MATHS

BOOKS - S CHAND MATHS (ENGLISH)

ELLIPSE

Solved Examples

1. Obtain the equation of the ellipse whose latus rectum is 5 and whose eccentricity is $\frac{2}{3}$,

the axes of the ellipse being the axes of coordinates.

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2. Find the equation of the ellipse with axes along the x-axis and the y-axis, which passes through the points P(4, 3) and Q(6, 2).

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3. Find the equation of the ellipse whose vertices are (2, -2), (2, -4) and whose eccentricity is $\frac{1}{3}$.

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4. Find the equation fo the ellipse with its centre at (1, 2) focus at (6, 2) and containing the point (4, 6).

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5. Obtain the equation of the ellipse whose focus is the point (-1, 1), and the corresponding directrix is the line $x - y + 3 = 0$, and the eccentricity is $\frac{1}{2}$.

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6. A point P(x, y) moves so that the sum of its distances from the points S(4, 2) and S' (-2, 2) is 8. Find the equation of its locus and show that it is an ellipse.

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7. Find the equation of the ellipse whose foci are at the points S(2, 0) and S' (-2, 0), and whose latus rectum is 6.

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8. Find the equation of the ellipse, whose centre is at (2, -3), one focus at (3, -3) and vertex at (4, -3).

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9. Find the eccentricity, the semi-major axis, the semi-minor axis, the coordinates of the foci, the equations of the directrices and the length of the latus rectum of the ellipse $3x^2 + 4y^2 = 12$.

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10. Find the eccentricity, distance between the foci, equation of the directrices, and the

length and coordinates of the ends of the latus rectum of the ellipse $25x^2 + 16y^2 = 400$.

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11. Find the centre of the ellipse $25x^2 + 9y^2 - 150x - 90y + 225 = 0$.

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Exercise 24

1. Find the eccentricity of the ellipse of which the major axis is double the minor axis.

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2. If the minor axis of an ellipse is equal to the distance between its foci, prove that its eccentricity is $\frac{1}{\sqrt{2}}$.

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3. Find the latus rectum and eccentricity of the ellipse whose semi-axes are 5 and 4.

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4. Find the eccentricity of the ellipse whose latus rectum is (i) half its major axis, (ii) half its minor axis.

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5. If the eccentricity is zero, prove that the ellipse becomes a circle.

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6. Find the equation to the ellipse with axes as the axes of coordinates.

major axis = 6, minor axis = 4,

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7. Find the equation to the ellipse with axes as the axes of coordinates.

which passes through the points (3, -1) and (2, -2).

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8. Find the equation to the ellipse with axes as the axes of coordinates.

axes are 10 and 8 and the major axis along

(a) the axis of x, (b) the axis of y,

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9. Find the equation to the ellipse with axes as the axes of coordinates.

major axis $\frac{9}{2}$ and eccentricity $\frac{1}{\sqrt{3}}$, where the major axis is the horizontal axis,

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10. Find the equation to the ellipse with axes as the axes of coordinates.

latus rectum is 5 and eccentricity $\frac{2}{3}$,

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11. Find the equation to the ellipse with axes as the axes of coordinates.

foci are $(\pm 4, 0)$ and $e = \frac{1}{3}$,

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12. Find the equation to the ellipse with axes as the axes of coordinates.

distance between the foci is 10 and its latus rectum is 15,

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13. Find the equation to the ellipse with axes as the axes of coordinates.

distance of the focus from the corresponding directrix is 9 and eccentricity is $\frac{4}{5}$,

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14. Find the equation to the ellipse with axes as the axes of coordinates.

the minor axis is equal to the distance between the foci, and the latus rectum is 10.

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15. Find the equation of the ellipse whose centre is at (-2, 3) and whose semi-axes are 3 and 2, when the major axis is (i) parallel to the axes of x, (ii) parallel to the axis of y.

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16. Find the equation of the ellipse with its centre at (4, -1), focus at (1, -1), and passing through (8, 0).


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17. Find the equation of the ellipse with its centre at (3, 1), vertex at (3, -2), and eccentricity equal to $\frac{1}{3}$.


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18. Find the equation of the ellipse whose centre is at (0, 2) and major axis along the axis of y and whose minor axis is equal to the distance between the foci and whose latus rectum is 2.

