DISTANCE FORMULA

1. The triangle with vertices (a, b); (b, a) and (c, c) is

(A) equilateral (B) isosceles (C) right angled (D) none of these

2. If $A(1,4)$; $B(3,0)$ and $C(2,1)$ are vertices of a triangle, then the length of the median through C is

(A) 1 (B) 2 (C) $\sqrt{2}$ (D) $\sqrt{3}$

3. If $A(2,2)$; $B(-4,-4)$; $C(5,-8)$ are vertices of a triangle, then the length of the median through C is equal to

(A) $\sqrt{65}$ (B) $\sqrt{117}$ (C) $\sqrt{85}$ (D) $\sqrt{113}$

4. Points $(4,0)$; $(-1,-2)$ and $(-11,-6)$ are

(A) vertices of an equilateral triangle. (B) vertices of an isosceles triangle.

(C) vertices of a right angled triangle. (D) collinear

5. Points $(2a, 4a)$; $(2a, 6a)$ and $((2+\sqrt{3})a, 5a)(a > 0)$ are vertices of a

(A) equilateral triangle (B) isosceles triangle

(C) right angled triangle (D) none of these

6. If a point P is at equal distance from three points A(1,3);

(A) $5\sqrt{5}$ (B) $5\sqrt{10}$ (C) 5 (D) 25

7. Let $A = (1,2)$, $B = (x, y)$ and $C(2,4)$ is the mid-point of AB. If BD is perpendicular to AB and $CD = 3$, then BD is equal to

(A) $2\sqrt{2}$ (B) 2 (C) $3\sqrt{2}$ (D) 3

SECTION FORMULA

8. The point $(5,8)$ divides AB internally in the ratio $2:1$. If $A \equiv (3,4)$, then B will be

(A) $(6,10)$ (B) $(10,6)$ (C) $(-7,10)$ (D) $(6,-10)$

9. The ratio in which the line segment joining $(-10,8)$ and $(-6,12)$ divides the line segment joining $(4,-2)$ and $(-2,4)$ is

(A) $2:1$ internally (B) 2:1 externally (C) $1:2$ internally (D) 1:2 externally

10. Two of the vertices of a triangle ABC are $A(4,6)$ and $B(2,7)$. If $(6,1)$ is the mid-point of the side AC, then the mid-point of BC is

(A) $(2,3/2)$ (B) $(3,3/2)$ (C) $(5,3/2)$ (D) $(6,3/2)$

11. Point $(-1/3,0)$ divides the line segment joining points $(1,-2)$ and $(-3,4)$ in the ratio

(A) $1:1$ (B) $1:2$ (C) $2:1$ (D) $2:3$

12. The line joining points $(2,-3)$ and $(-5,6)$ is divided by y-axis in the ratio

(A) $2:5$ (B) $2:3$ (C) $3:5$ (D) $1:2$

13. Q, R and S are points on the line joining the points $P(a, x)$ and $T(b, y)$ such that $PQ = QR = RS = ST$, then $\left(\frac{5a+3b}{8}, \frac{5x+3y}{8}\right)$ is the mid-point of the line segment

(A) RS (B) ST (C) PQ (D) QR

14. 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 $0 < \alpha, \beta, \theta < \pi/4$. Then

(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-collinear.

15. If mid-points of sides of a triangle are $D(6,1), E(3,5), F(-1,-2)$, then the vertex opposite to D is

(A) (2,5) (B) (10,8) (C) $(-4,2)$ (D) $(-4,5)$

16. 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 equals

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

NATURE OF TRIANGLE & QUADRILATERAL

17. If three vertices of a parallelogram in order are (1,3); (2,0) and (5,1); then its fourth vertex is

(A) (3,3) (B) (4,4) (C) (4,0) (D) $(0,-4)$

18. If $(1,-2)$ and $(1,2)$ are end points of a diagonal of a square and $(3,h)$; $(-1,k)$ are end points of its other diagonal, then

