MATHS

BOOKS - KC SINHA MATHS (HINGLISH)

CARTESIAN SYSTEMS OF RECTANGULAR COORDINATES - FOR BOARDS

Solved Examples

1. In which quadrant do the points lie: $(5, -4)$

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2. In which quadrant do the points lie: $(-3, -2)$

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3. In which quadrant do the points lie: $(4, 3)$

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4. In which quadrant do the points lie: $(-5, 2)$

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5. In which quadrant do the points lie: $(0, -3)$

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6. Plot the following points on a graph paper : $(3, 4)$ (ii) $-2, 3)$ $(-5, -2)$ (iv) $(4, -3)$

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7. Plot the points $\left(\frac{1}{2}, \frac{3}{2}\right)$

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8. Plot the points$(-3, 5)$

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9. Plot the points $(-2, -3)$

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10. Plot the points $(-3, 0)$

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11. Where does a point having y-coordinate -2 lie?

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12. If three vertices of a rectangle or $(0, 0)$, (2,0) and (0, 3)`, find the coordinates of the fourth vertex.

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13. The base of an equilateral triangle with side 20cm lies along x-axis such that the mid-point of the base is at the origin. Find the vertices of the triangle

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14. Prove that the distance of the point $(a\cos\alpha, a\sin\alpha)$ from the origin is independent of α

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15. Let A(6, -1), B (1, 3) and C (x, 8) be three points such that AB = BC then the value of x are

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16. Using distance formula, show that the points $(1, 5), (2, 4)$ and $(3, 3)$ are collinear.

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17. Prove that the points $(2a, 4a), (2a, 6a)$ and $\left(2a + \sqrt{3}a, 5a\right)$ are the vertices of an equilateral triangle.

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18. If the segments joining the points $A(a, b) and\ B(c, d)$ subtends an angle θ at the origin, prove that : $\theta = \dfrac{ac + bd}{(a^2 + b^2)(c^2 + d^2)}$

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19. Find the circumcentre of the triangle whose vertices are $(-2, -3), (-1, 0), (7, -6)$. Also find the radius of the circumcircle.

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20. Two opposite vertices of a square are $(0, -2)$ $(2, 6)$. Find the coordinates of the other vertices.

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21. Two vertices of an equilateral triangle are $(0, 0)$ and $(0, 2\sqrt{3})$. Find the third vertex

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22. Prove that the points $(-4, -1), (-2, -4), (4, 0)$ and $(2, 3)$ are the vertices of a rectangle. Also find the area of the rectangle.

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23. In any triangle ABC, prove that $AB^2 + AC^2 = 2(AD^2 + BD^2)$, where D is the midpoint of BC.

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24. Find the coordinates of the point which divides the line segment joining the points $(5, -2)$ and $(9, 6)$ internally and externally in the ration 3 : 1

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25. The coordinates of one end of a diameter of a circle are $(5, -7)$. If the coordinates of the centre be $(7, 3)$ find the coordinates of the other end of the diameter.

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26. $A(1, 1)$ and $B(2, -3)$ are two points and P is a point on AB produced such that $AP = 3AB$. Find the coordinates of P.

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27. Find the coordinates of points which trisect the line segment joining $(1, -2) and (-3, 4)$.

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28. A, B and C are three collinear points, where $A(3, 4)$ and $B(7, 7)$. If distance between A and C is 10 units, find the coordinates of C.

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29. Find the ratio in which the point (2, y) divides the line segment(4,3) and (6,3). hence find the value of y

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30. Find the ratio in which the line segment joining $(2, -3)$ and $(5, 6)$ is divided by the y-axis. Also find the point of division.

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31. In what ratio does the line x -y - 2 = 0 divides the line segment joining (3, -1) and (8, 9) ?

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32. If $(-3, 2), (1, -2)$ and $(5, 6)$ are the mid-points of the sides of a triangle, find the coordinates of the vertices of the triangle.

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33. Find the centroid of the trianlge whose vertices are $(-1, 4), (5, 2)$ and $(-1, 3)$

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34. Find the coordinates of the centreof the circle inscribed in the triangle whose vertices are $(7, -36), (7, 20)$ and $(-8, 0)$

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35. Prove that the centroid of any triangle is the same as the centroid of the triangle formed by joining the middle points of its sides

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36. Show that the quadrilateral with vertices $(3, 2), (0, 5), (-3, 2), (0, -1)$ is square.

