STRAIGHT LINES

SECTION - A : DISTANCE FORMULA

1. The circumcentre of the triangle with vertices $(0,0), (3,0)$ and $(0,4)$ is

(A) $(1,1)$

(C) $(3/2,2)$

(B) $(2,3/2)$

(D) $(2,2)$

2. The mid points of the sides of a triangle are $(5,0)$, $(5,12)$ and $(0,12)$, then orthocentre of this triangle is

(A) $(0,0)$

(B) $(0,24)$

(C) $(10,0)$

(D) $\left(\frac{13}{3}, 8\right)$

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

(A) an obtuse angled triangle

(B) an acute angled triangle

(C) a right angled triangle

(D) Points are collinear

4. The circumcentre of the triangle formed by the lines, $xy + 2x + 2y + 4 = 0$ and $x + y + 2 = 0$ is

(A) $(-1,-1)$

(C) $(0,0)$

(B) $(-2,-2)$

(D) $(-1,-2)$

5. If the equation of the locus of a point equidistant from the points (a_1, b_1) and (a_2, b_2) is $(a_1 - a_2)x + (b_1 - b_2)y + c = 0$, then the value of c is-

(A) $\sqrt{a_1^2 + b_1^2 - a_2^2 - b_2^2}$

(B) $a_1^2 - a_2^2 + b_1^2 - b_2^2$

(C) $\frac{1}{2}(a_1^2 + a_2^2 + b_1^2 + b_2^2)$

(D) $\frac{1}{2}(a_2^2 + b_2^2 - a_1^2 - b_1^2)$

SECTION - B : SECTION FORMULA

6. The ratio in which the line joining the points $(3, -4)$ and $(-5,6)$ is divided by x-axis

(A) $2:3$ (C) $3:2$ (B) $6:4$ (D) $4:3$

7. If a vertex of a triangle is $(1,1)$ and the mid points of two sides through this vertex are $(-1,2)$ and $(3,2)$, then the centroid of the triangle is

(A) $\left(-1, \frac{7}{3}\right)$

(B) $\left(\frac{-1}{3}, \frac{7}{3}\right)$

(C) $\left(1, \frac{7}{3}\right)$

(D) $\left(\frac{1}{3}, \frac{7}{3}\right)$

8. The centroid of a triangle is $(2,3)$ and two of its vertices are $(5,6)$ and $(-1,4)$. The third vertex of the triangle is-

(A) $(2,1)$

(B) $(2,-1)$

(C) $(1,2)$

(D) $(1,-2)$

9. The co-ordinates of the vertices P, Q, R & S of square PQRS inscribed in the triangle ABC with vertices $A(0,0), B(3,0)$ & $C(2,1)$ given that two of its vertices P, Q are on the side AB are respectively

(A) $\left(\frac{1}{4}, 0\right), \left(\frac{3}{8}, 0\right), \left(\frac{3}{8}, \frac{1}{8}\right)$ & $\left(\frac{1}{4}, \frac{1}{8}\right)$

(B) $\left(\frac{1}{2}, 0\right), \left(\frac{3}{4}, 0\right), \left(\frac{3}{4}, \frac{1}{4}\right)$ & $\left(\frac{1}{2}, \frac{1}{4}\right)$

(C) $(1,0) \left(\frac{3}{2}, 0\right), \left(\frac{3}{2}, \frac{1}{2}\right)$ & $\left(1, \frac{1}{2}\right)$

(D) $\left(\frac{3}{2}, 0\right), \left(\frac{9}{4}, 0\right), \left(\frac{9}{4}, \frac{3}{4}\right)$ & $\left(\frac{3}{2}, \frac{3}{4}\right)$

10. Three vertices of triangle ABC are $A(-1,11)$, $B(-9,-8)$ and $C(15,-2)$. The equation of angle bisector of angle A is

(A) $4x - y = 7$

(B) $4x + y = 7$

(C) $x + 4y = 7$

(D) $x - 4y = 7$

11. If one vertex of an equilateral triangle of side 'a' lies at the origin and the other lies on the line $x - \sqrt{3}y = 0$ then the co-ordiantes of the third vertex are