(A) $h=-1, k=1$ (B) $h=1, k=-1$ (C) $h=k=0$ (D) $h=k=1$

19. The triangle with vertices (2,4); $(4,-2)$ and $(-3,-1)$ is

(A) right angled (B) equilateral (C) isosceles (D) none of these

20. Points P(2,7); $Q(4,-1)$ and $R(-2,6)$ are vertices of a

(A) right angled triangle (B) equilateral triangle

(C) isosceles triangle (D) none of these

21. If P(1,2); Q(4,6); R(5,7) and S(a, b) are vertices ofs parallelogram PQRS, then

(A) $a=2, b=4$ (B) $a=3, b=4$ (C) $a=2, b=3$ (D) $a=3, b=5$

22. $(0,-1)$ and (0,3) are two opposite vertices of a square. The

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

23. Points $(2,-2)$, (8,4), (4,6) and $(-1,1)$ are vertices (in order) of a

(A) square (B) rhombus

(C) rectangle (but not square) (D) trapezium

24. Let P, Q, R and S be the points on the plane with position vectors $-2\mathbf{i}-\mathbf{j}, 4\mathbf{i}, 3\mathbf{i}+3\mathbf{j}$ and $-3\mathbf{i}+2\mathbf{j}$ respectively. The quadrilateral PQRS must be a

(A) parallelogram, which is neither a rhombus nor a rectangle.

(B) square

(C) rectangle but not a square

(D) rhombus, but not a square

25. The number of points, having both co-ordinates as integers, that lie in the interior of the triangle with vertices (0,0), (0,41) and (41,0), is :

(A) 901 (B) 861 (C) 820 (D) 780

AREA OF TRIANGLE & QUADRILATERAL

26. The point $(1,1)$; $(0, \sec^2 \theta)$; $(\operatorname{cosec}^2 \theta, 0)$ are collinear for

(A) $\theta = n\pi$ (B) $\theta = n\pi/2$ (C) $\theta \neq n\pi/2$ (D) none of these

27. If $(1,2)$; $(-2,3)$ and $(-3,-4)$ are vertices of a triangle, then its area is

(A) 11 (B) 12 (C) 22 (D) 24

28. If $(2,-1)$; $(4,3)$; $(-1,2)$ and $(-3,-2)$ are vertices of a quadrilateral, then its area is

(A) 36 (B) 18 (C) 54 (D) 27

29. $A(6,3)$; $B(-3,5)$; $C(4,-2)$ and $D(x, 3x)$ are four points. If the areas of $\triangle$ DBC and $\triangle$ ABC are in the ratio 1: 2, then x is equal to

(A) 11/8 (B) 8/11 (C) 3 (D) none of these

30. Points $(p^2, 0)$; $(0, q^2)$ and $(1,1)$ are collinear, if

(A) $1/p^2 + 1/q^2 = 1$ (B) $1/p + 1/q = 1$ (C) $p^2 + q^2 = 1$ (D) none of these

31. Each side of an equilateral triangle is equal to a. If its vertices are (x_1, y_1); (x_2, y_2) and (x_3, y_3); then $\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix}^2$ is equal to

(A) $3a^4$ (B) $3a^4/4$ (C) $4a^4$ (D) none of these

32. If points $(p+1,1)$; $(2p+1,3)$ and $(2p+2,2p)$ are vertices of a triangle, then

(A) $p \neq 1$ (B) $p \neq 2$ (C) $p \neq 0$ (D) $p \neq 3$

33. If a, b, c, d are unequal real numbers, then (a, b); (a, d); (c, d) and (c, b) are

(A) collinear

(B) vertices of a square

(C) vertices of a rhombus

(D) cyclic

34. Three points are $A(6,3)$; $B(-3,5)$; $C(4,-2)$ and $P(x, y)$ is a point, then the ratio of areas of $\triangle$ PBC and $\triangle$ ABC is

(A) $\left|\frac{x+y-2}{7}\right|$ (B) $\left|\frac{x-y+2}{2}\right|$ (C) $\left|\frac{x-y-2}{7}\right|$ (D) none of these

