line x + y + 1 = 0 is
(a) x cos (45°) + y sin (135°) + $\frac{1}{\sqrt{2}}$ = 0
(b) x cos (45°) + y sin (45°) = $\frac{1}{\sqrt{2}}$
(c) x cos (225°) + y sin (225°) = $\frac{1}{\sqrt{2}}$

(d) x cos (45°) + y sin (45°) + $\frac{1}{\sqrt{2}}$ = 0

47. If in a ΔABC, B is the orthocenter and if circumcenter of ΔABC is (2, 4) and vertex A is (0, 0) then coordinate of vertex C is
(a) (4, 2)
(b) (4, 8)
(c) (8, 4)
(d) (8, 2)

48. The equation of line passing through origin & at an angle of 30° with y = $\frac{1}{\sqrt{3}}$ x + 1
(a) $y-\sqrt{3}x$
(b) $\sqrt{3}y=x$
(c) $-\sqrt{3}y=x$
(d) $y=\sqrt{3}x$

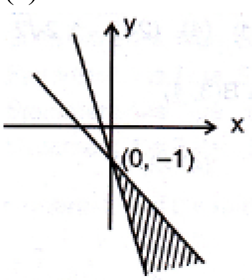
49. If $y=\sqrt{3}x+1$ is a angle bisector of L_1 & L_2 & if L_1 is $y=\frac{x}{\sqrt{3}}+1$ then equation of L_2 is
(a) x = 0
(b) y = 0
(c) x = 1
(d) y = 1

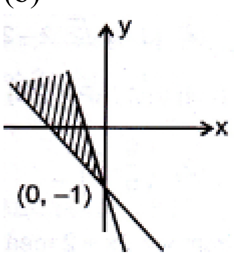
50. Area of square having two sides y = x + 1 and y = x + 2 is
(a) $\frac{1}{2}$
(b) 1
(c) 2
(d) 4

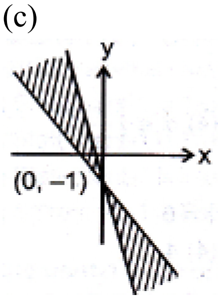
51. Area of polygon having sides y – x – 1 = 0, 2y – 2x + 2 = 0, y – 2x – 2 = 0 and 3y – 6x – 9 = 0
(a) $\frac{1}{4}$
(b) $\frac{1}{2}$
(c) 4
(d) 2

52. If area of Δ ABC 5 sq. unit where A (1, 1), B (2, 2) and C lies on y = 2x then co-ordinate of C can be
(a) (-10, -20)
(b) (-10, 20)
(c) (10, -20)
(d) (20, 10)

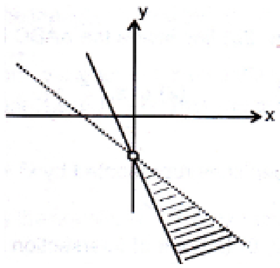
53. Area of pentagon formed by (1, 2), (2, -1), (-2, -1), (2, 1) and (-1, 2)
(a) 20
(b) 15
(c) 5
(d) 10

54. Area included by $y + x + 1 < 0$ and $y + 2x + 1 \geq 0$ is
(a)


(b)


(c)


(d)



55. Point on line x + y = 4 which is at a unit distance from the line 4x + 3y – 11 = 0 is
(a) (4, 0)
(b) (0, 4)
(c) (-6, 10)
(d) (10, -8)

56. Mirror image of (-3, 5) in line mirror x – y + 2 = 0
(a) (-1, 3)
(b) (1, 3)
(c) (3, -1)
(d) (3, 1)

57. If x + y + 1 = 0 and x + 2y + 1 = 0 are angle bisector of lines L_1 and L_2 and point (0, 0) lies on L_1, then acute angle bisector of L_1 and L_2 is
(a) x + y – 1 = 0
(b) x + y + 1 = 0
(c) x + 2y + 1 = 0
(d) data insufficient

58. Bisector of angle between x + 2y – 1 = 0 and 2x + y + 1 = 0 containing (2, 1) is
(a) x + y = 0
(b) x – y + 1 =0
(c) x + y + 2 = 0
(d) x – y + 2 = 0

59. Point where all lines of family x (a + 2b) + y (a + 3b) = a + b are concurrent is
(a) (2, 1)
(b) (2, -1)
(c) (1, 2)
(d) (1, -2)

60. Equation of line passing through point of intersection of $x + y + 2 = 0$ and $x - y + 4 = 0$ and having x-intercept = 0

