Conic Sections MCQs: Class 12, Chapter 6, Exercise 6.5

These 20 high-difficulty MCQs are designed for entry test preparation, focusing on ellipse properties.

Multiple Choice Questions

1. What is the eccentricity of the ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$?

   - (a) $\frac{1}{4}$

   - (b) $\frac{\sqrt{7}}{4}$

   - (c) $\frac{3}{4}$

   - (d) $\frac{\sqrt{3}}{2}$

2. For the ellipse with foci $(\pm 3, 0)$ and vertices $(\pm 6, 0)$, the value of b^2 is:

   - (a) 9

   - (b) 27

   - (c) 36

   - (d) 45

3. The equation of the ellipse with foci $(0, -1)$ and $(0, -5)$ and major axis length 6 is:

   - (a) $\frac{x^2}{5} + \frac{(y+3)^2}{9} = 1$

   - (b) $\frac{x^2}{9} + \frac{(y+3)^2}{5} = 1$

   - (c) $\frac{(x-3)^2}{5} + \frac{y^2}{9} = 1$

   - (d) $\frac{(x+3)^2}{9} + \frac{y^2}{5} = 1$

4. What are the vertices of the ellipse $\frac{(x-2)^2}{9} + \frac{(y-1)^2}{5} = 1$?

   - (a) $(5, 1)$, $(-1, 1)$

   - (b) $(2, 4)$, $(2, -2)$

   - (c) $(11, 1)$, $(-7, 1)$

   - (d) $(2, 6)$, $(2, -4)$

5. The latus rectum length of the ellipse $\frac{x^2}{25} + \frac{y^2}{16} = 1$ is:

   - (a) $\frac{32}{5}$

   - (b) $\frac{64}{5}$

   - (c) $\frac{16}{5}$

   - (d) $\frac{128}{5}$

6. For the ellipse with center $(0,0)$, vertices $(\pm 5,0)$, and eccentricity $\frac{3}{5}$, the value of b^2 is:

   - (a) 16
   - (b) 9
   - (c) 25
   - (d) 4

7. The directrices of the ellipse $\frac{x^2}{4} + \frac{y^2}{1} = 1$ are:

   - (a) $x = \pm \frac{4}{\sqrt{3}}$
   - (b) $y = \pm \frac{2}{\sqrt{3}}$
   - (c) $x = \pm \frac{2}{\sqrt{3}}$
   - (d) $y = \pm \frac{4}{\sqrt{3}}$

8. The equation of the ellipse with center $(2,2)$, major axis (y-axis) length 8, and minor axis length 6 is:

   - (a) $\frac{(x-2)^2}{16} + \frac{(y-2)^2}{9} = 1$
   - (b) $\frac{(y-2)^2}{16} + \frac{(x-2)^2}{9} = 1$
   - (c) $\frac{(x-2)^2}{9} + \frac{(y-2)^2}{16} = 1$
   - (d) $\frac{(y-2)^2}{9} + \frac{(x-2)^2}{16} = 1$

9. If an ellipse passes through $(2,3)$ and $(6,1)$ with center $(0,0)$ and major axis horizontal, the value of a^2 is:

   - (a) 40
   - (b) 10
   - (c) 20
   - (d) 50

10. The foci of the ellipse $\frac{(x+8)^2}{4} + (y-2)^2 = 1$ are:

    - (a) $(-8 \pm \sqrt{3}, 2)$
    - (b) $(-8 \pm 2, 2)$
    - (c) $(-6 \pm \sqrt{3}, 2)$
    - (d) $(-10 \pm \sqrt{3}, 2)$

11. For the ellipse with major axis length $4\sqrt{2}$ and distance between foci equal to minor axis length, the equation is:

    - (a) $\frac{x^2}{8} + \frac{y^2}{4} = 1$

- (b) $\frac{x^2}{4} + \frac{y^2}{8} = 1$

- (c) $\frac{x^2}{16} + \frac{y^2}{2} = 1$

- (d) $\frac{x^2}{2} + \frac{y^2}{16} = 1$

12. The greatest distance (apogee) of an asteroid from the sun, given distances range from 17 to 183 million miles, is:

    - (a) 100 million miles

    - (b) 183 million miles

    - (c) 166 million miles

    - (d) 200 million miles

13. The height of a semi-elliptic arch 90m wide and 30m high at the center, when 15m from the center, is:

    - (a) $20\sqrt{2}$m

    - (b) $10\sqrt{2}$m

    - (c) 15m

    - (d) 25m

14. The perigee of the moon's orbit with major axis 768,806km and minor axis 767,746km is:

    - (a) 364,224km

    - (b) 404,582km

    - (c) 384,403km

    - (d) 383,874km

15. The center of the ellipse $25x^2 + 9y^2 = 225$ is:

    - (a) $(0,0)$

    - (b) $(5,3)$

    - (c) $(-5,-3)$

    - (d) $(3,5)$

16. The value of b^2 for the ellipse $\frac{(2x-1)^2}{4} + \frac{(y+2)^2}{16} = 1$ is:

    - (a) 4

    - (b) 16

    - (c) 1

    - (d) 9

17. The directrices of the ellipse $\frac{x^2}{9} + \frac{y^2}{25} = 1$ are:

- (a) $y = \pm\frac{25}{4}$
- (b) $x = \pm\frac{5}{4}$
- (c) $y = \pm\frac{5}{4}$
- (d) $x = \pm\frac{25}{4}$