35. If $\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix} = \begin{vmatrix} a_1 & b_1 & 1 \\ a_2 & b_2 & 1 \\ a_3 & b_3 & 1 \end{vmatrix}$,then the two triangles with vertices (x_1, y_1); (x_2, y_2); (x_3, y_3) and (a_1, b_1); (a_2, b_2); (a_3, b_3) must be

(A) similar (B) congruent (C) never congruent (D) none of these

36. Point P divides the line segment joining $A(-5,1)$ and $B(3,5)$ internally in the ratio $\lambda: 1$. If $Q \equiv (1,5)$, $R \equiv (7,2)$ and area of $\triangle PQR = 2$, then λ equals

(A) 23 (B) 31/9 (C) 29/5 (D) none of these

37. The points (a, b); (c, d) and $(a-c, b-d)$ are collinear, if

(A) $ac = bd$ (B) $ad = bc$ (C) $ab = cd$ (D) none of these

38. If a, x_1, x_2 are in GP with common ratio r and b, y_1, y_2 are in GP with common ratio s where $s - r = 2$. Then the area of the triangle with vertices (a, b); (x_1, y_1); (x_2, y_2) is

(A) abrs (B) $ab(r^2 - s^2)$ (C) $|ab(s^2 - 1)|$ (D) $|ab(r^2 - 1)|$

39. Let $O(0,0)$, $P(3,4)$, $Q(6,0)$ be vertices of a $\triangle OPQ$. R is a point inside this triangle such that areas of $\triangle$'s OPR, PQR, OQR are equal. Then R is equal to

(A) (4/3,3) (B) (3,2/3) (C) (3,4/3) (D) (4/3,2/3)

SPECIAL POINTS OF A TRIANGLE

40. If (6,4) and (2,6) are two vertices of a triangle and its centroid is (4,6), then its third vertex will be

(A) (4,8) (B) (8,4) (C) (3,3) (D) none of these

41. If two vertices of a triangle are $(4,-3)$; $(-9,7)$ and its centroid is (1,4); then its area is

(A) 181/2 (B) 183/2 (C) 185/2 (D) none of these

42. The incentre of the triangle with vertices (0,0); (3,0) and (0,4) is

(A) (1,1) (B) (3,3) (C) (1,0) (D) (2,2)

43. If $(-2,3)$; $(4,-3)$ and (4,5) are mid-points of the sides of a triangle, then coordinates of its centroid are

(A) (2,5/3) (B) (6,5) (C) (−2,5/3) (D) (5/3,2)

44. Orthocentre of the triangle with vertices (a, b); (b, a) and (a, a) is

(A) (b, b) (B) (a, a) (C) (a/2, b/2) (D) (a/2, a/2)

45. If the vertices of a triangle be (2,1); (5,2) and (3,4), then its circumcentre is

(A) (13/2,9/2) (B) (9/4,13/4) (C) (13/4,9/4) (D) none of these

46. The orthocentre of the triangle with vertices (0,0); (3,0) and (0,4) is

(A) (1,4/3) (B) (0,0) (C) (3/2,2) (D) none of these

47. The incentre of the triangle formed by $(0,0)$; $(5,12)$; $(16,12)$ is

(A) $(9,7)$ (B) $(7,9)$ (C) $(-9,7)$ (D) $(-7,9)$

48. The distance between orthocentre and circumcentre of the triangle with vertices $(1,0)$; $(-1/2, \sqrt{3}/2)$, $(-1/2, -\sqrt{3}/2)$ is

(A) $1/2$ (B) $\sqrt{3}/2$ (C) $1/3$ (D) 0

49. ABC is a triangle with vertices $A(-1,4)$; $B(6,-2)$ and $C(-2,4)$, D, E, F are points which divide each AB, BC, CA in the ratio $3:1$ internally. Then the centroid of the triangle DEF is

(A) $(4,8)$ (B) $(1,2)$ (C) $(3,6)$ (D) $(-1,2)$

50. If coordinates of the mid-point of sides of a triangle are $(0,1)$ $(1,1)$ and $(1,0)$, then abscissa of incentre is

(A) $1+\sqrt{2}$ (B) $2+\sqrt{2}$ (C) $\sqrt{2}-1$ (D) $2-\sqrt{2}$

51. In right angled triangle ABC, $AB = AC$. If its vertices are $A(1,1)$; $B(5,1)$ and $C(1,4)$, then its circumcentre is