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37. x coordinates of two points B and C are the roots of equation $x^2 + 4x + 3 = 0$ and their y coordinates are the roots of equation $x^2 - x - 6 = 0$. If x coordinate of B is less than the x coordinate of C and y coordinate of B is greater than the y coordinate of C and coordinates of a third point A be $(3, -5)$, find the length of the bisector of the interior angle at A.

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38. If the points $(x_1, y_1), (x_2, y_2)$ and (x_3, y_3) be the three consecutive vertices of a parallelogram, find the coordinates of the fourth vertex.

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39. If G be the centroid of the ΔABC and O be any other point in theplane of the triangle ABC, then prove that: $OA^2 + OB^2 + OC^2 = GA^2 + GB^2 + GB^2 + GC^2 + 3GO^2$

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40. Find the area of the triangle whose vertices A, B, C are respectively, $(3, 4), (-4, 3)$ and $(8, 6)$.

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41. Find the area of the quadrilateral whose vertices are $(-3, 2), (5, 4), (7, -6)$ and $(-5, -4)$

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42. Find the area of the pentagon whose vertices taken in order are: $(4, 3), (-5, 6), (-7, -2), (0, -7)$ and $(3, -6)$

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43. Show that the points $(3, 3), (h, 0)$ and $(0, k)$ are collinear if $\frac{1}{h} + \frac{1}{k} = \frac{1}{3}$

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44. If $(1, 4)$ be the C.G. of a triangle and the coordinates of its any two vertices be $(4, -8)$ and $(-9, 7)$, find the area of the triangle.

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45. The area of a triangle is 5. Two of its vertices are $(2,\ 1)$ and $(3,\ -2)$. The third vertex lies on $y = x + 3$. Find the third vertex.

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46. The coordinates of points A, B, C and P are $(6, 3), (-3, 5), (4, -2)$ and (x, y) respectively, prove that $\frac{\Delta PBC}{\Delta ABC} = \frac{x + y - 2}{7}$

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47. Thevertices of a triangle ABC are $A(-7, 8), B(5, 2)$ and $C(11, 0)$. If D, E, F are the mid-points of the sides BC, CA and AB respectively, show that $\Delta ABC = 4\Delta DEF$.

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48. The coordinates of points P, Q, R and S are $(-3, 5), (4, -2), (p, 3p)$ and $(6, 3)$ respectively, and the ares of ΔPQR and ΔQRS are in ratio 2:3. Find p.

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49. If the coordinates of two points A and B are (3, 4) and $(5, -2)$, respectively, find the coordinates of any point P if $PA = PB$. Area of PAB is 10 sq. units.

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50. If A, B, C, D are points whose coordinates are $(-2, 3), (8, 9), (0, 4)$ and $(3, 0)$ respectively, find the ratio in which AB is divided by CD.

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51. If the vertices of a triangle have integral coordinates, prove that the trinagle cannot be equilateral.

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52. prove that the area of a triangle is four times the area of the triangle formed by joining the mid-points of its sides.

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53. Find the locus of a point at which the angle subtended by the line segment joining $(1, 2)$ and $(-1, 3)$ is a right angle.

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54. Find the locus of a point such that the sum of its distances from the points $(0, 2) and (0, -2)$ is6.

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55. Find the equation of the locus of a point which moves so that its distance from the x-axis is double of its distance from the y-axis.

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56. If the coordinates of a variable point P be $(a\cos\theta, b\sin\theta)$, where θ is a variable quantity, find the locus of P.

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57. AB is a variable line sliding between the coordinate axes in such a way that A lies on the x-axis and B lies on the y-axis. If P is a variable point on AB such that $PA = b, Pb = a$, and $AB = a + b,$ find the equation of the locus of P.

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58. If O be origin and A is a point on the locus $y^2 = 8x$ .find the locus of the middle point of OA

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59. If A and B are two fixed points, then the locus of a point which moves in such a way that the angle APB is a right angle is

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60. A straight line segment of length/moves with its ends on two mutually perpendicular lines. Find the locus of the point which divides the line segment in the ratio 1:2

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61. Describe the locus of the point (x, y) satisfying the equation $(x-2)^2 + (y-3)^2 = 25$

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62. Describe the locus of the point (x, y) satisfying the equation $x - y = 0$

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63. Examine whether point $(2, -5)$ lies on the curve $x^2 + y^2 - 2x + 1 = 0$

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64. If the equations $ax^2 + 2hxy + by^2 = 0$ and $y^2 - (m_1 + m_2)xy + m_1m_2x^2 = 0$ represent the same curve, find $m_1 + m_2$ and m_1m_2.

