Mathematics

TARGET : JEE 2013

SCORE

JEE (Advanced)

Home Assignment # 03

ALLEN™ CAREER INSTITUTE KOTA (RAJASTHAN)

Path to Success

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HOME ASSIGNMENT # 03

STRAIGHT OBJECTIVE TYPE

1. If $3x + y - 3 = 0$ is a tangent at the vertex of a parabola and $x + y - 7 = 0$ and $2x + y - 3 = 0$ are other tangents to the same parabola then co-ordinates of its focus are -

(A) (5, 16) (B) (16, –5) (C) (–5, –16) (D) (–16, –5)

2. The line $L_1 : 3x + 4y + 12 = 0$ is rotated through an angle of $\tan^{-1}\left(\frac{24}{7}\right)$ in anticlockwise about the point where it intersects the x-axis, line obtained in new position is denoted as $L_2 = 0$. If incentre of the triangle formed by $L_1 = 0$, $L_2 = 0$ and y-axis is $(4\lambda, 3k)$, then the value of $10k - 24\lambda$ is -

(A) –3 (B) 3 (C) 9 (D) –9

3. A(4, 0) and B(–4, 0) are two fixed points of ΔABC. If its vertex C moves in such way that $\cot A + \cot B = \lambda$, where λ is a constant, then the locus of the point C is -

(A) $\lambda y = 8$ (B) $y = 4\lambda$ (C) $4y = 2\lambda$ (D) none of these

4. If θ_1 and θ_2 be the possible inclinations of the line that can be drawn through the point P(1, 2), so that its intersection with the line $x + y = 4$ may be at a distance of $\frac{\sqrt{6}}{3}$ from the point P, then $\theta_1 + \theta_2$ is equal to -

(A) 90° (B) 135° (C) 150° (D) 60°

5. If the straight lines joining the origin to the point of intersection of straight line $x - y = k$ and the curve $5x^2 + 12xy - 8y^2 + 8x - 4y + 12 = 0$ make equal angles with co-ordinate axes then k is equal to -

(A) 2 (B) 3 (C) 4 (D) –1

6. Consider points $A\left(\sqrt{13}, 0\right)$ & $B\left(2\sqrt{13}, 0\right)$ lying on x-axis. These points are rotated in an anti clockwise direction about the origin through an angle of $\tan^{-1}\frac{2}{3}$. Let the new position of A & B be A' & B' respectively. With A' as centre and radius $\frac{2\sqrt{13}}{3}$ a circle C_1 is drawn and with B' as a centre and radius $\frac{\sqrt{13}}{3}$ circle C_2 is drawn. The radical axis of C_1 & C_2 is -

(A) $9x + 6y = 65$ (B) $3x + 3y = 10$ (C) $3x + 2y = 20$ (D) none of these

FILL THE ANSWER HERE

1. Ⓐ Ⓑ Ⓒ Ⓓ **2.** Ⓐ Ⓑ Ⓒ Ⓓ **3.** Ⓐ Ⓑ Ⓒ Ⓓ **4.** Ⓐ Ⓑ Ⓒ Ⓓ

5. Ⓐ Ⓑ Ⓒ Ⓓ **6.** Ⓐ Ⓑ Ⓒ Ⓓ

7. The equations of two adjacent sides of a rhombus formed in first quadrant are represented by $7x^2 - 8xy + y^2 = 0$ then slope of its longer diagonal is -

(A) $-\frac{1}{2}$ (B) 2 (C) $\frac{1}{2}$ (D) –2

8. Let P be a point on the circle $x^2 + y^2 - 6x - 12y + 40 = 0$ at the farthest distance from the origin, if it has been rotated on the circle through an angle of 90° in anticlockwise sense then co-ordinates of the point in the new position are -

(A) (1, 7) (B) (2, 4) (C) (4, 8) (D) (5, 1)

9. Equation of shortest chord of the circle $x^2 + y^2 - 3x + 5y - 1 = 0$ passing through a point (1, –2), is -

(A) $2x + y = 0$ (B) $x + 2y + 3 = 0$ (C) $x + y + 1 = 0$ (D) $x - y - 3 = 0$

10. If line $y = x - 2$ is normal to a circle, co-ordinates of its centre are such that abscissa is twice of ordinate & circle touches the x-axis then equation of the circle is -

(A) $x^2 + y^2 - 8x - 4y + 16 = 0$ (B) $x^2 + y^2 - 8x - 4y + 4 = 0$

(C) $x^2 + y^2 - 4x - 2y + 2y + 4 = 0$ (D) $x^2 + y^2 - 4x - 2y + 16 = 0$

11. Combined equation of straight lines passing through the origin, which are perpendicular to the lines represented by the equation $y^2 + 3xy - 6x + 5y - 14 = 0$, is -

(A) $y^2 - 3xy = 0$ (B) $3y^2 - xy = 0$ (C) $x^2 - 3xy = 0$ (D) $3x^2 - xy = 0$

12. One of the members of the family $x(a + 2b) + y(2a - b) + a + 2b = 0$ a, b $\in$ R which cuts off equal non-zero intercepts on co-ordinate axes is -

(A) $x - y + 1 = 0$ (B) $x - 2y + 1 = 0$ (C) $x + y + 1 = 0$ (D) $2x + y + 2 = 0$

13. Sum of values of b for which lines $L_1 : 2x + y - 5 = 0$, $L_2 : x + y - 2 = 0$ and $L_3 : bx + 3y - 1 = 0$ do not form a triangle, is -

(A) $\frac{4}{3}$ (B) $\frac{22}{3}$ (C) $\frac{31}{3}$ (D) $\frac{13}{3}$

14. The tangent at P(1, 2) to the parabola $y^2 = 4x$ meets the tangent at vertex at H. If S be the focus of the parabola & A be the area of the circle circumscribing ΔSHP, then [A] is (where [.] is greatest integer function) -

(A) 1 (B) 2 (C) 3 (D) 4

15. If the locus of the foot of perpendicular from the centre upon any normal to the hyperbola $\frac{x^2}{1} - \frac{y^2}{2} = 1$ is $(x^2 + y^2)(k_1y^2 - k_2x^2) = (k_3)^2 x^2y^2$, then the value of $(k_1 + k_2 + k_3)$ is -

(A) 2 (B) 4 (C) 6 (D) 8

7.	Ⓐ Ⓑ Ⓒ Ⓓ	8.	Ⓐ Ⓑ Ⓒ Ⓓ	9.	Ⓐ Ⓑ Ⓒ Ⓓ	10.	Ⓐ Ⓑ Ⓒ Ⓓ
11.	Ⓐ Ⓑ Ⓒ Ⓓ	12.	Ⓐ Ⓑ Ⓒ Ⓓ	13.	Ⓐ Ⓑ Ⓒ Ⓓ	14.	Ⓐ Ⓑ Ⓒ Ⓓ
15.	Ⓐ Ⓑ Ⓒ Ⓓ						

16. $16x^2 - 2y^2 = 1$ is a hyperbola and P is extrimity of latus rectum in first quadrant. Then identity the wrong statement about it -

(A) coordinate of P are $\left(\frac{3}{4}, 2\right)$

(B) equation of tangent at P is $12x - 4y = 1$

(C) locus of foot of perpendicular from foci upon its tangent is $x^2 + y^2 = 14$

(C) equation of asymptotes are $y = \pm 2\sqrt{2}x$

17. If conic $4x^2 + y^2 + ax + by + c = 0$ is tangent to the x-axis at the origin and pass through (–1, 2), then its eccentricity is -

(A) 1 (B) 0 (C) 3/5 (D) $\sqrt{3}/2$

18. Normal to the ellipse $\frac{x^2}{64}+\frac{y^2}{49}=1$ intersect major and minor axis at P and Q respectively then locus of the point dividing segment PQ in 2 : 1 is -

(A) $\frac{64x^2}{25}+\frac{49y^2}{100}=1$ (B) $\frac{64x^2}{100}+\frac{49y^2}{25}=1$ (C) $64x^2 + 49y^2 = 225$ (D) $\frac{49}{100}x^2+\frac{64}{25}y^2=1$