(A) $(3,1)$ (B) $(6,5)$ (C) $\left(\frac{1,5}{2}\right)$ (D) $\left(\frac{3,5}{2}\right)$

52. Two vertices of $\triangle$ ABC are $A(2,-3)$ and $B(-5,1)$. If its centroid lies on x-axis and vertex C lies on y-axis, then C is

(A) $(0,2)$ (B) $(2,0)$ (C) $(0,-2)$ (D) $(-2,0)$

53. In a $\triangle$ ABC, G is its centroid and D is the mid-point of BC. If $A = (2,3)$ and $G = (7,5)$, then coordinates of D are

(A) $(9/2,6)$ (B) $(19/2,6)$ (C) $(11/2,11/2)$ (D) $(8,13/2)$

54. Three distinct points A, B and C are given in the 2-dimensional coordinate plane such that the ratio of the distance of any one of them from the point $(1,0)$ to the distance from the point $(-1,0)$ is equal to $1/3$. Then the circumcentre of the triangle ABC is at the point

(A) $(5/4,0)$ (B) $(5/2,0)$ (C) $(5/3,0)$ (D) $(0,0)$

LOCUS

55. Line segment joining $(5,0)$ and $(10\cos\theta, 10\sin\theta)$ is divided by a point P in ratio $2:3$. If θ varies then locus of P is a

(A) straight line (B) circle

(C) pair of straight lines (D) parabola

56. If the distance of a variable point from y-axis is twice to its distance from x-axis, then its locus is a

(A) circle (B) parabola (C) straight line (D) pair of straight line

57. If the sum of the distances of a point from the origin and from the line $x = 2$ is always equal to 4 , then the locus of this point

(A) straight line (B) circle (C) parabola (D) none of these

58. If the difference between distances of a variable point from (3,0) and (−3,0) always remains 4 , then its locus is

(A) $5x^2 + 4y^2 = 20$ (B) $4x^2 - 5y^2 = 20$ (C) $5x^2 - 4y^2 = 20$ (D) $4x^2 + 5y^2 = 20$

59. Locus of the 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) $(3x+1)^2 + (3y)^2 = a^2 + b^2$

60. Two fixed points are $A(a, 0)$ and $B(-a, 0)$. Then the locus of the point C of $\triangle ABC$, if $\angle A - \angle B = \theta$, will be

(A) $x^2 + y^2 + 2xy\tan\theta = a^2$ (B) $x^2 + y^2 + 2xy\cot\theta = a^2$

(C) $x^2 - y^2 + 2xy\tan\theta = a^2$ (D) $x^2 - y^2 + 2xy\cot\theta = a^2$

TRANSFORMATION OF AXES

61. Reflecting the point $(2, -1)$ about y-axis, coordinate axes are rotated at 45° angle in negative direction without shifting the origin. The new coordinates of the point are

(A) $(-1/\sqrt{2}, -3/\sqrt{2})$ (B) $(-3/\sqrt{2}, 1/\sqrt{2})$ (C) $(1/\sqrt{2}, 3/\sqrt{2})$ (D) none of these

62. On shifting the origin to the point $(2, -1)$ and keeping the axes parallel, the transformed equation of $x^2 + y^2 - 4x + 2y + 1 = 0$ will be

(A) $x^2 + y^2 + 4 = 0$ (B) $x^2 - y^2 - 4 = 0$ (C) $x^2 - y^2 + 4 = 0$ (D) $x^2 + y^2 - 4 = 0$

63. The new coordinates of a point (4,5) when the origin is shifted to the point $(1, -2)$ are

(A) (3,5) (B) (5,3) (C) (3,7) (D) (7,3)