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Exercise

1. In which quadrant do the following points lies: $(10, -3)$

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2. In which quadrant do the following points lies: $(-4, -6)$

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3. In which quadrant do the following points lies: $(-8, 6)$

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4. in which quadrant $\left(\frac{3}{2}, 5\right)$ lies

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5. In which quadrant do the following points lies: $(3, 0)$

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6. In which quadrant do the following points lies: $(0, -5)$

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7. Plot the points in a rectangular coordinate system: $(4, 5)$

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8. Plot the points in a rectangular coordinate system: $(-2, 7)$

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9. Plot the points in a rectangular coordinate system: $(-2, -7)$

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10. Plot the points in a rectangular coordinate system: $(6, -2)$

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11. Plot the points in a rectangular coordinate system: $(-4, 2)$

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12. Plot the points in a rectangular coordinate system: $(4, 0)$

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13. Where does a point having y-coordinate -5 lie?

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14. If three vertices of a rectangle are $(-2, 0), (2, 0), (2, 1),$ find the coordinates of the fourth vertex

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15. Draw the triangle whose vertices are $(2, 3), (-4, 2) AND (3, -1)$

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16. The base of an equilateral triangle with side 2a lies along the yaxis such that the midpoint of the base is at the origin. Find vertices of the triangle.

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17. Let ABCD be a rectangle such that $AB = 10$ units and $BC = 8$ units. Taking AB and AD as x and y axis respectively, find the coordinates of A, B, C and D.

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18. ABCD is a square having length of a side 20 units. Taking the centre of the square as the origin and x and y axes parallel to AB and AD respectively, find the coordinates of A, B, C and D.

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19. Find the distance between the pair of points: $(0, 0), (-5, 12)$

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20. Find the distance between the pair of points: $(4, 5), (-3, 2)$

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21. Find the distance between points $P(x_1, y_1)$ and $Q(x_2, y_2)$: PQ is parallel to y-axis

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22. Find the distance between points $P(x_1, y_1)$ and $Q(x_2, y_2)$: PQ is parallel to x-axis

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23. Examin whether the points $(1, -1), (-5, 7)$ and $(2, 5)$ are equidistant from the point $(-2, 3)$?

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24. Find a if the distance between $(a, 2)$ and $(3, 4)$ is 8.

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25. A line is of length 10 units and one of its ends is $(-2, 3)$. If the ordinate of the other end is 9, prove that the abscissa of the other end is 6 or -10

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26. The distance between the points $(a\cos\alpha, a\sin\alpha)$ and $(a\cos\beta, a\sin\beta)$ where a> 0

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27. Find the distance between the points : $(at_1^2, 2at_1)$ and $(at_2^2, 2at_2)$

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28. Find the distance between the points : $(a-b, b-a), (a+b, a+b)$

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29. Find the distance between the points : $(\cos\theta, \sin\theta), (\sin\theta, \cos\theta)$

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30. Find a point on the x-axis which is equidistant from the points $(7, 6)$ and $(-3, 4)$.

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31. Find the point on x-axis which is equidistant from the pair of points: $(3, 2)$ and $(-5, -2)$

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32. Find the point on x-axis which is equidistant from the pair of points: $(7, 6)$ and $(3, 4)$

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33. Find a point on y-axis which is equidistant from the points $(5, \ -2)$ and $(-3, \ 2)$.

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34. Using distance formula, examine whether the sets of points are collinear : $(3, 5), (1, 1), (-2, \ -5)$

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35. Using distance formula, examine whether the sets of points are collinear : $(5, 1), (1, \ -1), (11, 4)$

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36. Using distance formula, examine whether the sets of points are collinear : $(0, 0), (9, 6), (3, 2)$

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37. Using distance formula, examine whether the sets of points are collinear : $(-1, 2), (5, 0), (2, 1)$

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38. If $A \equiv (6, 1), B \equiv (1, 3), C \equiv (x, 8)$, find the value of x such that $AB = BC$

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39. Prove that the distance between the points $(a + r\cos\theta, b + r\sin\theta)$ and (a, b) is independent of θ.