19. The points of contact Q and R of tangents from the point P(2, 3) to the parabola $y^2 = 4x$ are -

(A) (9, 6) and (1, 2) (B) (4, 4) and (9, 6) (C) (9, 6) and $\left(\frac{1}{4}, 1\right)$ (D) (1, 2) and (4, 4)

20. If focus and directrix of a parabola are (3, 5) and x + y = 4, then coordinates of its vertex are -

(A) (1, 3) (B) (3, 4) (C) (2, 4) (D) data insufficient

21. A variable point P moves such that the chord of contact of the pair of tangent drawn to hyperbola $\frac{x^2}{16}-y^2=1$ always parallel to its tangent at (5, 3/4). The locus of P is a -

(A) straight line (B) circle (C) parabola (D) ellipse

22. The locus of centre of the ellipse sliding between two perpendicular lines is -

(A) straight line (B) circle (C) ellipse (C) hyperbola

23. If the tangent at (α, β) to the hyperbola $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ cuts the auxillary circle at points whose ordinates are y_1 & y_2, then $\frac{1}{y_2}+\frac{1}{y_2}$ is equal to -

(A) $\frac{1}{\alpha}$ (B) $\frac{2}{\alpha}$ (C) $\frac{1}{\beta}$ (D) $\frac{2}{\beta}$

16.	Ⓐ Ⓑ Ⓒ Ⓓ	17.	Ⓐ Ⓑ Ⓒ Ⓓ	18.	Ⓐ Ⓑ Ⓒ Ⓓ	19.	Ⓐ Ⓑ Ⓒ Ⓓ
20.	Ⓐ Ⓑ Ⓒ Ⓓ	21.	Ⓐ Ⓑ Ⓒ Ⓓ	22.	Ⓐ Ⓑ Ⓒ Ⓓ	23.	Ⓐ Ⓑ Ⓒ Ⓓ

24. The area of the triangle formed by the tangents drawn from point $(2, 2\sqrt{3})$ to the circle $x^2 + y^2 = 4$ & the chord of contact formed by joining the point of contact of these tangents is -

(A) $3\sqrt{3}$ (B) $\sqrt{12}$ (C) $2\sqrt{3}$ (D) 4

25. Consider the following statements :

(i) If two lines are perpendicular, then product of their slopes is –1.

(ii) If the product of the slopes of two lines is –1, then the lines are perpendicular.

(iii) If three lines $a_ix + b_iy + c_i = 0$, where i = 1, 2, 3 are concurrent, then $\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix} = 0$

(iv) If $\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix} = 0$, then the three lines given by $a_ix + b_iy + c_i = 0$, where i = 1, 2, 3 are concurrent.

If T implies that statement is true and F implies that statement is false, then for the above statements which of the following sequence of T and F is correct :

(A) TTTT (B) FTFT (C) TFTF (D) FTTF

26. If $y = 4x - 5$ is tangent to the curve $y^2 = px^3 + q$ at (2, 3), then p + q is -

(A) –5 (B) 5 (C) –9 (D) 9

27. The equation of the bisector of the obtuse angle between the lines $x - 4 = 0$ & $x - \sqrt{3}y = 0$ is -

(A) $x + \sqrt{3}y = 8$ (B) $x - \sqrt{3}y = 8$ (C) $3x + \sqrt{3}y + 8 = 0$ (D) none of these

28. Tangents are drawn from the point P(–1, 6) to the circle $x^2 + y^2 - 4x - 6y + 4 = 0$. If A and B be the points of contact of these tangents and 'O' be the centre of the circle, then area of quadrilateral PAOB is -

(A) 6 (B) 9 (C) 18 (D) $\frac{9\sqrt{3}}{4}$

29. The algebraic sum of ordinates of points of contact of the tangents drawn from the point (–2, 3) to the parabola $y^2 = 8x$ is -

(A) 6 (B) 8 (C) 10 (D) 8.5

30. The equation of the circum-circle of the triangle formed by the bisectors of the pair of lines $xy + 2 = 2x + y$ & the line y = 3 is -

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

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

24.	Ⓐ Ⓑ Ⓒ Ⓓ	25.	Ⓐ Ⓑ Ⓒ Ⓓ	26.	Ⓐ Ⓑ Ⓒ Ⓓ	27.	Ⓐ Ⓑ Ⓒ Ⓓ
28.	Ⓐ Ⓑ Ⓒ Ⓓ	29.	Ⓐ Ⓑ Ⓒ Ⓓ	30.	Ⓐ Ⓑ Ⓒ Ⓓ		

31. If ℓ, m, n $\in$ R, such that $\frac{\ell}{n}=\frac{1}{3}$, then the conic whose directrix is $\ell x + my = n$, focus (3, 0) and eccentricity $\sqrt{2}$ is -

(A) circle (B) hyperbola which is not rectangular
(C) rectangular hyperbola (D) none of these

32. A point P(3, 0) lies on a parabola, whose axis is $4x + 3y = 0$ and tangent at vertex is $3x - 4y = 5$. The distance between the focus and directrix is -

(A) 7.2 (B) 3.6 (C) 1.8 (D) data insufficient

33. If a & b are real numbers such that $3a + 4b = 25$, then minimum value of $a^2 + b^2$ is equal to -

(A) 1 (B) 5 (C) 25 (D) not defined

34. If $xy = x + y - 1$ is the combined equation of the bisectors of the pair of lines $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$, then which of the following is necessarily implied ?

(A) $h = 0$ (B) $a + b = 0$ (C) $a - b = 1$ (D) none of these

35. If the lines expressed by the equation $x^2 + 4xy - 2y^2 + 4x + 2fy + c^2 = 0$ meets at x-axis, then f is equal to -

(A) 1 (B) 2 (C) 4 (D) 8

36. Equation of chord of a circle S : $(x - 3)^2 + (y - 4)^2 = 25$, which passes through two points on the circle situated at a distance 3 units from origin, is -

(A) $2x + 3y - 3\sqrt{13} = 0$ (B) $6x + 8y = 9$
(C) $2x - 3y + 3\sqrt{13} = 0$ (D) $6x - 8y + 9 = 0$

37. The combined equation of straight lines passing through origin and perpendicular to the lines $xy + 3x + 2y + 6 = 0$ is -

(A) $xy - 3x - 2y + 6 = 0$ (B) $xy - 3x - 2y = 0$
(C) $xy = 0$ (D) none of these

38. The sides of a right angled triangle are three consecutive natural numbers, then circumradius of the triangle is -

(A) $\frac{5}{2}$ unit (B) 5 units (C) 1 unit (D) 10 units

39. Every line of the family $x(a + 2\lambda) + y(1 + 3\lambda) = (1 + 2\lambda)$ intersect the line $3x - 2y = 3$ at the same point, where λ is parameter and a is constant, then the value of a is -

(A) 0 (B) 4 (C) 2 (D) none of these

40. If for the given equation $6x^2 + 11xy - 10y^2 + x + 31y + k = 0$, there exists real x for every real y and there exists real y for every real x, then the value of 'k' is -

(A) –15 (B) 15 (C) –10 (D) 10

31.	Ⓐ Ⓑ Ⓒ Ⓓ	32.	Ⓐ Ⓑ Ⓒ Ⓓ	33.	Ⓐ Ⓑ Ⓒ Ⓓ	34.	Ⓐ Ⓑ Ⓒ Ⓓ
35.	Ⓐ Ⓑ Ⓒ Ⓓ	36.	Ⓐ Ⓑ Ⓒ Ⓓ	37.	Ⓐ Ⓑ Ⓒ Ⓓ	38.	Ⓐ Ⓑ Ⓒ Ⓓ
39.	Ⓐ Ⓑ Ⓒ Ⓓ	40.	Ⓐ Ⓑ Ⓒ Ⓓ				

41. If $\sqrt{a}+\sqrt{d}=\sqrt{c}+\sqrt{b}$ and ad = bc (where a, b, c, d > 0), then family of lines $(a^2x + b^2y + c^2) + d^2x = 0$ pass through a fixed point -