(a) $x + 3y = 2$

(b) $3x + y = 0$

(c) $2x + y + 5 = 0$

(d) $x + 3y = 0$

61. If the slope of one line is double the other in line pair $x^2 + 6xy + by^2 = 0$, then b = ?

(a) 2

(b) 4

(c) 6

(d) 8

62. Equation of line pair perpendicular to $ax^2 + by^2 + 2hxy = 0$

(a) $ax^2 + 2hxy - by^2 = 0$

(b) $ax^2 - 2hxy + by^2 = 0$

(c) $bx^2 - 2hxy + ay^2 = 0$

(d) $bx^2 + 2hxy + 2y^2 = 0$

63. The sum of square of distances of a point from axes is 4 then its locus is

(a) $\sqrt{x^2 + y^2} = 14$

(b) $\sqrt{x^2 + y^2} = 12$

(c) $x^2 + y^2 = 4$

(d) $x^2 + y^2 = 16$

64. The point A (2, 1) is translated parallel to the line $x - y = 3$ by a distance 4 units. If its new position A' is in third quadrant, then the co-ordinates of A' are

(a) $\left(2 - 2\sqrt{2}, 1 - 2\sqrt{2}\right)$

(b) $\left(2 + 2\sqrt{2}, 2 - 2\sqrt{2}\right)$

(c) $\left(-2 + 2\sqrt{2}, 2\sqrt{2} + 1\right)$

(d) $\left(2\sqrt{2} - 1, 2\sqrt{2} + 2\right)$

65. Find point P on x-axis such that (AP + PB) is minimum where A (1, 1) & B (3, 4)

(a) $\left(\frac{7}{5},0\right)$

(b) $\left(\frac{9}{5},0\right)$

(c) $\left(\frac{6}{5},0\right)$

(d) (2, 0)

66. The distance of (0, 0) from y = 2x + 2 measured along y = x

(a) 1

(b) $\sqrt{2}$

(c) 2

(d) $\frac{1}{2}$

67. Values of α if (α, 2α) lies inside the Δ ABC if A (0, 2), B (2, 0) and C (4, 4)

(a) $\alpha \in \left(\frac{1}{3},\frac{2}{3}\right)$

(b) $\alpha \in \left(\frac{2}{3},1\right)$

(c) $\alpha \in \left(\frac{2}{3},\frac{4}{3}\right)$

(d) $\alpha \in \left(\frac{1}{3},1\right)$

68. Distance between lines represented by $x^2 + 2\sqrt{2}xy + 2y^2 + 4x + 4\sqrt{2}y + 1 = 0$

(a) 1

(b) 2

(c) 3

(d) 4

69. If line joining (0, 0) to point of intersection of $5x^2 + 12xy - 6y^2 + 4x - 2y + 3 = 0$ and $x + ky - 1 = 0$ are equally inclined with axis then k = ?
(a) 0
(b) 1
(c) – 1
(d) – 2

70. A variable line passing through fixed point (a, b) intersect the coordinate axes at A and B if O is origin, then locus of centroid of the triangle OAB is
(a) $bx + ay - 3xy = 0$
(b) $bx + ay - 2xy = 0$
(c) $ax + by - 3xy = 0$
(d) $ax + by - 2xy = 0$

71. On the portion of the straight line $x + 2y = 4$ intercepted between the axes, a square is constructed on the side of the line away from the origin. Then the point of intersection of its diagonals has co-ordinates:
(a) (2, 3)
(b) (3, 2)
(c) (3, 3)
(d) none

72. If $P\left(1+\frac{t}{\sqrt{2}}, 2+\frac{t}{\sqrt{2}}\right)$ be any point on a line, then the range of values of *t* for which the point P lies between the parallel lines $x + 2y = 1$ and $2x + 4y = 15$ is
(a) $-\frac{4\sqrt{2}}{3} < t < \frac{5\sqrt{2}}{6}$
(b) $0 < t < \frac{5\sqrt{2}}{6}$
(c) $-\frac{4\sqrt{2}}{5} < t < 0$
(d) none of these

73. If vertices of Δ are (8, - 2), (2, - 2) & (8, 6), then find its orthocenter
(a) (8, - 2)
(b) (8, 6)
(c) (2, 2)
(d) (-2, 2)

74. Statement-1: There is only one circle passing through (-3, 4), (2, 1) & (7, -2)
Statement-2: Equation $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ represent a circle if $\Delta \neq 0$, $a = b \neq 0$ and $h = 0$.
(a) Statement-1 is true, statement-2 is true; statement-2 is correct explanation for statement-1.
(b) Statement-1 is true, statement-2 is true; statement-2 is not a correct explanation for statement-1.
(c) Statement-1 is true, statement-2 is false.
(d) Statement-1 is false, statement-2 is true.