(A) $(0, a)$

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

(C) $(0, -a)$

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

12. If one diagonal of a square is the portion of the line $\frac{x}{a} + \frac{y}{b} = 1$ intercepted by the axes, then the extremities of the other diagonal of the square are

(A) $\left(\frac{a+b}{2}, \frac{a+b}{2}\right)$

(B) $\left(\frac{a-b}{2}, \frac{a+b}{2}\right)$

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

(D) $\left(\frac{a+b}{2}, \frac{b-a}{2}\right)$

SECTION - C

AREA OF TRIANGLE & CONDITION OF COLLINEARITY

13. Area of a triangle whose vertices are $(a\cos\theta, b\sin\theta), (-a\sin\theta, b\cos\theta)$ and $(-a\cos\theta, -b\sin\theta)$ is

(A) $ab\sin\theta\cos\theta$

(B) $a\cos\theta\sin\theta$

(C) $\frac{1}{2}ab$

(D) ab

14. The point A divides the join of the points $(-5,1)$ and $(3,5)$ in the ratio k: 1 and coordinates of points B and C are $(1,5)$ and $(7,-2)$ respectively. If the area of $\triangle ABC$ be 2 units, then k equals

(A) 7,9

(B) 6,7

(C) 7,31/9

(D) 9,31/9

15. The points with the co-ordinates $(2a, 3a), (3b, 2b)$ & (c, c) are collinear

(A) for no value of a, b, c

(B) for all values of a, b, c

(C) If $a, \frac{c}{5}, b$ are in H.P.

(D) if $a, \frac{2}{5}c, b$ are in H.P.

16. Area of the rhombus bounded by the four lines, ax $\pm$ by $\pm$ c = 0 is

(A) $\frac{c^2}{2ab}$

(B) $\frac{2c^2}{|ab|}$

(C) $\frac{4c^2}{ab}$

(D) $\frac{ab}{4c^2}$

17. The area enclosed by $2|x| + 3|y| \leq 6$ is

    (A) 3 sq. units

    (B) 4 sq. units

    (C) 12 sq. units

    (D) 24 sq. units

18. The points $(-a, -b), (0,0), (a, b)$ and (a^2, ab) are-

    (A) collinear

    (B) concyclic

    (C) vertices of a rectangle

    (D) vertices of a parallelogram

19. The area of a triangle is 5 . Two of its vertices are $(2,1) \& (3, -2)$. The third vertex lies on $y = x + 3$. Find the third vertex.

    (A) $\left(\frac{7}{2}, -\frac{13}{2}\right)$　　　(B) $\left(\frac{-3}{2}, \frac{3}{2}\right)$　　　(C) $\left(\frac{7}{2}, \frac{13}{2}\right)$　　　(D) $\left(\frac{3}{2}, \frac{3}{2}\right)$

SECTION - D : LOCUS

20. If $A(\cos \alpha, \sin \alpha), B(\sin \alpha, -\cos \alpha), C(1,2)$ are the vertices of a $\triangle ABC$, then as α varies, the locus of its centroid is

    (A) $x^2 + y^2 - 2x - 4y + 3 = 0$　　　(B) $x^2 + y^2 - 2x - 4y + 1 = 0$

    (C) $3(x^2 + y^2) - 2x - 4y + 1 = 0$　　　(D) $x^2 + y^2 - 2x + 3y + 3 = 0$

21. A stick of length 10 units rests against the floor and a wall of a room. If the stick begins to slide on the floor then the locus of its middle point is

    (A) $x^2 + y^2 = 2.5$

    (B) $x^2 + y^2 = 25$

    (C) $x^2 + y^2 = 100$

    (D) $x + y = 10$

22. If $P(1,0); Q(-1,0)$ & $R(2,0)$ are three give points. then the locus of the points S satisfying the relation, $SQ^2 + SR^2 = 2SP^2$ is

    (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

23. A rod PQ of length $2a$ slides with its ends on the axes then locus of circumcentre of $\triangle OPQ$ is-

    (A) $x^2 + y^2 = 2a^2$　　　(B) $x^2 + y^2 = 4a^2$

    (C) $x^2 + y^2 = 3a^2$　　　(D) $x^2 + y^2 = a^2$

24. A(1,0) and B(−1,0) are two points and Q is a point which satisfies the relation $AQ - BQ = \pm 1$. The locus of Q is -