(A) (2, –2) (B) (–1, 1) (C) (–2, 2) (D) (1, –1)

42. If the angle between the pair of straight lines represented by the equation $x^2-3xy+\lambda y^2+3x-5y+2=0$ is $\tan^{-1}\left(\frac{1}{3}\right)$, where λ is a non-negative real number. Then λ is -

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

43. If the line $y=\sqrt{3}x$ cuts the curve $x^4 + ax^2y + bxy + cx + dy + 6 = 0$ at A, B, C and D, then value of OA .OB . OC . OD is, (where O is origin) -

(A) a + b + c (B) $2c^2d$ (C) 96 (D) 6

44. P is a point on the line y + 2x = 1 and Q and R are two points on the line 3y + 6x = 6 such that ΔPQR is an equilateral triangle. Then the area of triangle is -

(A) $\frac{1}{5\sqrt{5}}$ (B) $\frac{1}{5\sqrt{3}}$ (C) $\frac{2}{3\sqrt{5}}$ (D) $\frac{3}{\sqrt{5}}$

45. Any member of the family of lines (x + y – 1) + λ(2x + 3y – 2) = 0 intersects any member of the family of lines (ax + y – 2) + μ(bx + 4y – 5) = 0 at a fixed point. Then centroid of the triangle having vertices (1, –1), (3, 16), (5, 6) is -

(A) (3a – b, b – a) (B) (2a + b, a + b) (C) (a + b, 2b – a) (D) (b – a, a + b)

46. The equation of the circle which passes through the intersection of circles $x^2 + y^2 + 13x - 3y = 0$ and $2x^2 + 2y^2 + 4x - 7y - 25 = 0$ and whose centre lies on 13x + 30y = 0, is -

(A) $x^2 + y^2 + 30x - 13y - 25 = 0$ (B) $4x^2 + 4y^2 + 30x - 13y - 25 = 0$

(C) $2x^2 + 2y^2 + 30x - 13y - 25 = 0$ (D) $x^2 + y^2 + 30x - 13y + 25 = 0$

47. The parabola $y^2 = 8x$ and the circle $x^2 + y^2 = 2$ -

(A) have only two common tangents which are mutually perpendicular

(B) have only two common tangents which are neither parallel nor perpendicular

(C) have infinitely many common tangents

(D) does not have any common tangent

48. If focal chord of the parabola $y^2 = ax$ is 2x – y – 8 = 0 then the equation of directrix is -

(A) x + 4 = 0 (B) x – 4 = 0 (C) y – 4 = 0 (D) y + 4 = 0

49. Consider the family of parabolas $y = x^2 + px + q$ $(q \neq 0)$, whose graph cuts the x-axis at points A and B and y-axis at point C. The family of circles passing through the points A, B and C will have a common point -

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

41.	Ⓐ Ⓑ Ⓒ Ⓓ	42.	Ⓐ Ⓑ Ⓒ Ⓓ	43.	Ⓐ Ⓑ Ⓒ Ⓓ	44.	Ⓐ Ⓑ Ⓒ Ⓓ
45.	Ⓐ Ⓑ Ⓒ Ⓓ	46.	Ⓐ Ⓑ Ⓒ Ⓓ	47.	Ⓐ Ⓑ Ⓒ Ⓓ	48.	Ⓐ Ⓑ Ⓒ Ⓓ
49.	Ⓐ Ⓑ Ⓒ Ⓓ						

50. If $(3m_i^2, -6m_i)$ represents the feet of the normals to the parabola $y^2 = 12x$ from (1, 2), then $\sum \frac{1}{m_i}$ is -

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

51. Tangents PA and PB are drawn to circle $(x-2)^2 + (y+3)^2 = 4$ from variable point P on $xy = 1$, then the locus of circumcentre of triangle PAB is -

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

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

52. If the eccentricity of the ellipse $\frac{x^2}{a^2+2}+\frac{y^2}{a^2+5}=1$ be $\frac{1}{\sqrt{3}}$, then length of latus rectum of ellipse is -

(A) 4 (B) $\frac{18}{\sqrt{6}}$ (C) $\frac{10}{\sqrt{6}}$ (D) 8

53. Let P be a point in the first quadrant lying on the ellipse $\frac{x^2}{8}+\frac{y^2}{18}=1$. Let AB be the tangent at P to the ellipse meeting the x-axis at A and y axis at B. If O is the origin, then the minimum possible area of ΔOAB is (in square units) -

(A) 12 (B) 4 (C) 6 (D) 8

54. Number of points outside the hyperbola $3x^2 - y^2 = 48$ from where two perpendicular tangents can be drawn to the hyperbola is/are -

(A) 1 (B) 2 (C) infinite (D) none of these

55. If the normal at the point $(a\cos\alpha, b\sin\alpha)$ on $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ intersects the curve again at $(a\cos\beta, b\sin\beta)$, then -

(A) $\tan\alpha \tan\beta = -1$ (B) $\tan\alpha \tan\beta = -2$

(C) $\tan\alpha \tan\left(\frac{\alpha+\beta}{2}\right)=-\frac{a^2}{b^2}$ (D) $\tan\alpha \tan\left(\frac{\alpha+\beta}{2}\right)=-\frac{b^2}{a^2}$

56. R is a point inside the parabola $y^2 = 4x$ and it divide the line segment PQ internally in $\lambda : 1$. If P is (1, 3) and Q is (1, 1), then the range of λ is -

(A) $(1, \infty)$ (B) $(-\infty, -5/3) \cup (1, \infty)$

(C) $(5/3, \infty)$ (D) $(-5/3, 1)$

57. Let A(1, 4) and B(4, 8) are two points and $P(\alpha, \beta)$ is a point on line AB such that $\frac{AB}{AP}+\frac{BP}{AP}=1$ and AP = 15, then $\alpha + \beta$ is -

(A) 36 (B) 16 (C) 26 (D) 18

58. The common tangent of two parabolas $y = x^2$ and $y = x^2 - 2x + 2$ is -

(A) $y = 2x - 1$ (B) $4y - x + 4 = 0$ (C) $4x - 4y - 1 = 0$ (D) $y + 4x + 4 = 0$

50.	Ⓐ Ⓑ Ⓒ Ⓓ	**51.**	Ⓐ Ⓑ Ⓒ Ⓓ	**52.**	Ⓐ Ⓑ Ⓒ Ⓓ	**53.**	Ⓐ Ⓑ Ⓒ Ⓓ
54.	Ⓐ Ⓑ Ⓒ Ⓓ	**55.**	Ⓐ Ⓑ Ⓒ Ⓓ	**56.**	Ⓐ Ⓑ Ⓒ Ⓓ	**57.**	Ⓐ Ⓑ Ⓒ Ⓓ
58.	Ⓐ Ⓑ Ⓒ Ⓓ						

MULTIPLE OBJECTIVE TYPE

59. Consider the circle $x^2 + y^2 - 10x - 6y + 30 = 0$. Let O be the centre of the circle and tangents at A(7, 3) and B(5, 1) meet at C. Let S = 0 represents family of circles passing through A and B, then -

(A) area (□OACB) = 4

(B) the radical axis for the family of circle S = 0 is x + y = 10

(C) the smallest possible circle of the family S = 0 is $x^2 + y^2 - 12x - 4y + 38 = 0$

(D) the co-ordinate of point C = (7, 1)

60. The curve $y = \tan(\tan^{-1}x)$ intersects the line $L \equiv x + y = 4\sqrt{2}$ at B in first quadrant. If the line L cuts x-axis at A & O be the origin, then

(A) orthocentre of ΔOAB is $(2\sqrt{2}, 2\sqrt{2})$
(B) circum centre of ΔOAB is $(2\sqrt{2}, 0)$
(C) incentreof ΔOAB is $(2\sqrt{2}, 2\sqrt{2}(\sqrt{2}-1))$
(D) centroid of ΔOAB is $\left(2\sqrt{2}, \frac{2\sqrt{2}}{3}\right)$

