

MISSION NDA MATHEMATICS

COMPLETE TOPICWISE QUESTIONS

ELLIPSE

- The eccentricity of the ellipse $\frac{x^2}{255} + \frac{y^2}{289} = 1$ is
(a) $\frac{17}{8}$ (b) $\frac{8}{17}$
(c) $\frac{3}{4}$ (d) $\frac{4}{3}$
- If the major axis of an ellipse is 3 times its minor axis, then its eccentricity is
(a) $\frac{2}{3}$ (b) $\frac{\sqrt{2}}{3}$
(c) $\frac{2\sqrt{2}}{3}$ (d) $\frac{4\sqrt{2}}{3}$
- If the distance between the foci of an ellipse is equal to its minor axis, then eccentricity of the ellipse is
(a) $\frac{1}{\sqrt{2}}$ (b) $\frac{1}{\sqrt{3}}$
(c) $\frac{1}{\sqrt{4}}$ (d) $\frac{1}{\sqrt{6}}$
- The foci of the ellipse $25(x+1)^2 + 9(y+2)^2 = 255$ are
(a) $(-1, 2)$ and $(6, 1)$ (b) $(-1, -2)$ and $(1, 6)$
(c) $(1, -2)$ and $(1, -6)$ (d) $(-1, 2)$ and $(-1, -6)$
- The length of the latus rectum of the ellipse $9x^2 + 4y^2 = 1$ is
(a) $\frac{3}{2}$ (b) $\frac{8}{3}$
(c) $\frac{4}{9}$ (d) $\frac{8}{9}$
- The length of minor axes of the ellipse $16x^2 + 25y^2 = 400$ is
(a) 10 (b) 8
(c) 6 (d) 3
- The equation of an ellipse whose vertices are $(2, -2)$, $(2, 4)$ and eccentricity $1/3$ is
(a) $\frac{(x-2)^2}{9} + \frac{(y-1)^2}{8} = 1$ (b) $\frac{(x-2)^2}{8} + \frac{(y-1)^2}{9} = 1$
(c) $\frac{(x+2)^2}{8} + \frac{(y+1)^2}{9} = 1$ (d) $\frac{(x-2)^2}{9} + \frac{(y+1)^2}{8} = 1$
- The equation of an ellipse whose latus rectum is 8 and eccentricity is $1/\sqrt{2}$ is
(a) $\frac{x^2}{18} + \frac{y^2}{32} = 1$ (b) $\frac{x^2}{8} + \frac{y^2}{9} = 1$
(c) $\frac{x^2}{64} + \frac{y^2}{32} = 1$ (d) $\frac{x^2}{16} + \frac{y^2}{24} = 1$
- The equation $\frac{x^2}{2-r} + \frac{y^2}{r-5} + 1 = 0$ represents an ellipse, if
(a) $r > 2$ (b) $r < 2$