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19. Find the equation of the ellipse with focus at (1, -1), directrix x = 0, and $e = \frac{\sqrt{2}}{2}$,

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20. Find the equation of the ellipse with focus at (0, 0), eccentricity is $\frac{5}{6}$, and directrix is $3x + 4y - 1 = 0$.

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21. Find the equation of the ellipse from the following data: axis is coincident with x = 1, centre (1, 5), focus is (1, 8) and the sum of the focal distances of a point on the ellipse is 12.]

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22. A point P(x, y) moves so that the product of the slopes of the two lines joining P to the two points (-2, 1) and (6, 5) is -4. Show that the locus is an ellipse and locate its centre.

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23. Find the eccentricity, the coordinates of the foci, and the length of the latus rectum of

the ellipse $2x^2 + 3y^2 = 1$.

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24. For the ellipse, $9x^2 + 16y^2 = 576$, find the semi-major axis, the semi-minor axis, the eccentricity, the coordinates of the foci, the equations of the directrices, and the length of the latus rectum.

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25. Find the length of the axes, the co-ordinates of the foci, the eccentricity, and latus rectum of the ellipse $3x^2 + 2y^2 = 24$.

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26. Find the eccentricity of the ellipse, $4x^2 + 9y^2 - 8x - 36y + 4 = 0$.

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27. Find the centre of the ellipse, $\frac{x^2 - ax}{a^2} + \frac{y^2 - by}{b^2} = 0.$

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28. Find the distance between a focus and an extremity of the minor axis of the ellipse

(i) $4x^2 + 5y^2 = 100$ (ii) $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1.$

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29. Given the ellipse $36x^2 + 100y^2 = 3600$, find the equations and the lengths of the focal radii drawn through the point $\left(8, \frac{18}{5}\right)$.

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30. The focal distance of an end of the minor axis of the ellipse is k and the distance between the foci is 2h. Find the lengths of the semi-axes.

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31. Find the eccentricity of the ellipse whose latus rectum is 4 and distance of the vertex from the nearest focus is 1.5 cm.

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32. The directrix of a conic section is the line $3x + 4y = 1$ and the focus S is (-2, 3). If the eccentricity e is $\frac{1}{\sqrt{2}}$, find the equation to the conic section.

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33. Find the equation to the conic section whose focus is (1, -1), eccentricity is $\left(\frac{1}{2}\right)$ and the directrix is the line $x - y = 3$. Is the conic section an ellipse?

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34. Find the equation of the ellipse whose foci are (-1, 5) and (5, 5) and whose major axis is 10.

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35. Find the ellipse if its foci are $(\pm 2, 0)$ and the length of the latus rectum is $\frac{10}{3}$.

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36. Find the eccentricity of the ellipse of minor axis is 2b, if the line segment joining the foci subtends an angle 2α at the upper vertex. Also, find the equation of the ellipse if the major axis is $2\sqrt{2}$

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Chapter Test

1. Find the eccentricity of the ellipse

$$\frac{(x-3)^2}{8}+\frac{(y-4)^2}{6}=1.$$

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2. The distance between the foci of the ellipse

$5x^2+9y^2=45$ is

A. 2

B. 3

C. 4

D. 5

Answer: C

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3. Find the equation of an ellipse whose latus rectum is 8 and eccentricity is $\frac{1}{3}$

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4. Find the equation of the ellipse whose foci are at (-2, 4) and (4, 4) and major and minor axes are 10 and 8 respectively. Also, find the eccentricity of the ellipse.

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5. Find the equation of the ellipse whose eccentricity is $\frac{1}{2}$ and whose foci are at the points $(\pm 2, 0)$.

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6. Find the equation of the ellipse whose centre is the origin, major axis $\frac{9}{2}$ and eccentricity $\frac{1}{\sqrt{3}}$ where the major axis is the horizontal axis.

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7. Find the equation of the ellipse whose minor axis is 4 and which has a distance of 6

units between foci.

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8. Find the equation of the ellipse with its centre at (4, -1), focus at (1, -1), and passing through (8, 0).

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9. Find the coordinates of the vertices and the foci and the length of the latus rectum of the

ellipse $9x^2 + 25y^2 = 225$.

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10. Find the eccentricity and the equations of the directrices of the ellipse $7x^2 + 16y^2 = 112$.

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