61. Identify correct statement(s) about conic $\sqrt{(x-5)^2+(y-7)^2} + \sqrt{(x+1)^2+(y+1)^2} = 12$

(A) centre is (2, 3)
(B) hyperbola with foci (5, 7) and (–1, –1)
(C) equation of major axis 4x – 3y + 1 = 0
(D) $e = \frac{5}{7}$

62. Equation of common tangent(s) of $x^2 - y^2 = 12$ and xy = 8 is (are) -

(A) $y = 3x + 4\sqrt{6}$
(B) $y = -3x + 4\sqrt{6}$
(C) $3y = x + 4\sqrt{6}$
(D) $y = -3x - 4\sqrt{6}$

63. From the point of intersection of the circle $S : x^2 + y^2 - 4x + 6y + 13 = 0$ and the line $L : 2x + 5y + 11 = 0$ two tangents are drawn to the circle $x^2 + y^2 = \frac{121}{29}$, whose slopes are m_1 and m_2, then -

(A) $m_1 + m_2 = \frac{348}{5}$
(B) $m_1 . m_2 = 28$
(C) $m_1 + m_2 = -\frac{87}{35}$
(D) $m_1 . m_2 = -28$

64. A(3, 4) B(0, 0) and C(3, 0) are vertices of ΔABC. If 'P' is a point inside ΔABC such that $d(P, BC) \le \min.\{d(P, AB), d(P, AC)\}$, where d(P, BC) represents distance of P from BC, then identify correct statement -

(A) if d(P, BC) is maximum, then P is incentre of the triangle.

(B) if d(P, BC) is maximum, then P is centroid of the triangle.

(C) max. d(P, BC) = 1

(D) max. d(P, BC) $= \frac{4}{3}$

65. If the equation $ax^2 - 6xy + y^2 + bx + cy + d = 0$ represents pair of lines whose slopes are m and m^2, then value of a is/are -

(A) a = –8
(B) a = 8
(C) a = 27
(D) a = –27

59.	Ⓐ Ⓑ Ⓒ Ⓓ	**60.**	Ⓐ Ⓑ Ⓒ Ⓓ	**61.**	Ⓐ Ⓑ Ⓒ Ⓓ	**62.**	Ⓐ Ⓑ Ⓒ Ⓓ
63.	Ⓐ Ⓑ Ⓒ Ⓓ	**64.**	Ⓐ Ⓑ Ⓒ Ⓓ	**65.**	Ⓐ Ⓑ Ⓒ Ⓓ		

66. In a ΔABC $A \equiv (\alpha, \beta)$, $B \equiv (1, 2)$, $C \equiv (2, 3)$ and point A lies on line $y = 2x + 3$, where $\alpha, \beta \in I$ and area of the triangle S is such that $2 \le S < 3$. Then the coordinates of A will be -

(A) (–6, –9) (B) (–7, –11) (C) (2, 7) (D) (3, 9)

67. The lines $x + y - 1 = 0$, $(m - 1)x + (m^2 - 7)y - 5 = 0$ and $(m - 2)x + (2m - 5)y = 0$ are -

(A) concurrent for three values of m (B) concurrent for no value of m

(C) parallel for one value of m (D) parallel for two values of m

68. Equation of two equal sides of a triangle are the line $7x + 3y - 20 = 0$ and $3x + 7y - 20 = 0$ and the third side passes through the point (–3, 3), then the equation of third side can be -

(A) $x + y = 0$ (B) $x - y + 6 = 0$ (C) $x + 3 = 0$ (D) $y = 3$

69. If (a, 0) is a point on a diameter of the circle $x^2 + y^2 = 4$, then the equation $x^2 - 6x - a^2 = 0$ has -

(A) exactly one real root in (–1, 0] (B) distinct roots greater than –1

(C) exactly one real root in [3, 7] (D) distinct roots less than 7

70. If two distinct chords of a parabola $x^2 = 4ay$ passing through (2a, a) are bisected on the line $x + y = 1$, then length of latus rectum can be -

(A) 2 (B) 1 (C) 4 (D) 5

71. Tangents are drawn from the point $(\alpha, 3)$ to the circle $2x^2 + 2y^2 = 25$ will be perpendicular to each other if α equals -

(A) 5 (B) –4 (C) 4 (D) –5

72. If the area of the quadrilateral formed by the tangents from the origin to the circle $x^2+y^2+6x-8y+\lambda= 0$ and the pair of radii at the point of contact of these tangent to the circle is $2\sqrt{6}$ sq. units then the value of λ must be -

(A) 24 (B) $4\sqrt{6}$ (C) 1 (D) $8\sqrt{6}$

73. For the curve $5(x - 1)^2 + 5(y - 2)^2 = 3(2x + y - 1)^2$ which of the following is true -

(A) an hyperbola with eccentricity $\sqrt{3}$ (B) an hyperbola with directrix $2x + y - 1 = 0$

(C) an hyperbola with focus (1, 2) (D) an hyperbola with focus (2, 1)

74. The equation of common tangent of hyperbola $9x^2 - 9y^2 = 8$ and the parabola $y^2 = 32x$ is/are -

(A) $9x + 3y - 8 = 0$ (B) $9x - 3y + 8 = 0$ (C) $9x + 3y + 8 = 0$ (D) $9x - 3y - 8 = 0$

75. If the normal at point P to the rectangular hyperbola $x^2 - y^2 = 4$ meets the transversal and conjugate axes at A and B respectively and C is the centre of the hyperbola, then -

(A) PA = PC (B) PA = PB (C) PB = PC (D) AB = 2PC

66.	Ⓐ Ⓑ Ⓒ Ⓓ	**67.**	Ⓐ Ⓑ Ⓒ Ⓓ	**68.**	Ⓐ Ⓑ Ⓒ Ⓓ	**69.**	Ⓐ Ⓑ Ⓒ Ⓓ
70.	Ⓐ Ⓑ Ⓒ Ⓓ	**71.**	Ⓐ Ⓑ Ⓒ Ⓓ	**72.**	Ⓐ Ⓑ Ⓒ Ⓓ	**73.**	Ⓐ Ⓑ Ⓒ Ⓓ
74.	Ⓐ Ⓑ Ⓒ Ⓓ	**75.**	Ⓐ Ⓑ Ⓒ Ⓓ				

76. From the intersection point of the circle $x^2 + y^2 = 9$ and the line $y = 2x$ perpendicular is drawn to the major axis of the ellipse $\frac{x^2}{9}+\frac{y^2}{4}=1$, which meets the ellipse at point M, then equation of tangent at M to the ellipse is/are -

(A) $x + 3y - 3\sqrt{5} = 0$ (B) $4x + 3y - \sqrt{5} = 0$ (C) $x + 3y + 3\sqrt{5} = 0$ (D) $4x + 3y + \sqrt{5} = 0$

77. $\left|\sqrt{(x-4)^2+(y-2)^2}-\sqrt{(x+4)^2+(y+2)^2}\right|=4$ is equation of -

(A) an ellipse with centre (0,0)
(B) a hyperbola with centre (0,0)
(C) a conic section whose eccentricity is $\sqrt{5}$
(D) a conic whose auxillary circle is $x^2 + y^2 = 4$

78. The real values of m for which the circles $x^2 + y^2 + 4x + 2(m^2 + m)y + 6 = 0$ and $x^2 + y^2 + (2y + 1)(m^2 + m) = 0$ intersect orthogonally -

(A) 1 (B) –1 (C) 2 (D) –2

79. If PQ is a chord of parabola $x^2 = 4y$ which subtends right angle at vertex. Then locus of centroid of triangle PSQ (S is focus) is a parabola whose -

(A) vertex is (0, 3)
(B) length of LR is 4/3
(C) axis is x = 0
(D) tangent at the vertex is x = 3

COMPREHENSION

Paragraph for Question 80 to 82

Let $S : 4x^2 - 4x - 24y + 49 = 0$ is a parabola and $S_1 = 0$ represent locus of middle point of chords of parabola $S = 0$, which passes through origin. L_1 & L_2 are the tangents for $S = 0$ and normals for $x^2 + y^2 = 72$