- (c) $r > 5$ (d) $2 < r < 5$
10. The equation of the normal at the point (0,3) of the ellipse $9x^2 + 5y^2 = 45$ is
 (a) $y - 3 = 0$ (b) $y + 3 = 0$
 (c) x -axis (d) y -axis
11. The equations of the tangents to the ellipse $9x^2 + 16y^2 = 144$ from the point (2,3) are
 (a) $y = 3$ and $x = 5$ (b) $y = 3$ and $x = 2$
 (c) $y = 2$ and $x = 3$ (d) $y = 3$ and $x + y = 5$
12. The locus of the middle point of the intercept of the tangent drawn from an external point to the ellipse $x^2 + 2y^2 = 2$, between the coordinate axes, is
 (a) $\frac{1}{x^2} + \frac{1}{2y^2} = 1$ (b) $\frac{1}{4x^2} + \frac{1}{2y^2} = 1$
 (c) $\frac{1}{2x^2} + \frac{1}{4y^2} = 1$ (d) $\frac{1}{2x^2} + \frac{1}{y^2} = 1$
13. If $\tan \theta_1 \tan \theta_2 = -\frac{a^2}{b^2}$, then the chord joining two points $P(\theta_1)$ and $Q(\theta_2)$ on the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ will subtend a right angle at
 (a) focus (b) centre
 (c) end of the major axis (d) end of the minor axis
14. If any tangent to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ intercepts equal lengths l on the axes, then $l =$
 (a) $\sqrt{a^2 + b^2}$ (b) $a^2 + b^2$
 (c) $(a^2 + b^2)^2$ (d) none of these
15. The equation of the ellipse with foci at $(\pm 3, 0)$ and vertices $(\pm 5, 0)$ is
 (a) $\frac{x^2}{25} + \frac{y^2}{9} = 1$ (b) $\frac{x^2}{25} + \frac{y^2}{16} = 1$
 (c) $\frac{x^2}{16} + \frac{y^2}{25} = 1$ (d) none of these
16. The slope of a common tangent to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ and a concentric circle of radius is
 (a) $\tan^{-1} \sqrt{\frac{r^2 - b^2}{a^2 - r^2}}$ (b) $\sqrt{\frac{r^2 - b^2}{a^2 - r^2}}$
 (c) $\left(\frac{r^2 - b^2}{a^2 - r^2} \right)$ (d) $\sqrt{\frac{a^2 - r^2}{r^2 - b^2}}$
17. The eccentric angle of a point on the ellipse $\frac{x^2}{6} + \frac{y^2}{2} = 1$ whose distance from the centre of the ellipse is 2 is
 (a) $\frac{\pi}{4}$ (b) $\frac{3\pi}{2}$
 (c) $\frac{5\pi}{3}$ (d) $\frac{7\pi}{6}$
18. Let P be a variable point on the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ with foci S_1 and S_2 . If A is the area of the triangle PS_1S_2 , then the maximum value of A is
 (a) ab (b) abe
 (c) e (d) none of these



19. If $P(x, y)$, $F_1 = (3, 0)$, $F_2 = (-3, 0)$ and $16x^2 + 25y^2 = 400$, then $PF_1 + PF_2$ equals
 (a) 6 (b) 8
 (c) 10 (d) 12
20. P is a variable point on the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ with AA' as the major axis. Then the maximum value of the area of the triangle APA' is
 (a) ab (b) $2ab$
 (c) $ab/2$ (d) none of these
21. The eccentricity of the ellipse whose pair of conjugate diameters are $y = x$ and $3y = -2x$ is
 (a) $\frac{1}{\sqrt{3}}$ (b) $\frac{1}{3}$
 (c) $\frac{2}{3}$ (d) none of these
22. The locus of the point of intersection of the perpendicular tangents to the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$ is
 (a) $x^2 + y^2 = 9$ (b) $x^2 + y^2 = 4$
 (c) $x^2 + y^2 = 13$ (d) $x^2 + y^2 = 5$
23. If t is a variable, then the locus of the point of intersection of $\frac{x}{4} - \frac{y}{3} = t$ and $\frac{x}{4} + \frac{y}{3} = \frac{2}{t}$ is a/an
 (a) parabola (b) ellipse
 (c) hyperbola (d) pair of lines
24. An ellipse is described by using an endless string which is passed over two pins. If the axes are 6 cm and 4 cm, the necessary length of the string and the distance between the pins respectively in centimetres are
 (a) $6, 2\sqrt{5}$ (b) $6, \sqrt{5}$
 (c) $4, 2\sqrt{5}$ (d) $6 + 2\sqrt{5}, 2\sqrt{5}$
25. If the line joining foci subtends an angle of 90° at an extremity of the minor axis, then eccentricity e is
 (a) $\frac{1}{\sqrt{6}}$ (b) $\frac{1}{\sqrt{3}}$
 (c) $\frac{1}{\sqrt{2}}$ (d) none of these
26. The equation of the auxiliary circle of the ellipse $9x^2 + 4y^2 - 8y - 32 = 0$ is
 (a) $x^2 + y^2 - 2y - 8 = 0$ (b) $x^2 + y^2 - 8y + 7 = 0$
 (c) $x^2 + y^2 - 4x - 5 = 0$ (d) none of these
27. The lengths of the axes of the conic $9x^2 + 4y^2 - 6x + 4y + 1 = 0$ are
 (a) $\frac{1}{2}, 9$ (b) $3, \frac{2}{5}$
 (c) $1, \frac{2}{3}$ (d) $3, 2$
28. The eccentricity of the conic $2x^2 + 3y^2 - 4x + 5y + 4 = 0$ is
 (a) $\frac{1}{2}$ (b) $\frac{1}{\sqrt{2}}$
 (c) $\frac{1}{3}$ (d) $\frac{1}{\sqrt{3}}$
29. If S and T are the foci of an ellipse, B is an end of the minor axis and STB is an equilateral triangle, then the eccentricity of the ellipse is