75. Statement-1: Area of Δ ABC where A (20, 22), B (21, 24), C (22, 23) and area of Δ PQR where P (0, 0), Q (1, 2), R (2, 1) is equal
Statement-2: The area of Δ be constant with respect to parallel transformation of co-ordinate axes.
(a) Statement-1 is true, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
(b) Statement-1 is true, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1
(c) Statement-1 is True, Statement-2 is False
(d) Statement-1 is False, Statement-2 is True
76. Statement-1: If the middle point of the sides of a Δ ABC are (0, 0), (1, 2), (- 3, 4) then centroid of Δ ABC is $\left(\frac{-2}{3}, 2\right)$
Statement-2: Centroid of a Δ ABC and centroid of the triangle formed by joining the mid points of sides of Δ ABC be always same
(a) Statement-1 is true, Statement-2 is true; Statement-2 is a correct explanation for Statement-1.
(b) Statement-1 is true, Statement-2 is true; Statement-2 is NOT a correct explanation for Statement-1
(c) Statement-1 is true, Statement-2 is False
(d) Statement-1 is False, Statement-2 is True

77. Statement-1: Two of the straight lines represented by the equation $ax^3 + bx^2y + cxy^2 + dy^3 = 0$ will be at right angle if $a^2 + ac + bd + d^2 = 0$
Statement-2: If roots of equation $px^3 + qx^2 + rx + s = 0$ are α, β, and γ, then $\alpha\beta\gamma = - s/p$.
(a) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
(b) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1
(c) Statement-1 is True, Statement-2 is False
(d) Statement-1 is False, Statement-2 is True

78. Statement-1: The diagonals of the quadrilateral whose sides are 3x + 2y + 1 = 0, 3x + 2y + 2 = 0, 2x + 3y + 1 = 0 and 2x + 3y + 2 = 0 include an angle $\pi/2$.
Statement-2: Diagonals of a parallelogram bisect each other.
(a) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
(b) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1
(c) Statement-1 is True, Statement-2 is False
(d) Statement-1 is False, Statement-2 is True

79. Statement-1: Each point on the line y – x + 12 = 0 is at same distance from the lines 3x + 4y – 12 = 0 and 4x + 3y – 12 = 0
Statement-2: Locus of point which is at equal distance from the two given intersecting lines is the angle bisectors of the two lines.
(a) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
(b) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1
(c) Statement-1 is True, Statement-2 is False
(d) Statement-1 is False, Statement-2 is True

80. Statement-1: Area of triangles formed by the line which is passing through the point (5, 6) such that segment of the line between axes is bisected at the point, with coordinates axes is 60 sq. units.
Statement-2: Area of triangle formed by the line passing through point (α, β), with axes is maximum when point (α, β) is mid-point of segment of line between axes.
(a) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
(b) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1
(c) Statement-1 is True, Statement-2 is False
(d) Statement-1 is False, Statement-2 is True

81. Point Q is symmetric to P (4, – 1) with respect to the bisector of the first quadrant. Then, length of PQ, is (2009)
(a) $3\sqrt{2}$
(b) $5\sqrt{2}$
(c) $7\sqrt{2}$

(d) $9\sqrt{2}$

82. The number of integer values of m, for which the x-coordinate of the point of intersection of the lines 3x + 4y = 9 and y = mx + 1 is also an integer, is (2001)
(a) 2
(b) 0
(c) 4
(d) 1

83. The circumcenter of the triangle formed by the lines xy + 2x + 2y + 4 = 0 and x + y + 2 = 0, is (2005)
(a) (– 1, – 1)
(b) (0, – 1)
(c) (1, 1)
(d) (– 1, 0)

84. A straight line through the origin meets the parallel lines 4x + 2y = 9 and 2x + y + 6 = 0 at point P and Q respectively. Then, the point O divides the segment PQ in the ratio (2002)
(a) 1 : 2
(b) 3 : 4
(c) 2 : 1
(d) 4 : 3

85. The point (3, 2) is reflected in the y-axis and then moved a distance of 5 units towards the negative side of y-axis. The coordinates of the point thus obtained are (1997)
(a) (3, – 3)
(b) (– 3, 3)
(c) (3, 3)
(d) (– 3, – 3)

86. If non-zero numbers a, b, c are in H.P., then the straight line $\frac{x}{a}+\frac{y}{b}+\frac{1}{c}=0$ always passes through a fixed point. That point is (2005)
(a) (1, – 1 /2)
(b) (1, – 2)
(c) (–1, –2)
(d) (–1, 2)

87. The line parallel to the x-axis and passing through the intersection of the lines $ax + 2by + 3b = 0$ and $bx - 2ay - 3a = 0$, where $(a, b) \neq (0, 0)$ is (2005)

(a) above the x-axis at a distance of 2/3 from it

(b) above the x-axis at a distance of 3/2 from it

(c) below the x-axis at a distance of 2/3 from it

(d) below the x-axis at a distance of 3/2 from it

88. If the point (a, a) falls between the lines $|x + y| = 2$, then (2007)

(a) $|a| = 2$

(b) $|a| = 1$

(c) $|a| < 1$

(d) $|a| < \frac{1}{2}$

89. The bisector of the acute angle formed between the lines $4x - 3y + 7 = 0$ and $3x - 4y + 14 = 0$ has the equation (2008)