On the basis of above informations, answer the following questions :

80. Identify the **incorrect** statement about S = 0 -

(A) vertex is $\left(\frac{1}{2}, 2\right)$ (B) latus rectum is 6 (C) directrix is y = 1/2 (D) focus is $\left(\frac{1}{2}, \frac{9}{2}\right)$

81. $S_1 = 0$ is -

(A) an ellipse
(B) a circle
(C) a parabola whose axis is parallel to y-axis
(D) a parabola whose axis is parallel to x-axis

82. Sum of the slopes of L_1 and L_2 is -

(A) $\frac{7}{3}$ (B) $-\frac{7}{3}$ (C) $-\frac{1}{3}$ (D) $-\frac{4}{3}$

76.	Ⓐ Ⓑ Ⓒ Ⓓ	77.	Ⓐ Ⓑ Ⓒ Ⓓ	78.	Ⓐ Ⓑ Ⓒ Ⓓ	79.	Ⓐ Ⓑ Ⓒ Ⓓ
80.	Ⓐ Ⓑ Ⓒ Ⓓ	81.	Ⓐ Ⓑ Ⓒ Ⓓ	82.	Ⓐ Ⓑ Ⓒ Ⓓ		

Paragraph for Question 83 to 85

A ray of light strikes a line mirror y = 0 along the line $L_1 : x - 3y = 1$ and reflects along the line $L_2 = 0$. There is another line mirror $x - 4 = 0$ in the way of reflected ray. After 2nd reflection ray moves along the line $L_3 = 0$ and finally it travels in the direction of the line $L_4 = 0$ after 3rd reflection from line mirror $y + 2 = 0$.

On the basis of above informations, answer the following questions :

83. Equation of the line $L_4 = 0$ is -

(A) $x - 3y = 7$ (B) $x + 3y = 1$ (C) $x + 3y + 5 = 0$ (D) $x + 3y - 5 = 0$

84. Area of the closed figure so formed is -

(A) 6 sq. units (B) 12 sq. units (C) 24 sq. units (D) 36 sq. units

85. Equation of the circle inscribed in the closed figure is -

(A) $(x-1)^2 + (y+1)^2 = \frac{3}{10}$ (B) $(x-1)^2 + (y+1)^2 = \frac{9}{10}$

(C) $(x-1)^2 + (y+\frac{1}{2})^2 = \frac{3}{10}$ (D) $(x-1)^2 + (y+\frac{1}{2})^2 = \frac{9}{10}$

Paragraph for Question 86 to 88

A point P moves in x-y plane such that sum of square of its distances from two intersecting lines is $x^2 - 3y^2 = 0$ is always 12. Let the locus of point P be $C_1 \equiv \frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$.

Consider another curve $C_2 \equiv bx^2 - b^2a = a^2b - ay^2$. A tangent to the curve C_1 at point P meets the curve C_2 at A & B. The tangents at A & B to the curve C_2 meets at point R.

On the basis of above informations, answer the following questions :

86. The value of eccentricity for curve C_1 is -

(A) 1 (B) $\frac{1}{\sqrt{3}}$ (C) $\sqrt{\frac{2}{3}}$ (D) $\frac{1}{\sqrt{6}}$

87. The distance of the point R from the origin -

(A) $2\sqrt{6} + 2\sqrt{2}$ (B) $16 - 8\sqrt{3}$ (C) $16 + \sqrt{3}$ (D) $16 - \sqrt{3}$

88. The tangent at the point P with eccentric angle $\frac{\pi}{4}$ to curve C_1 meets the directrix at F then the angle subtended by portion of tangent between point of contact & directrix at corresponding focus is -

(A) 30° (B) 45° (C) 60° (D) 90°

Paragraph for Question 89 to 91

Consider the following curves.

$C_1 : y^2 = 4x$

$C_2 : y^2(a + bx) = (a + cx)^2$, a, b, c $\in I^+$

where C_2 is the locus of the family of circles which passes through focus of C_1 and cuts C_1 orthogonally.

On the basis of above information, answer the following questions :

83. Ⓐ Ⓑ Ⓒ Ⓓ	84. Ⓐ Ⓑ Ⓒ Ⓓ	85. Ⓐ Ⓑ Ⓒ Ⓓ	86. Ⓐ Ⓑ Ⓒ Ⓓ
87. Ⓐ Ⓑ Ⓒ Ⓓ	88. Ⓐ Ⓑ Ⓒ Ⓓ		

89. The value of a + b + c is -
(A) 3 (B) 4 (C) 5 (D) 6

90. The area bounded by the curve C_2 & the ordinates $x = -\frac{1}{3}$ and x = 1 -
(A) $\frac{11\sqrt{3}}{9}$ (B) $\frac{20\sqrt{3}}{9}$ (C) $\frac{\sqrt{3}}{9}$ (D) none of these

91. If the tangents to the curve C_1 at P(1, 2) and Q(4, –4) meets at point R, if the area of triangle PQR is A then [A], (where [.] is greatest integer function), is -
(A) 5 (B) 10 (C) 12 (D) 13

Paragraph for Question 92 to 94

A rectangle PQRS is inscribed in a circle C with centre O and a diameter along the line 2y – 4x = 9. P and Q are the points (–8, –2) and (4, –2) respectively. Let a circle C_1 be drawn taken RS as the diameter.

On the basis of above information, answer the following :

92. Area of rectangle PQRS is -
(A) 24 (B) 36 (C) 60 (D) 90

93. If m_1 & m_2 are the finite slopes of tangent to circle C_1 from P & Q respectively, then the value of $|m_1| + |m_2|$ is -
(A) $\frac{11}{60}$ (B) $\frac{11}{30}$ (C) $\frac{11}{15}$ (D) $\frac{11}{4}$

94. A line through (7, 5) at maximum distance from point O will have slope equal to -
(A) 1 (B) $\frac{1}{2}$ (C) –1 (D) –2

Paragraph for Question 95 to 97

Let ABC be a triangle whose vertex A is (3, 4). $L_1 = 0$ and $L_2 = 0$ are the internal angle bisectors of angles B and C respectively, where $L_1 \equiv x + y - 2 = 0$, $L_2 \equiv 2x + y - 5 = 0$. Let A_1 is the image of point A about line L_1.
On the basis of above information answer the following :

95. Co-ordinate of point A_1 is -
(A) (2, 1) (B) (–2, –1) (C) (2, –1) (D) (–1, –2)

96. Slope of side BC is -
(A) 3 (B) $-\frac{1}{3}$ (C) $\frac{1}{3}$ (D) –3

97. Inradius of triangle ABC is -
(A) $\sqrt{10}$ (B) $2\sqrt{10}$ (C) $\frac{3}{2}\sqrt{10}$ (D) $\frac{5}{2}\sqrt{10}$

89.	Ⓐ Ⓑ Ⓒ Ⓓ	**90.**	Ⓐ Ⓑ Ⓒ Ⓓ	**91.**	Ⓐ Ⓑ Ⓒ Ⓓ	**92.**	Ⓐ Ⓑ Ⓒ Ⓓ
93.	Ⓐ Ⓑ Ⓒ Ⓓ	**94.**	Ⓐ Ⓑ Ⓒ Ⓓ	**95.**	Ⓐ Ⓑ Ⓒ Ⓓ	**96.**	Ⓐ Ⓑ Ⓒ Ⓓ
97.	Ⓐ Ⓑ Ⓒ Ⓓ						

Paragraph for Question 98 to 100

Let $B_1 \equiv 3x + 4y - 10 = 0$ and $B_2 \equiv 4x - 3y - 5 = 0$ are bisectors of angle between lines $L_1 = 0$ and $L_2 = 0$. If L_1 passes through origin and $L_2 = 0$ meets the curve $y^2 = 4ax$ at A and B.