18. If the sum of distances from points $(0,0)$ and $(1,1)$ to a point $P(x,y)$ is 2, the equation includes the term:
    - (a) $3x^2 + 3y^2 - 2xy$
    - (b) $2x^2 + 2y^2 - xy$
    - (c) $x^2 + y^2 - 2xy$
    - (d) $4x^2 + 4y^2 - 3xy$

19. The vertices of the ellipse $x^2 + 16x + 4y^2 - 16y + 76 = 0$ are:
    - (a) $(-6,2)$, $(-10,2)$
    - (b) $(-8,6)$, $(-8,-2)$
    - (c) $(-10,-2)$, $(-6,6)$
    - (d) $(-8,2)$, $(-8,-6)$

20. The foci of the ellipse $\frac{(x-5)^2}{4} + \frac{(y-2)^2}{25} = 1$ are:
    - (a) $(5, 2\pm\sqrt{21})$
    - (b) $(5\pm\sqrt{21}, 2)$
    - (c) $(5, 2\pm 5)$
    - (d) $(5\pm 5, 2)$

Answers with Explanations

1. Correct Answer: (b) $\frac{\sqrt{7}}{4}$ Explanation: $a^2 = 16$, $b^2 = 9$, $e^2 = \frac{a^2-b^2}{a^2} = \frac{16-9}{16} = \frac{7}{16}$, $e = \frac{\sqrt{7}}{4}$.

2. Correct Answer: (b) 27 Explanation: $c = 3$, $a = 6$, $c^2 = a^2 - b^2 \implies 9 = 36 - b^2 \implies b^2 = 27$.

3. Correct Answer: (a) $\frac{x^2}{5} + \frac{(y+3)^2}{9} = 1$ Explanation: Center $(0,-3)$, $c = 2$, $2a = 6 \implies a = 3$, $c^2 = a^2 - b^2 \implies 4 = 9 - b^2 \implies b^2 = 5$.

4. Correct Answer: (b) $(2,4)$, $(2,-2)$ Explanation: $a^2 = 9$, vertices along y-direction from $(2,1)\pm a \implies (2,1\pm 3)$.

5. Correct Answer: (a) $\frac{32}{5}$ Explanation: $a^2 = 25$, $b^2 = 16$, latus rectum $= \frac{2b^2}{a} = \frac{2\cdot 16}{5} = \frac{32}{5}$.

6. Correct Answer: (a) 16 Explanation: $a = 5$, $e = \frac{3}{5}$, $ae = 3 \implies c = 3$, $c^2 = a^2 - b^2 \implies 9 = 25 - b^2 \implies b^2 = 16$.

7. Correct Answer: (c) $x = \pm\frac{2}{\sqrt{3}}$ Explanation: $a^2 = 4$, $b^2 = 1$, $e^2 = \frac{4-1}{4} = \frac{3}{4}$, $e = \frac{\sqrt{3}}{2}$, directrix $x = \pm\frac{a}{e} = \pm\frac{2}{\sqrt{3}}$.

8. Correct Answer: (b) $\frac{(y-2)^2}{16} + \frac{(x-2)^2}{9} = 1$ Explanation: $2a = 8 \implies a^2 = 16$, $2b = 6 \implies b^2 = 9$, major axis along y.

9. Correct Answer: (a) 40 Explanation: From $(2,3)$ and $(6,1)$, $a^2 = 40$ fits the derived equation $\frac{x^2}{40} + \frac{y^2}{10} = 1$.

10. Correct Answer: (a) $(-8 \pm \sqrt{3}, 2)$ Explanation: $a^2 = 4$, $e^2 = \frac{4-1}{4} = \frac{3}{4}$, $c = a \cdot \frac{\sqrt{3}}{2} = \sqrt{3}$, foci shift from $(-8, 2)$.

11. Correct Answer: (a) $\frac{x^2}{8} + \frac{y^2}{4} = 1$ Explanation: $2a = 4\sqrt{2} \implies a^2 = 8$, $c = b$, $c^2 = a^2 - b^2 \implies b^2 = 4$.

12. Correct Answer: (b) 183 million miles Explanation: Apogee $= a + c = 183$ million miles.

13. Correct Answer: (b) $10\sqrt{2}$m Explanation: $a = 45$, $b = 30$, at $x = 15$, $y = 10\sqrt{2}$ fits $\frac{x^2}{2025} + \frac{y^2}{900} = 1$.

14. Correct Answer: (a) 364,224km Explanation: $a = 384,403$, $c = 20,179$, perigee $= a - c = 364,224$km.

15. Correct Answer: (a) $(0,0)$ Explanation: Standard form $\frac{x^2}{9} + \frac{y^2}{25} = 1$ has center $(0,0)$.

16. Correct Answer: (a) 4 Explanation: $a^2 = 16$, $b^2 = 4$ from the given equation.

17. Correct Answer: (c) $y = \pm\frac{5}{4}$ Explanation: $a^2 = 25$, $e^2 = \frac{25-9}{25} = \frac{16}{25}$, $e = \frac{4}{5}$, directrix $y = \pm\frac{a}{e} = \pm\frac{5}{4}$.

18. Correct Answer: (a) $3x^2 + 3y^2 - 2xy$ Explanation: Derived equation includes this term from the distance sum.

19. Correct Answer: (a) $(-6,2)$, $(-10,2)$ Explanation: $a^2 = 4$, vertices shift from $(-8,2) \pm 2$.

20. Correct Answer: (a) $(5, 2 \pm \sqrt{21})$ Explanation: $a^2 = 25$, $e^2 = \frac{25-4}{25} = \frac{21}{25}$, $c = 5 \cdot \frac{\sqrt{21}}{5} = \sqrt{21}$.