- (a) $\frac{1}{4}$ (b) $\frac{1}{3}$
 (c) $\frac{1}{2}$ (d) $\frac{2}{3}$
30. A man running round a race course notes that the sum of the distances of two flag posts from him is always 10 m and the distance between the flag posts is 8 m. The area of the path he encloses in square metres is
 (a) 8π (b) 12π
 (c) 18π (d) 15π
31. If c is the centre and A and B are two points on the conic $4x^2 + 9y^2 - 8x - 36y + 4 = 0$ such that $\angle ACB = \frac{\pi}{2}$, then $CA^{-2} + CB^{-2}$ is equal to
 (a) $\frac{13}{36}$ (b) $\frac{36}{13}$
 (c) $\frac{16}{33}$ (d) $\frac{33}{16}$
32. Let E be the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$ and C be the circle $x^2 + y^2 = 9$. Let P and Q be the points $(1,2)$ and $(2,1)$, respectively. Then
 (a) Q lies inside C but outside E (b) Q lies outside both C and E
 (c) P lies inside both C and E (d) P lies inside C but outside E
33. The equation of the circle passing through the points of intersection of the ellipses $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ and $\frac{x^2}{b^2} + \frac{y^2}{a^2} = 1$ is
 (a) $x^2 + y^2 = a^2$ (b) $x^2 + y^2 = b^2$
 (c) $x^2 + y^2 = \frac{a^2 b^2}{a^2 + b^2}$ (d) $x^2 + y^2 = \frac{2a^2 b^2}{a^2 + b^2}$
34. On the ellipse $4x^2 + 9y^2 = 1$, the points at which the tangents are parallel to the line $8x = 9y$ are
 (a) $(\frac{2}{5}, \frac{1}{5})$ (b) $(-\frac{2}{5}, \frac{1}{5})$
 (c) $(-\frac{2}{5}, -\frac{1}{5})$ (d) none of these
35. The number of tangents from $(7,6)$ to the ellipse $\frac{x^2}{16} + \frac{y^2}{25} = 1$ is
 (a) 0 (b) 1
 (c) 2 (d) none of these
36. The angle subtended by common tangents of two ellipses $4(x-4)^2 + 25y^2 = 100$ and $4(x+1)^2 + y^2 = 4$ at the origin is
 (a) $\frac{\pi}{3}$ (b) $\frac{\pi}{4}$
 (c) $\frac{\pi}{2}$ (d) none of these
37. The eccentricity of the ellipse which meets the straight line $\frac{x}{7} + \frac{y}{2} = 1$ on the x -axis and the straight line $\frac{x}{3} - \frac{y}{5} = 1$ on the y -axis and whose axis is the coordinate axis is
 (a) $\frac{3\sqrt{2}}{7}$ (b) $\frac{2\sqrt{6}}{7}$
 (c) $\frac{\sqrt{6}}{7}$ (d) none of these



38. A tangent at any point on the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$ is cut by the tangents at the extremities of the major axis at T_1 and T_2 . The circle with T_1T_2 as diameter passes through the point
- (a) (2,1) (b) $(\sqrt{5}, 0)$
 (c) $(0, \sqrt{5})$ (d) $(0, -\sqrt{5})$
39. If the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is rotated 90° about the origin, the equation of the ellipse after rotation is
- (a) $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ (b) $\frac{x^2}{a(a+b)} + \frac{y^2}{b(a+b)} = 1$
 (c) $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ (d) none of these
40. AB is a diameter of $x^2 + 9y^2 = 25$. The eccentric angle of A is $\pi/6$. Then the eccentric angle of B is
- (a) $\frac{5\pi}{6}$ (b) $-\frac{5\pi}{6}$
 (c) $-\frac{2\pi}{3}$ (d) none of these
41. The angle between the tangent drawn from the point (5,4) to the ellipse $\frac{x^2}{25} + \frac{y^2}{16} = 1$ is
- (a) 60° (b) 90°
 (c) 120° (d) 45°