On the basis of above information answer the following :

98. Equation of line $L_1 = 0$ is -

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

99. Equation of line $L_2 = 0$ is -

(A) $11x + 2y = 24$ (B) $11x - 2y = 20$ (C) $5x + 3y = 13$ (D) $3x + 5y = 10$

100. If AB subtends 90° at origin then a is equal to -

(A) $\frac{4}{11}$ (B) $\frac{3}{11}$ (C) $\frac{5}{11}$ (D) $\frac{2}{11}$

Paragraph for Question 101 to 103

Through point O a straight line L_1 is drawn to cut two given straight lines $3x + 4y - 5 = 0$ and $x + 2y - 3 = 0$ at the points L & M, where O is origin.

On the basis of above information answer the following :

101. Locus of a point N on a variable line if ON is the A.M. of OL and OM is -

(A) $3x^2 + 8y^2 + 10xy - 7x - 11y = 0$ (B) $8x^2 + 3y^2 - 10xy - 7x - 11y = 0$

(C) $8x^2 + 3y^2 - 10xy + 7x + 11y = 0$ (D) $3x^2 + 8y^2 - 10xy + 7x + 11y = 0$

102. The equation of line L_1 if OL : OM is equal to 5 : 3 is -

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

103. The equation of the angle bisector between two given lines which will contain the point (2, 3) is -

(A) $(3+\sqrt{5})x + 2(2-\sqrt{5})y + \sqrt{5}(3+\sqrt{5}) = 0$ (B) $(3-\sqrt{5})x + 2(2-\sqrt{5})y + \sqrt{5}(3-\sqrt{5}) = 0$

(C) $(3+\sqrt{5})x + 2(2+\sqrt{5})y + \sqrt{5}(3+\sqrt{5}) = 0$ (D) $(3-\sqrt{5})x - 2(2+\sqrt{5})y - \sqrt{5}(3-\sqrt{5}) = 0$

Paragraph for Question 104 to 106

Normals are drawn at the end points of the ordinate PQ of parabola $y^2 = 4x$ intersects at x-axis at point $R(x_1, 0)$ and tangents drawn at P & Q intersects at x-axis at point $T(x_2, 0)$.

On the basis of above information answer the following :

104. If $x_1 = 3$, then area of the quadrilateral PTQR is (in sq. units)

(A) 4 (B) 8 (C) 16 (D) 6

105. If $x_1 = 11$ and quadrilateral PTQR can be inscribed in a circle, then the circumference of circle will be -

(A) 10π (B) 4π (C) 80π (D) 20π

106. The number of normals that can be drawn to the parabola from $R(x_1, 0)$ will be -

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

98. Ⓐ Ⓑ Ⓒ Ⓓ **99.** Ⓐ Ⓑ Ⓒ Ⓓ **100.** Ⓐ Ⓑ Ⓒ Ⓓ **101.** Ⓐ Ⓑ Ⓒ Ⓓ
102. Ⓐ Ⓑ Ⓒ Ⓓ **103.** Ⓐ Ⓑ Ⓒ Ⓓ **104.** Ⓐ Ⓑ Ⓒ Ⓓ **105.** Ⓐ Ⓑ Ⓒ Ⓓ
106. Ⓐ Ⓑ Ⓒ Ⓓ

Paragraph for Question 107 to 109

Let ABC be a triangle equation of whose sides are $AB \equiv x + 2y = 3$, $AC \equiv 2x + y = 3$, and $BC \equiv x + y = 4$. Circles S_1, S_2 and S_3 are drawn taking AB, AC and BC as diameter respectively. Now $L_{12} = 0$, $L_{31} = 0$ and $L_{23} = 0$ are the radical axis of S_1 and S_2, S_3 and S_1, and S_2 and S_3 respectively. These radical axis intersects the sides BC, AC and AB at points D, E and F respectively.

On the basis of above information answer the following :

107. Equation of $L_{12} = 0$ is -

(A) $x - y = 2$ (B) $2x + 3y = 5$ (C) $x - y = 0$ (D) $2x - 3y = 1$

108. A parabola is drawn taking vertex A as vertex and $x + 1 = 0$ as directrix then focus of the parabola will lie on -

(A) AB (B) BC (C) AC (D) inside the ΔABC

109. Radical centre of S_1, S_2 and S_3 will be -

(3, – 3) (B) (– 3, – 3) (C) (– 7, – 7) (D) (3, 3)

Paragraph for Question 110 to 112

Consider the two points A(3, 7) and B(6, 5). Family of circles S is drawn passing through these two points. A circle C is also given whose equation is $x^2 + y^2 - 4x - 6y - 3 = 0$.

On the basis of above information answer the following :

110. The common chord of the circle C and family of circle S will always pass through the point -

(A) $\left(\frac{23}{2}, 3\right)$ (B) $\left(2, \frac{23}{3}\right)$ (C) $\left(3, \frac{23}{2}\right)$ (D) $\left(\frac{23}{3}, 3\right)$

111. Equation of the member of the family S which bisects the circumference of C is -

(A) $x^2 + y^2 - 5x + 6y - 1 = 0$ (B) $x^2 + y^2 - 5x + 6y + 1 = 0$

(C) $x^2 + y^2 - 5x - 6y - 1 = 0$ (D) $x^2 + y^2 + 5x - 6y + 1 = 0$

112. If O is origin and P is the centre of C, then difference of the squares of the length of the tangents from A and B to the circle C is equal to -

(A) AB^2 (B) OP^2 (C) $|AP^2 - BP^2|$ (D) none of these

107. (A) (B) (C) (D) **108.** (A) (B) (C) (D) **109.** (A) (B) (C) (D) **110.** (A) (B) (C) (D)

111. (A) (B) (C) (D) **112.** (A) (B) (C) (D)

Paragraph for Question 113 to 115

Consider an ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ (a > b) whose eccentricity is e_1 and there is another ellipse with eccentricity e_2 which is concentric to the given ellipse. Focus of these ellipse are such that focus of the one lie on the other and length of their major axis are also equal (where foci of first ellipse are S & S' and foci of other are H & H')

On the basis of above information answer the following :

113. The value of H'S' + HS' is -

(A) a (B) 2a (C) 4a (D) 6a

114. If the angle between the axes be θ, then the maximum value of HS' is -

(A) $a(e_1 + e_2)$ (B) $a(e_1 - e_2)$ (C) $2a(e_1 + e_2)$ (D) $a|e_2 - e_1|$

115. If the angle between the axes be θ, then the minimum value of HS is -

(A) $a^2(e_1^2+e_2^2)$ (B) $a\sqrt{e_1^2+e_2^2}$ (C) $a|e_1 - e_2|$ (D) $a(e_1 + e_2)$

Paragraph for Question 116 to 118

An asymptote to a curve is a straight line which tends to be become tangent when point of contact approaches to infinity.

Let the equation of hyperbola is S = 0, then the equation of its asymptotes is S + λ = 0, which will be pair of lines.

On the basis of above information answer the following :

116. The equation of hyperbola whose asymptotes are the lines 3x – 4y + 7 = 0 and 4x + 3y + 1 = 0 and which passes through point (2, 3) is -

(A) $12x^2 - 12y^2 - 7xy + 31x + 17y = 0$ (B) $12x^2 - 12y^2 + 7xy + 31x + 17y + 25 = 0$

(C) $12x^2 - 12y^2 + 7xy - 31x - 17y - 11 = 0$ (D) $12x^2 - 12y^2 - 7xy + 31x + 17y - 11 = 0$

117. The centre of a rectangular hyperbola is (1, 2) and its asymptotes are parallel to lines x + y = 2 and x – y = 3, then the equation of asymptotes are -

(A) (x + y – 3)(x + y – 1) = 0 (B) (x + y – 3)(x – y + 1) = 0

(C) (x + y + 3)(x – y + 1) = 0 (D) (x + y + 3)(x – y – 1) = 0

118. The product of perpendiculars from any point on the hyperbola $\frac{x^2}{16}-\frac{y^2}{25}=1$ to its asymptotes is equal to -

(A) $\frac{20}{9}$ (B) $\frac{400}{9}$ (C) $\frac{20}{41}$ (D) $\frac{400}{41}$

113. Ⓐ Ⓑ Ⓒ Ⓓ **114.** Ⓐ Ⓑ Ⓒ Ⓓ **115.** Ⓐ Ⓑ Ⓒ Ⓓ **116.** Ⓐ Ⓑ Ⓒ Ⓓ

117. Ⓐ Ⓑ Ⓒ Ⓓ **118.** Ⓐ Ⓑ Ⓒ Ⓓ

Paragraph for Question 119 to 121

Consider an ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ (a > b)

Let P(acosθ, bsinθ) be any point on the ellipse in the first quadrant at which tangent is drawn which meets the major axis and minor axis at A and B respectively.