(a) $x + y + 3 = 0$

(b) $x - y - 3 = 0$

(c) $x - y + 3 = 0$

(d) $3x + y - 7 = 0$

90. The number of integral points (integral point means both the coordinates should be integer) exactly in the interior of the triangle with vertices (0, 0), (0, 21) and (21, 0) is (2003)

(a) 133

(b) 190

(c) 233

(d) 105

91. If the pair of lines $ax^2 + 2(a + b)xy + by^2 = 0$ lie along diameters of a circle and divide the circle into four sectors such that the area of one of the sectors is thrice the area of the another sector, then (2005)

(a) $3a^2 + 2ab + 3b^2 = 0$

(b) $3as + 10ab + 3b^2 = 0$

(c) $3a^2 - 2ab + 3b^2 = 0$

(d) $3a^2 - 10ab + 3b^2 = 0$

92. The area (in square units) of the quadrilateral formed by two pair of the lines
$l^2x^2 - m^2y^2 - n(lx + my) = 0$ and $l^2x^2 - m^2y^2 + n(lx - my) = 0$ is (2003)

(a) $\frac{n^2}{2|lm|}$

(b) $\frac{n^2}{|lm|}$

(c) $\frac{n}{|lm|}$

(d) $\frac{n^2}{4|lm|}$

93. The equation $4x^2 - 24xy + 11y^2 = 0$ represents (2003)
(a) two parallel lines
(b) two perpendicular lines
(c) two lines through the origin
(d) a circle

94. Area of the triangle formed by the line $x + y = 3$ and angle bisectors of the pair of straight lines $x^2 - y^2 + 2y = 1$ (2004)
(a) 2 sq. units
(b) 4 sq. units
(c) 6 sq. units
(d) 8 sq. units

95. If one of the lines given by $6x^2 - xy + 4cy^2 = 0$ is $3x + 4y = 0$, then c equals (2004)
(a) – 3
(b) – 1
(c) 3
(d) 1

96. If the pair of lines represented by $ax^2 + 2hxy + by^2 + 2fy + c = 0$ intersect on y-axis, then (2002)
(a) $2fgh = bg^2 + ch^2$
(b) $bg^2 + ch^2 = fgh$
(c) $abc = 2\ fgh$
(d) none of these

97. The gradient of one of the lines given by $ax^2 + 2hxy + by^2 = 0$. Then, (2001)
(a) $h^2 = ab$
(b) $h = a + b$

(c) $8h^2 = 9ab$
(d) $9h^2 = 8ab$

98. If the gradient of one of the lines given by $x^2 + hxy + 2y^2 = 0$ is twice that of the other, then h = (1995)
(a) ± 2
(b) ± 3
(c) ± 1
(d) ± 3/2

99. The set of values of h for which the equation $4x^2 + hxy – 3y^2 = 0$ represents a pair of real and distinct lines is
(a) R
(b) (3, 4)
(c) (-3, 4)
(d) (4, ∞)

100. If one of the lines of $my^2 + (1 – m^2) xy – mx^2 = 0$ is a bisector of the angle between the lines xy = 0, then m is (2007)
(a) 1
(b) 2
(c) – ½
(d) – 2

Answer

1. (d)	2. (c)	3. (a)	4. (d)	5. (c)	6. (b)	7. (b)	8. (b)	9. (d)	10. (c)	11. (c)	12. (a)
13. (b)	14. (d)	15. (c)	16. (a)	17. (c)	18. (d)	19. (d)	20. (c)	21. (a)	22. (b)	23. (d)	24. (c)
25. (a)	26. (b)	27. (d)	28. (c)	29. (c)	30. (d)	31. (d)	32. (a)	33. (c)	34. (b)	35. (a)	36. (b)
37. (b)	38. (c)	39. (c)	40. (c)	41. (d)	42. (c)	43. (b)	44. (c)	45. (a)	46. (c)	47. (b)	48. (d)
49. (a)	50. (a)	51. (d)	52. (a)	53. (d)	54. (d)	55. (a)	56. (c)	57. (c)	58. (d)	59. (b)	60. (d)
61. (d)	62. (c)	63. (c)	64. (a)	65. (a)	66. (b)	67. (c)	68. (b)	69. (c)	70. (a)	71. (c)	72. (a)
73. (a)	74. (d)	75. (d)	76. (a)	77. (a)	78. (b)	79. (d)	80. (c)	81. (b)	82. (a)	83. (a)	84. (b)
85. (d)	86. (b)	87. (d)	88. (c)	89. (c)	90. (b)	91. (a)	92. (a)	93. (c)	94. (a)	95. (a)	96. (a)
97. (c)	98. (b)	99. (a)	100. (a)								

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