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40. Use distance formula to show that the points $(\cos ec^2\theta, 0)$, $(0, \sec^2\theta)$ and $(1, 1)$ are collinear.

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41. Use distance formula to show that $(3, 3)$ is the centre of the circle passing through points $(6, 2), (0, 4)$ and $(4, 6)$. Find the radius of the circle

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42. If the point (x, y) is equidistant from the points $(2, 3)$ and $(6, -1)$, find the relation between x and y.

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43. If the point $P(x, y)$ be equidistant from the points $(a+b, b-a)$ and $(a-b, a+b)$, prove that $\frac{a-b}{a+b} = \frac{x-y}{x+y}$.

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44. Prove that the points $(3, 4), (8, -6)$ and $(13, 9)$ are the vertices of a right-angled triangle.

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45. Determine the type (isosceles, right-angled, right-angled isosceles, equilateral, scalence) of the triangles whose vertices are: $(1, 1), (-\sqrt{3}, \sqrt{3}), (-1, -1)$

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46. Determine the type (isosceles, right-angled, right-angled isosceles, equilateral, scalence) of the triangles whose vertices are:

$(0, 2), (7, 0), (2, 5)$

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47. Determine the type (isosceles, right-angled, right-angled isosceles, equilateral, scalence) of the triangles whose vertices are: $(-2, 5), (7, 10), (3, -4)$

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48. Determine the type (isosceles, right-angled, right-angled isosceles, equilateral, scalence) of the triangles whose vertices are: $(4, 4), (3, 5), (-1, -1)$

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49. Determine the type (isosceles, right-angled, right-angled isosceles, equilateral, scalence) of the triangles whose vertices are:

$(1, 2\sqrt{3}), (3, 0), (-1, 0)$

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50. Determine the type (isosceles, right-angled, right-angled isosceles, equilateral, scalence) of the triangles whose vertices are: $(0, 6), (-5, 3), (3, 1)$

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51. If $A(at^2, 2at), B\left(\frac{a}{t^2}, -\frac{2a}{t}\right)$ and $C(a, 0)$ be any three points, show that $\frac{1}{AC} + \frac{1}{BC}$ is independent of t.

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52. If the two vertices of an equilateral triangle be $(0, 0), (3, \sqrt{3})$, find the third vertex.

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53. Find the circumcentre and circumradius of the triangle whose vertices are $(-2, 3), (2, -1)$ and $(4, 0)$.

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54. If the line segment joining the points $A(a, b)$ and $B(c, d)$ subtends a right angle at the origin, show that $ac + bd = 0$

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55. The vertices of a triangle ABC are $A(0, 0), B(2, -1)$ and $C(9, 2)$, find $\cos B$.

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56. If the line segment joining the points $A(a, b)$ and $B(a, -b)$ subtends an angle θ at the origin, show that $\cos\theta = \frac{a^2 - b^2}{a^2 + b^2}$.

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57. The centre of a circle is $(2x - 1, 3x + +1)$ and radius is 10 units. Find the value of x if the circle passes through the point $(-3, -1)$.

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58. Prove that the point $(4, 3), (6, 4), (5, 6)$ and $(3, 5)$ asre the vertices of a square.

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59. Prove that the points $(3, 2), (6, 3), (7, 6)$ and $(4, 5)$ are the vertices of a parallelogram. Is it a rectangle?

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60. Prove that the points $(6, 8), (3, 7), (-2, -2), (1, -1)$ are the vertices of a parallelogram.

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61. Prove that the points $(4, 8), (0, 2)(3, 0)$ and $(7, 6)$ are the vertices of a rectangle.

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62. Show that the points $A(1, 0), B(5, 3), C(2, 7)$ and $D(-2, 4)$ are the vertices of a rhombus.

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63. A(-4,0) and B (-1,4) are two given points. Cand D are points which are symmetric to the given points A and B respectively with respect to y-axis. Calculate the perimeter of the trapezium ABDC.

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64. A line segement AB through the point $A(2, 0)$ which makes an angle of 30^0 with the positive direction of x-axis is rotated about A in anticlockwise direction through an angle of 15^0. If C be the new position of point $B(2+\sqrt{3}, 1)$, find the coordinates of C.