On the basis of above information answer the following :

119. The eccentric angle θ of point P if P divides AB in the ratio of 1 : 3 will be -

(A) $\frac{\pi}{3}$ (B) $\frac{\pi}{6}$ (C) $\frac{\pi}{4}$ (D) $\frac{\pi}{8}$

120. If distance AB is minimum, then θ is equal to -

(A) $\tan^{-1}\sqrt{\frac{a}{b}}$ (B) $\tan^{-1}\sqrt{\frac{b}{a}}$ (C) $\tan^{-1}\frac{a}{b}$ (D) $\tan^{-1}\frac{b}{a}$

121. Locus of mid point of AB is -

(A) $\frac{a^2}{x^2}-\frac{b^2}{y^2}=4$ (B) $\frac{a^2}{x^2}+\frac{b^2}{y^2}=4$ (C) $\frac{b^2}{x^2}+\frac{a^2}{y^2}=4$ (D) $\frac{b^2}{x^2}-\frac{a^2}{y^2}=4$

Paragraph for Question 122 to 124

Straight lines 3x + 4y = 5 and 4x – 3y = 15 intersect at A. Points B and C are chosen on these lines such that AB = AC. (1, 2) is a point on the line BC. Distance of BC from A is less than 2.

On the basis of above information answer the following :

122. The area of ΔABC is -

(A) 2.24 (B) 2.42 (C) 2 (D) $\frac{11}{5\sqrt{2}}$

123. Circumcentre of ΔABC is -

(A) $\left(\frac{73}{25},-\frac{61}{25}\right)$ (B) $\left(\frac{73}{14},-\frac{31}{14}\right)$ (C) $\left(\frac{24}{7},-\frac{3}{7}\right)$ (D) none of these

124. Internal angle bisector of angle A of ΔABC is -

(A) x + 7y – 10 = 0 (B) 7x + 7y – 20 = 0 (C) x – 7y – 10 = 0 (D) x – 7y + 13 = 0

Paragraph for Question 125 to 127

Locus of the centroids of equilateral triangle inscribed in the parabola $y^2 = 9x$ is a conic section S = 0.

On the basis of above information answer the following :

125. Length of latus rectum of S = 0 is -

(A) $\frac{1}{2}$ (B) 1 (C) 2 (D) $\frac{1}{4}$

119. (A) (B) (C) (D) **120.** (A) (B) (C) (D) **121.** (A) (B) (C) (D) **122.** (A) (B) (C) (D)

123. (A) (B) (C) (D) **124.** (A) (B) (C) (D) **125.** (A) (B) (C) (D)

126. Locus of point of intersection of perpendicular tangents of S = 0 is -

(A) $4x - 71 = 0$ (B) $x^2 + y^2 - 16x = 0$ (C) $4x - 1 = 0$ (D) $x^2 + y^2 = 16$

127. Chord of contact of pair of tangents drawn from origin to S = 0 meet x-axis at $(\alpha, 0)$, then α is -

(A) 18 (B) 30 (C) 45 (D) 36

Paragraph for Question 128 to 130

Tangents are drawn from a variable point P to the ellipse $x^2 + 4y^2 = 4$ meeting it at Q & R. So QR is chord of contact of pair of tangents drawn from P.

On the basis of above information answer the following :

128. If the sum of inclination of PQ and PR is constant ($\neq 90°$), then the locus of P is a -

(A) hyperbola (B) ellipse (C) parabola (D) circle

129. If angle between PQ & PR is 45°, then locus of P is -

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

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

130. If PQ & PR are perpendicular and the locus of mid point of QR is $(x^2 + y^2) = \lambda(x^2 + 4y^2)^2$, then λ is equal to -

(A) 5/8 (B) 5 (C) 16 (D) 5/16

MATCH THE COLUMN

131.

	Column-I		Column-II
(A)	If end points of latus rectum of a parabola are (2, 6) and (6, 2) and possible equation of its directrix is $x + y = \lambda_i$, where i = 1, 2, then $\lambda_1 + \lambda_2$ is equal to	(P)	4
(B)	Product of lengths of the perpendiculars drawn from (–3, 0) and (3, 0) to the line $mx - y = \sqrt{25m^2 + 16}$ is	(Q)	8
(C)	A ray of lights is moving along the line y = 8 and strikes the inner surface of the parabolic mirror $y^2 = 8x$. After reflection it moves along the line $L_1 = 0$ and again strikes and reflects along $L_2 = 0$. If equation of L_2 is $ax + 2y + c = 0$, then a + 2c is equal to	(R)	16
(D)	The greatest value of $f(x) = 2x^3 - 3x^2 - 12x + 1$ on $\left[-2, \frac{5}{2}\right]$ is equal to	(S)	2

126. (A) (B) (C) (D) 127. (A) (B) (C) (D) 128. (A) (B) (C) (D) 129. (A) (B) (C) (D)

130. (A) (B) (C) (D) 131. (A) (P) (Q) (R) (S) (T)
(B) (P) (Q) (R) (S) (T)
(C) (P) (Q) (R) (S) (T)
(D) (P) (Q) (R) (S) (T)

132. **Column-I** **Column-II**

(A) The angle bisector of $\angle A$ in the ΔABC, where A(–8, 5), B(–15, –19) and C(1, –7) is $13x + by + c = 0$, then the value of b + c is equal to — (P) 6

(B) If the line passing through $P\left(\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}\right)$ and with slope 1 intersects the curve $2x^2 + xy - 1 = 0$ at the point A and B, then $\left|\frac{1}{PA} - \frac{1}{PB}\right|$ is equal to — (Q) 1

(C) If the lines $x + ay + a = 0$, $bx + y + b = 0$ and $cx + cy + 1 = 0$ (a, b, c being distinct $\neq 1$) are concurrent, then the value of $\frac{a}{a-1} + \frac{b}{b-1} + \frac{c}{c-1}$ — (R) 24

(D) If the vertices of a quadrilateral is given by $(x^2 - 9)^2 + (y^2 - 4)^2 = 0$, then area of quadrilateral is — (S) 128

133. **Column-I** **Column-II**

The set of values of 'a' for which

(A) Point (a, 2) lies inside the triangle formed by the lines x = 0, x + y = 4 and x – y = 4 is/are — (P) $(-4, -3]$

(B) Point $(2a - 5, a^2)$ is on the same side of the line x + y = 3 as that of (1, 1) is/are — (Q) $(-3, 0) \cup \left(\frac{1}{3}, 1\right)$

(C) Point (a, 2) lies between the lines x – y = 1 and 2(x – y) + 5 = 0 is/are — (R) (0, 2)

(D) Point $(a^2, a + 1)$ lies between the angles of the lines 3x – y + 1 = 0 and x + 2y – 5 = 0 which contains origin is/are — (S) $\left(-\frac{1}{2}, 3\right)$

134. **Column-I** **Column-II**

(A) The number of point (s) (x , y) (where x and y both are perfect squares of integers) on the parabola $y^2 = px$, p being a prime number, is — (P) 8

(B) If AFB is a focal chord of the parabola $y^2 = 4ax$ and AF = 2, FB = 6 then the length of latus rectum will be (where F is focus of parabola) — (Q) 1

(C) The coordinates of the point on the parabola $y = x^2 + 7x + 2$, which is nearest to the straight line y = 3x – 3 is (a, b) then 2a – b is equal to. — (R) 4

(D) The value of 'a' for which at least one tangent to the parabola $y^2 = 4ax$ becomes normal to the circle $x^2 + y^2 - 2ax - 4ay + 3a^2 = 0$ is/are — (S) 6