Assertion-Reason Type Questions

These questions are Assertion-Reason type questions. Each of these questions contains two statements: Statement 1 (Assertion) and Statement 2 (Reason). Each of these questions has four alternative answers. Only one of them is the correct answer. Select the correct answer.

- (a) Both Statement 1 and Statement 2 are true and Statement 2 is a correct explanation of Statement 1.
 (b) Both Statement 1 and Statement 2 are true but Statement 2 is not a correct explanation of Statement 1.
 (c) Statement 1 is true, Statement 2 is false.
 (d) Statement 1 is false, Statement 2 is true.
42. Statement 1: The foci of the ellipse $x^2 + \lambda y^2 = 4$ will lie on the y -axis if $0 < \lambda < 1$.
 Statement 2: Foci of any ellipse lie on the x -axis.
43. Statement 1: The distance of $P(1,1)$ on the ellipse $4x^2 + 5y^2 = 9$ from the nearer focus is $\frac{3}{2} - \frac{1}{\sqrt{5}}$.
 Statement 2: The focal distance of any point (x_1, y_1) on the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ ($a > b$) is $a \pm ex_1$ where $e^2 = \frac{a^2 - b^2}{a^2}$.
44. Statement 1: If $A, C < 0$, then the equation $Ax^2 + Bx + Cy^2 + Dy = E$ represents an ellipse if $E + \frac{B^2}{4A} + \frac{D^2}{4C} < 0$.
 Statement 2: The equation $Px^2 + Qx + R = 0$ has real roots if $Q^2 - 4PR > 0$.
45. Statement 1: The slopes of the tangents drawn through (3,4) to the ellipse $x^2 + 4y^2 = 1$ are given by the equation $64m^2 - 96m + 65 = 0$.



Statement 2: The line $y = mx \pm \sqrt{m^2 + \frac{1}{4}}$ is a tangent to the ellipse $x^2 + 4y^2 = 1$ for all values of m .

46. The equation of the ellipse whose foci are $(\pm 2, 0)$ and eccentricity $1/2$ is
 (a) $\frac{x^2}{12} + \frac{y^2}{16} = 1$ (b) $\frac{x^2}{16} + \frac{y^2}{12} = 1$
 (c) $\frac{x^2}{16} + \frac{y^2}{8} = 1$ (d) none of these
47. The eccentricity of an ellipse, with its centre at the origin is $1/2$. If one of the directrices is $x = 4$, then the equation of the ellipse is
 (a) $3x^2 + 4y^2 = 1$ (b) $3x^2 + 4y^2 = 12$
 (c) $4x^2 + 3y^2 = 12$ (d) $4x^2 + 3y^2 = 1$
48. The area of the greatest rectangle that can be inscribed in the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is
 (a) ab (b) $2ab$
 (c) a/b (d) $\sqrt{ab}$
49. In an ellipse, the distance between its foci is 6 and minor axis is 8. Then its eccentricity is
 (a) $\frac{1}{2}$ (b) $\frac{4}{5}$
 (c) $\frac{1}{\sqrt{5}}$ (d) $\frac{3}{5}$
50. A focus of an ellipse is at the origin. The directrix is the line $x = 4$ and the eccentricity is $1/2$, then the length of the semi major axis is
 (a) $5/3$ (b) $8/3$
 (c) $2/3$ (d) $4/3$
51. The ellipse $x^2 + 4y^2 = 4$ is inscribed in a rectangle aligned with the coordinate axes, which in turn is inscribed in another ellipse that passes through the point $(4, 0)$. Then the equation of the ellipse is
 (a) $x^2 + 12y^2 = 16$ (b) $4x^2 + 48y^2 = 48$
 (c) $4x^2 + 64y^2 = 48$ (d) $x^2 + 16y^2 = 16$
52. The length of major axis of the ellipse $9x^2 + 7y^2 = 63$ is
 (a) 3 (b) 9
 (c) 6 (d) $2\sqrt{7}$
53. How many real tangents can be drawn to the ellipse $5x^2 + 98y^2 = 32$ from the point $(2, 3)$?
 (a) 2 (b) 1
 (c) 0 (d) 3
54. In an ellipse, the angle between the lines joining the foci with the positive end of the minor axis is a right angle. The eccentricity of the ellipse is
 (a) $1/\sqrt{2}$ (b) $1/\sqrt{3}$