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65. The point $(1, -2)$ is reflected in the x-axis and then translated parallel to the positive direction of x-axis through a distance of 3 units, find the coordinates of the point in the new position.

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66. The line segment joining $A(3, 0)$ and $B(5, 2)$ is rotated about A in the anticlockwise direction through an angle of 45^0 so that B goes to C. If D is the reflection of C in y-axis, find the coordinates of D.

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67. Let $ABCD$ be a rectangle and P be any point in its plane. Show that $AP^2 + PC^2 = PB^2 + PD^2$.

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68. Prove analytically that the diagonals of a rectangle are equal

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69. Prove analytically that the sum of square of the diagonals of a rectangle is equal to the sum of squares of its sides.

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70. Find the coordinates of the point which divides the line segment joining $(2, 4)$ and $(6, 8)$ in the ratio $1:3$ internally and externally.

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71. Find the coordinates of the points which trisect the line segment joining the points $(2, 3)$ and $(6, 5)$.

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72. $A(1, 4)$ and $B(4, 8)$ are two points. P is a point on AB such that $AP = AB + BP$. If $AP = 10$, find the coordinates of P.

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73. The line segment joining $A(2, 3)$ and $B(-3, 5)$ is extended through each end by a length equal to its original length. Find the coordinates of the new ends.

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74. The line segment joining $A(6, 3)$ to $B(-1, -4)$ is doubled in length by having its length added to each end , then the ordinates of new ends are

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75. The coordinatse of two points A and B are $(-1, 4)$ and $(5, 1)$, respectively. Find the coordinates of the point P which lie on extended line AB such that it is three times as far from B as from A.

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76. Find the distance of that point from the origin which divides the line segment joining the points $(5, -4)$ and $(3, -2)$ in the ratio $4:3$.

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77. The coordinates of the middle points of the sides of a triangle are $(1, 1), (2, 3)$ and $(4, 1)$, find the coordinates of its vertices.

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78. $A(1, -2)$ and $B(2, 5)$ are two points. The line OA, OB are produced to C and D respectively such that $OC = 2OA$ and $OD = 20B$. Find CD

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79. Find the lengths of the medians of a triangle whose vertices are $A(-1, 3)$, $B(1, -1)$ and $C(5, 1)$.

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80. If $A(1, 5), B(-2, 1)$ and $C(4, 1)$ be the vertices of ΔABC and internal bisector of $\angle A$ meets BC at D, find AD.

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81. If the middle point of the line segment joining $(3, 4)$ and $(k, 7)$ is (x, y) and $2x + 2y + 1 = 0$, find the value of k.

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82. One end of a diameterof a circle is at $(2, 3)$ and the centre is $(-2, 5)$, find the coordinates of the other end of the diameter.

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83. If the point $C(-1, 2)$ divides internally the line segment joining $A(2, 5)$ and B in the ration $3:4$. Find the coordinates of B.

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84. Find the ratio in which $(-8, 3)$ divides the join of points $(2, -2)$ and $(-4, 1)$.

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85. In what ratio does the x=axis divide the line segment joining the points $(2, -3)$ and (5, 6)?

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86. Find the ratio in which the line segment joining of the points $(1, 2)$ and $(-2, 3)$ is divided by the line $3x + 4y = 7$

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87. Find the centroid and incentre of the triangle whose vertices are $(2, 4), (6, 4), (2, 0)$.

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88. The vertices of a triangle are at $(2, 2), (0, 6)$ and $(8, 10)$. Find the coordinates of the trisection point of each median which is nearer the opposite side.

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89. Two vertices of a triangle are $(1, 4)$ and $(5, 2)$. If its centroid is $(0, -3)$, find the third vertex.

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90. The coordinates of centroid of a triangle are $(\sqrt{3}, 2)$ and two of its vertices are $(2\sqrt{3}, -1)$ and $(2\sqrt{3}, 5)$. Find the third vertex of the triangle.

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91. Find the centroid of the triangle ABC whose vertices are $A(9, 2), B(1, 10)$ and $C(-7, -6)$. Find the coordinates of the middle points of its sides and hence find the centroid of the triangle formed by joining these middle points. Do the two triangles have same centroid?