(A) $12x^2 - 4y^2 = 3$

(B) $12x^2 - 4y^2 + 3 = 0$

(C) $12x^2 + 4y^2 = 3$

(D) $12x^2 + 4y^2 + 3 = 0$

25. Locus of centroid of the triangle whose vertices are $(a\cos t, a\sin t), (b\sin t, -b\cos t)$ and $(1,0)$, where t is a parameter, is -

(A) $(3x + 1)^2 + (3y)^2 = a^2 - b^2$

(B) $(3x - 1)^2 + (3y)^2 = a^2 - b^2$

(C) $(3x - 1)^2 + (3y)^2 = a^2 + b^2$

(D) $(3x + 1)^2 + (3y)^2 = a^2 + b^2$

26. Let A$(2, -3)$ and B$(-2, 1)$ be vertices of a triangle ABC. If the centroid of this triangle moves on the line $2x + 3y = 1$, then the locus of the vertex C is the line

(A) $2x + 3y = 9$

(B) $2x - 3y = 7$

(C) $3x + 2y = 5$

(D) $3x - 2y = 3$

Subjective

27. Two vertices of a triangle are $(4, -3) \& (-2, 5)$. If the orthocentre of the triangle is at $(1, 2)$, find the coordinates of the third vertex.

28. Line $\frac{x}{6} + \frac{y}{8} = 1$ intersects the x and y axes at M and N respectively. If the coordinates of the point P lying inside the triangle OMN (where 'O' is origin) are (a, b) such that the areas of the triangle POM, PON and PMN are equal. Find

(a) The coordinates of the point P and

(b) The radius of the circle escribed opposite to the angle N.

29. The point A divides the join of P$(-5, 1)$ & Q$(3, 5)$ in the ratio $K : 1$. Find the two values of K for which the area of triangle ABC, where B is $(1, 5)$ and C is $(7, -2)$, is equal to 2 units in magnitude.

30. Determine the ratio in which the point P$(3, 5)$ divides the join of $A(1, 3)$ and $B(7, 9)$. Find the harmonic conjugate of P w.r.t. A & B.

31. A triangle has side lengths 18, 24 and 30. Find the area of the triangle whose vertices are the incentre, circumcentre and centroid of the triangle.

32. A straight line L is perpendicular to the line $5x - y = 1$ The area of the triangle formed by the line L & the coordinate axes is 5. Find the equation of the line.

33. If $(x_1 - x_2)^2 + (y_1 - y_2)^2 = a^2$, $(x_2 - x_3)^2 + (y_2 - y_3)^2 = b^2$ and $(x_3 - x_1)^2 + (y_3 - y_1)^2 = c^2$

then $\lambda \begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix}^2 = (a + b + c)(b + c - a)(c + a - b)(a + b - c)$. Find the value of λ.

34. Let $A(h, k), B(1,1)$ and $C(2,1)$ be the vertices of a right angled triangle with AC as its hypotenuse. If the area of the triangle is 1, then the set of values which "k" ean take is given by   **[AIEEE-2007]**

(A) $\{1,3\}$ (B) $\{0,2\}$ (C) $\{-1,3\}$ (D) $\{-3, -2\}$

35. The perpendicular bisector of the line segment joining $P(1,4)$ and $Q(k, 3)$ has y-intercept-4. Then a possible value of k is -   **[AIEEE-2008]**

(A) 2   (B) -2   (C) -4   (D) 1

36. The line L given by $\frac{x}{5} + \frac{y}{b} = 1$ passes through the point (13,32). The line K is parallel to L and has the equation $\frac{x}{c} + \frac{y}{3} = 1$. The the distance between **L** and K is -   **[AIEEE-2010]**

(A) $\frac{23}{\sqrt{15}}$ (B) $\sqrt{17}$ (C) $\frac{17}{\sqrt{15}}$ (D) $\frac{23}{\sqrt{17}}$

37. The lines $L_1: y - x = 0$ and $L_2: 2x + y = 0$ intersect the line $L_3: y + 2 = 0$ at P and Q respectively. The bisector of the acute angle between L_1 and L_2 intersects L_1 at R.