132.						133.						134.					
(A)	P	Q	R	S	T	(A)	P	Q	R	S	T	(A)	P	Q	R	S	T
(B)	P	Q	R	S	T	(B)	P	Q	R	S	T	(B)	P	Q	R	S	T
(C)	P	Q	R	S	T	(C)	P	Q	R	S	T	(C)	P	Q	R	S	T
(D)	P	Q	R	S	T	(D)	P	Q	R	S	T	(D)	P	Q	R	S	T

135. Column-I | **Column-II**

(A) If the circumference of the circle $x^2 + y^2 + 6x + 6y - b = 0$ is bisected by the circle $x^2 + y^2 - 4x + 2y + a = 0$, then $|a + b|$ is equal to — (P) 20

(B) The point of intersection of the tangents of the circle $x^2 + y^2 = 10$, drawn at end points of the chord $x + y = 2$ is (a, b) then the value of $a^2 + b^2$ is equal to — (Q) 26

(C) The intercept on the line $y = 2x$ by the circle $x^2 + y^2 - 5x = 0$ is AB. If the equation of the circle with AB as diameter is $x^2 + y^2 - ax - by = 0$ then the value of $2a + 9b$ is equal to — (R) 50

(D) If the equation of the locus of the middle points of the chords of the circle $2x^2 + 2y^2 - 6x + 2y + 1 = 0$ that subtends an angle 120° at the centre is $x^2 + y^2 - ax - by + 2 = 0$ then $a^3 + b^3$ is equal to — (S) 42

136. Column-I | **Column-II**

(A) The eccentricity of the hyperbola whose asymptotes are $3x + 4y - 2 = 0$ and $4x - 3y + 5 = 0$ is — (P) 2

(B) The normal at any point P of a hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ of eccentricity 2 intersects its transverse and conjugate axis at L and M respectively. If locus of the mid point of L and M is a conic, then eccentricity of the conic is — (Q) $\sqrt{2}$

(C) The number of real tangents that can be drawn to the ellipse $3x^2 + 5y^2 = 32$ from point (5, 3) is — (R) 3

(D) If one of the asymptotes of the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ makes an angle of 30° with the positive x-axis, then the eccentricity of the hyperbola is — (S) $\frac{2}{\sqrt{3}}$

135.
(A) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ
(B) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ
(C) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ
(D) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ

136.
(A) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ
(B) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ
(C) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ
(D) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ

137. **Column-I** **Column-II**

	Column-I		Column-II
(A)	The coordinates of the point, which is at shortest distance from the line $x + y = 7$ and lying on the ellipse $x^2 + 2y^2 = 6$ are (a, b), then a + b is equal to	(P)	$\frac{25}{3}$
(B)	The maximum distance of the centre of the ellipse $\frac{x^2}{16}+\frac{y^2}{9}=1$ from the chord of contact of two mutually perpendicular tangents of the ellipse is $\frac{a}{b}$, then value of $a - 2b$ is equal to, where a & b are coprime numbers.	(Q)	3
(C)	A normal to the hyperbola $\frac{x^2}{4}-\frac{y^2}{1}=1$ have equal intercepts on positive x and y axes. If the normal touches the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$, then $a^2 + b^2$ is equal to	(R)	4
(D)	The length of the latus rectum of the hyperbola $xy - 3x - 3y + 7 = 0$ is	(S)	6

138. Consider the hyperbola $3x^2 - y^2 - 24x + 4y - 4 = 0$.

	Column-I		Column-II
(A)	If centre of the hyperbola is (a, b), then a + b is equal to	(P)	12
(B)	Length of semi latus rectum is	(Q)	9
(C)	If e_2 is eccentricity of its conjugate hyperbola, then $9e_2^2$ is equal to	(R)	15
(D)	If foci are (a, b) & (c, d), then (a + b + c + d) is equal to	(S)	6

139.

	Column-I		Column-II
(A)	If line $3x - 4y = 9$ intersect the circle $x^2 + y^2 - 6x - 10y = 46$ at A and B, then AB is equal to	(P)	25
(B)	Value of $9m^2$ for which $y = mx + 2\sqrt{5}$ touches $16x^2 - 9y^2 = 144$ is	(Q)	48
(C)	The chords of contacts of pair of tangents drawn from each point on the line $7x + 24y = 1$ to the circle $x^2 + y^2 = 1$ pass through a fixed point P, then OP is {O is origin}	(R)	36
(D)	If the normal at any point P of the ellipse $16x^2 + 25y^2 = 400$ meet the major axis at A and OF is the perpendicular upon this normal from centre O, then PF. PA is equal to	(S)	16

137.
(A) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ
(B) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ
(C) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ
(D) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ

138.
(A) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ
(B) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ
(C) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ
(D) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ

139.
(A) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ
(B) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ
(C) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ
(D) Ⓟ Ⓠ Ⓡ Ⓢ Ⓣ

INTEGER TYPE / SUBJECTIVE TYPE

140. If the locus of the point from where two of three normals to the curve $y^2 + 2y - 4x + 5 = 0$ are perpendicular is $\left(y-\frac{k}{2}\right)^2-(x-\lambda)=0$, then find the value of $\lambda - 2k$.

141. P(a, b), Q(c, d) & R(e, f) are three points satisfying the inequality $x^2 + y^2 - 6x - 8y < 0$, where a, b, c, d, e, & $f \in I$, such that P is situated at least distance while Q & R are situated at greatest distance from the point A(–2, 4). Now internal bisector of angle P of triangle PQR intersects the tangents to the circle $x^2 + y^2 - 6x - 8y = 0$ drawn at origin and $\left(\frac{c+e}{2}+1,\ b\right)$. If area of the triangle formed by these three lines (two tangents and internal bisector of angle P) is Δ, then find the value of 3Δ.

140.

141.

ANSWER KEY

1. D	2. C	3. A	4. A	5. D	6. A	7. B	8. A	9. D	10. A
11. C	12. C	13. C	14. C	15. C	16. C	17. D	18. A	19. D	20. C
21. A	22. B	23. D	24. A	25. D	26. A	27. A	28. B	29. A	30. D
31. D	32. B	33. C	34. A	35. C	36. B	37. C	38. A	39. D	40. A
41. B	42. A	43. C	44. B	45. D	46. B	47. A	48. B	49. B	50. A
51. B	52. A	53. A	54. D	55. D	56. A	57. C	58. C	59. A,C,D	

60. A,B,C,D	61. A,C	62. B,D	63. A,D	64. A,C
65. B,D	66. A,B,C,D	67. B,C	68. A,B	69. A,B,C,D
70. A,B	71. B,C	72. A,C	73. A,B,C	74. B,C
75. A,B,C,D	76. A,C	77. B,C,D	78. A,D	79. A,B,C

80. D	81. C	82. C	83. C	84. A	85. B	86. C	87. A	88. D	89. D
90. B	91. C	92. C	93. B	94. D	95. B	96. A	97. C	98. A	99. B
100. C	101. A	102. C	103. B	104. B	105. D	106. C	107. C	108. D	109. C
110. B	111. C	112. C	113. B	114. A	115. C	116. D	117. B	118. D	119. B
120. B	121. B	122. B	123. A	124. C	125. B	126. A	127. D	128. A	129. B
130. D									

131. (A)→(R), (B)→(R), (C)→(Q), (D)→(Q)

132. (A)→(S); (B)→(P); (C)→(Q); (D)→(R)

133. (A)→(R); (B)→(P,Q,R); (C)→(S); (D)→(Q)

134. (A)→(Q); (B)→(S); (C)→(R), (D)→ (P,Q,R,S)

135. (A) → (S); (B) → (R); (C) → (P); (D) → (Q)

136. (A) → (Q), (B) → (S), (C) → (P), (D) → (S)

137. (A) → (Q), (B) → (S), (C) → (P), (D) → (R)

138. (A) → (S), (B) → (P), (C) → (P), (D) → (P)

139. (A) → (S), (B) → (R), (C) → (P), (D) → (S)

140. 8 141. 200

Important Notes