64. On rotating coordinate axes at 135°, the new coordinates of a point P are $(4, -3)$; Former coordinates of P are

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

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

65. If coordinate axes are rotated at $\pi/4$ angle, then equation $x^2 + 6xy + 8y^2 = 10$ will be transformed to

(A) $15x^2 - 14xy + 3y^2 = 0$ (B) $15x^2 - 14xy - 3y^2 = 0$

(C) $15x^2 + 14xy - 3y^2 = 0$ (D) $15x^2 + 14xy + 3y^2 = 0$

66. If pair of lines $\sqrt{3}x^2 - 4xy + \sqrt{3}y^2 = 0$ is rotated about origin in anti-clockwise direction at an angle $\pi/6$, then its new equation will be

(A) $xy - \sqrt{3}x = 0$ (B) $\sqrt{3}x^2 - xy = 0$ (C) $\sqrt{3}x^2 + xy = 0$ (D) $xy + \sqrt{3}x = 0$

SLOPE

67. The condition that three points $(a, 0), (0, b)$ and $(1,1)$ are collinear is

(A) $1/a + 1/b = 2$ (B) $1/a + 1/b = 1$ (C) $1/a = 1/b$(D) $1/a + 1/b = 0$

68. If three different points $(x + 1,2); (1, x + 2)$ and $\left(\frac{1}{x+1}, \frac{2}{x+1}\right)$ are collinear, then x is

(A) 4 (B) -4 (C) 0 (D) none of these

69. Let $A(2, -1)$ and $B(6,5)$ be two points. The foot of the perpendicular drawn from $P(4,1)$ on AB divides AB in the ratio

(A) $5: 8$ (B) $8: 5$ (C) $8: 15$ (D) $-5: 8$

IMAGE OF A POINT

70. If B is the reflection of the point $A(1,2)$ with respect to the line $y = x$ and (α, β) is the reflection of B with respect to $y = 0$, then

(A) $\alpha = 1, \beta = -2$ (B) $\alpha = 0, \beta = 0$ (C) $\alpha = 2, \beta = -1$ (D) none of these

71. If reflection of a point $(-1,3)$ with respect to $y = x$ is P and that of P with respect to y-axis is Q and that of Q with respect to the origin is R, then coordinates of R are

(A) $(1,3)$ (B) $(3,1)$ (C) $(-3, -1)$ (D) $(3, -1)$

72. Following two successive transformations are performed on point $(4,1)$

(i) reflection with respect to $y = x$.

(ii) translation through a distance 2 units along the positive direction of x-axis.

The coordinates of the final position of the point are

(A) $(4,3)$ (B) $(3,4)$ (C) $(1,4)$ (D) $(7/2,7/2)$

ANSWER KEY

1.	(B)	**2.**	(A)	**3.**	(C)	**4.**	(D)	**5.**	(A)	**6.**	(B)	**7.**	(B)
8.	(A)	**9.**	(B)	**10.**	(C)	**11.**	(B)	**12.**	(A)	**13.**	(D)	**14.**	(D)
15.	(C)	**16.**	(B)	**17.**	(B)	**18.**	(C)	**19.**	(C)	**20.**	(A)	**21.**	(C)
22.	(A)	**23.**	(D)	**24.**	(A)	**25.**	(D)	**26.**	(C)	**27.**	(A)	**28.**	(B)
29.	(A)	**30.**	(A)	**31.**	(B)	**32.**	(B)	**33.**	(B)	**34.**	(A)	**35.**	(D)
36.	(A)	**37.**	(B)	**38.**	(D)	**39.**	(C)	**40.**	(A)	**41.**	(B)	**42.**	(A)
43.	(A)	**44.**	(B)	**45.**	(C)	**46.**	(B)	**47.**	(B)	**48.**	(D)	**49.**	(B)
50.	(C)	**51.**	(D)	**52.**	(A)	**53.**	(B)	**54.**	(A)	**55.**	(B)	**56.**	(D)
57.	(C)	**58.**	(C)	**59.**	(C)	**60.**	(D)	**61.**	(A)	**62.**	(D)	**63.**	(C)
64.	(B)	**65.**	(D)	**66.**	(B)	**67.**	(B)	**68.**	(B)	**69.**	(A)	**70.**	(C)
71.	(B)	**72.**	(B)										