[AIEEE-20II]

Statement-1 : The ratio $PR :$ RQ equal $2\sqrt{2}: \sqrt{5}$ Statement - 2: In any triangle, bisector of an angle divides the triangle into two similar triangles. (A) Statement (1) is true and statement (2) is true and statement (2) is correct explanation for Statement (1)

(B) Statement (1) is true and statement (2) is true and statement (2) is NOT a correct explanation for Statement (1)

(C) Statement (1) is true but (2) is false

(D) Statement (1) is false but (2) is true

38. If the line $2x + y = k$ passes through the point which divides the line segment joining the points (1,1) and (2,4) in the ratio 3: 2, then k equal: **[AIEEE-2012]**

(A) 6   (B) 11/5   (C) 29/5   (D) 5

39. Locus of the image of the point (2,3) in the line $(2x - 3y + 4) + k(x - 2y + 3) = 0, k \in R$, is a :

[JEE-MAIN 2015]

(A) circle of radius $\sqrt{2}$ (B) circle of radius $\sqrt{3}$

(C) straight line parallel to x-axis   (D) straight line parallel to y-axis

40.   (a) Let $O(0,0), P(3,4), Q(6,0)$ be the vertices of the triangle OPQ. The point R inside the triangle OPQ is such that the triangles OPR, PQR, OQR are of equal area. The coordinates of R are   **[JEE 2007]**

(A) (4/3,3)

(B) (3,2/3)

(C) (3,4/3)

(D) (4/3,2/3)

(b)   Lines $L_1: y - x = 0$ and $L_2: 2x + y = 0$ intersect the line $L_3: y + 2 = 0$ at P and Q, respectively. The bisector of the acute angle between L_1 and L_2 intersects L_3 at R.

Statement-1: The ratio PR : RQ equals $2\sqrt{2}:\sqrt{5}$ because

Statement-2: In any triangle, bisector of an angle divides the triangle into two similar triangles.

(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

41.   Consider the lines given by   **[JEE 2008]**

$$L_1 = x + 3y - 5 = 0 \qquad L_2 = 3x - ky - 1 = 0 \qquad L_3 = 5x + 2y - 12 = 0$$

Match the statements/Expression in Column-I with the statements/Expressions in Column-II and indicate your answer by darkening the appropriate bubbles in the 4×4 matrix given in OMR.

Column-I	Column-II
(A) L_1, L_2, L_3 are concurrent, if	(P) $k = -9$
(B) One of L_1, L_2, L_3 is parallel to at least one of the other two, if	(Q) $k = -\dfrac{6}{5}$
(C) L_1, L_2, L_3 form a triangle, if	(R) $k = \dfrac{5}{6}$
(D) L_1, L_2, L_3 do not form a triangle, if	(S) $k = 5$

ANSWER KEY

1.	(C)	**2.**	(A)	**3.**	(D)	**4.**	(A)	**5.**	(D)	**6.**	(A)	**7.**	(C)
8.	(B)	**9.**	(D)	**10.**	(B)	**11.**	(A, B, C, D)	**12.**	(A, C)	**13.**	(D)	**14.**	(C)
15.	(D)	**16.**	(B)	**17.**	(C)	**18.**	(A)	**19.**	(B, C)	**20.**	(C)	**21.**	(B)
22.	(D)	**23.**	(D)	**24.**	(A)	**25.**	(C)	**26.**	(A)	**27.**	(33,26)		

28. (a) $\left(2, \frac{8}{3}\right)$; (b) $\frac{4}{3}$ **29.** $(K = 7 \text{ or } 31/9)$ **30.** $(1:2; \ Q\ (-5,-3))$ **31.** (3 units)

32. $(x + 5y + 5\sqrt{2} = 0 \text{ or } x + 5y - 5\sqrt{2} = 0)$ **33.** (4)   **34.** (C)   **35.** (C)

36. (D)   **37.** (C)   **38.** (A)   **39.** (A)   **40.** (C)

41. (A)-S; (B)-P,Q (C)-R;(D)-P,Q,S