(c) $\sqrt{2}$

(d) $\sqrt{3}$

55. The foci of an ellipse are $(0, \pm 4)$ and the equations for the directrices are $y = \pm 9$. The equation for the ellipse is

(a) $5x^2 + 9y^2 = 4$

(b) $2x^2 - 6y^2 = 28$

(c) $6x^2 + 3y^2 = 45$

(d) $9x^2 + 5y^2 = 180$

56. The number of maximum normals which can be drawn from a point to an ellipse is

(a) 4

(b) 2

(c) 1

(d) 3

57. If M_1 and M_2 are the feet of the perpendiculars from the foci S_1 and S_2 of the ellipse

$$\frac{x^2}{9} + \frac{y^2}{16} = 1$$
 on the

tangent at any point P on the ellipse, then $(S_1M_1)(S_2M_2)$ is equal to

(a) 16

(b) 9

(c) 4

(d) 3

58. For the ellipse $24x^2 + 9y^2 - 120x - 90y + 225 = 0$, the eccentricity is equal to

(a) $2/5$

(b) $3/5$

(c) $\sqrt{15/24}$

(d) $1/5$

59. Statement 1: An equation of a common tangent to the parabola $y^2 = 16\sqrt{3}x$ and the ellipse $2x^2 + y^2 = 4$ is $y = 2x + 2\sqrt{3}$.

Statement 2: If the line $y = mx + (4\sqrt{3}/m)$, ($m \neq 0$) is a common tangent to the parabola $y^2 = 16\sqrt{3}x$ and the ellipse $2x^2 + y^2 = 4$, then m satisfies $m^4 + 2m^2 = 24$.

(a) Statement 1 is false, statement 2 is true.

(b) Statement 1 is true, statement 2 is true; statement 2 is a correct explanation for statement 1

(c) Statement 1 is true, statement 2 is true; statement 2 is a not a correct explanation for statement 1

(d) Statement 1 is true, statement 2 is false

60. An ellipse is drawn by taking a diameter of the circle $(x - 1)^2 + y^2 = 1$ as its semi-minor axis and a diameter of the circle $x^2 + (y - 2)^2 = 4$ as its semi-major axis. If the centre of the ellipse is at the origin and its axes are the coordinate axes, then the equation of the ellipse is

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

(b) $x^2 + 4y^2 = 8$

(c) $4x^2 + y^2 = 8$

(d) $x^2 + 4y^2 = 16$

ANSWER KEY

1. (b)	2. (c)	3. (a)	4. (d)	5. (a)	6. (b)	7. (b)	8. (c)
9. (d)	10. (d)	11. (d)	12. (c)	13. (b)	14. (a)	15. (b)	16. (b)
17. (a)	18. (b)	19. (c)	20. (a)	21. (a)	22. (c)	23. (c)	24. (d)



25. (c)	26. (a)	27. (c)	28. (d)	29. (c)	30. (d)	31. (a)	32. (d)
33. (d)	34. (b)	35. (c)	36. (c)	37. (b)	38. (b)	39. (a)	40. (b)
41. (b)	42. (c)	43. (a)	44. (a)	45. (a)	46. (b)	47. (b)	48. (b)
49. (d)	50. (b)	51. (a)	52. (c)	53. (c)	54. (a)	55. (d)	56. (a)
57. (b)	58. (c)	59. (b)	60. (d)				

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