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92. If $(1, 2), (0, -1)$ and $(2, -1)$ are the middle points of the sides of a triangle, find the coordinates of its centroid.

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93. Find the incentre of the triangle with vertices $(1, \sqrt{3}), (0, 0)$ and $(2, 0)$

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94. The mid-points of the sides of a triangle are $\left(\frac{1}{2}, 0\right), \left(\frac{1}{2}, \frac{1}{2}\right)$ and $\left(0, \frac{1}{2}\right)$. Find the coordinates of the incentre.

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95. Two vertices of a triangle are $A(2, 1)$ and $B(3, -2)$. The third vertex C lies on the line $y = x + 9$. If the centroid of ΔABC lies on y-axis, find the coordinates of C and the centroid.

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96. Prove that the points $(-2, -1), (1, 0), (4, 3)$ and $(1, 2)$ are the vertices of a parallelogram.

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97. Show that the points $A(1, 0), B(5, 3), C(2, 7)$ and $D(-2, 4)$ are the vertices of a rhombus.

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98. Prove that the points $(4, 8), (0, 2), (3, 0)$ and $(7, 6)$ are the vertices of a rectangle.

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99. Prove that the points $(4, 3), (6, 4), (5, 6)$ and $(3, 5)$ are the vertices of a square.

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100. If $(6, 8), (3, 7)$ and $(-2, -2)$ be the coordinates of the three consecutive vertices of a parallelogram, find the coordinates of the fourth vertex.

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101. Three consecutive vertices of a rhombus are $(5, 3), (2, 7)$ and $(-2, 4)$. Find the fourth vertex

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102. A quadrilateral has the vertices at the points $(-4, 2), (2, 6), (8, 5)\ and\ (9, -7)$. Show that the mid points of the sides of this quadrilateral are the vertices of a parallelogram.

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103. Prove that the line segment joining the middle points of two sides of a triangle is half the third side.

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104. If P, Q, R divide the sides BC, CA and AB of ΔABC in the same ratio, prove that the centroid of the triangles ABC and PQR coincide.

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105. Prove that three times the sum of the squares of the sides of a triangle is equal to four times the sum of the squares of the medians of the triangle.

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106. If G be the centroid of the ΔABC, then prove that $AB^2 + BC^2 + CA^2 = 3(GA^2 + GB^2 + GC^2)$

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107. Prove that the mid point of the hypotenuse of a right triangle is equidistant from its vertices.

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108. Find the area of the triangle whose vertices are : `(3,-4), (7, 5), (-1, 10)

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109. Find the area of the triangle whose vertices are : $(at_1^2, 2at_1), (at_2^2, 2at_2), (at_3^2, 2at_3)$

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110. Find the area of the triangle whose vertices are : $(a\cos\alpha, b\sin\alpha), (a\cos\beta, b\sin\beta), (a\cos\gamma, b\sin\gamma)$

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111. Find the area of the quadrilateral whose vertices are : $(1, 1), (7, -3), (12, 2)$ and $(7, 21)$

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112. Find the area of the quadrilateral whose vertices are : $(-4, 5), (0, 7), (5, -5)$ and $(-4, -2)$

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113. Find the area of the pentagon whose vertices are $(4, 3), (-5, 6), (0, -7), (3, -6), (-7, -2)$

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114. Find the area of the hexagon whose consecutive vertices are $(5, 0), (4, 2), (1, 3), (-2, 2), (-3, -1)$ and $(0, -4)$

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115. If A, B, C are the points $(-1, 5), (3, 1), (5, 7)$ respectively and D, E, F are the middle points of BC, CA and AB respectively, prove that : $\Delta ABC = 4\Delta DEF$.

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116. Three vertices of a triangle are $A(1, 2), B(-3, 6)$ and $C(5, 4)$. If D, E and F are the mid-points of the sides opposite to the vertices A, B and C, respectively, show that the area of triangle ABC is four times the area of triangle DEF.

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117. Find the area of a triangle ABC if the coordinates of the middle points of the sides of the triangle are $(-1, -2), (6, 1)$ and $(3, 5)$

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118. The vertices of a ΔABC are $A(3, 0), B(0, 6)$ and $C(6, 9)$. A straight line DE divides AB and AC in the ration 1:2 at D and E respectively, prove that $\frac{\Delta ABC}{\Delta ADE} = 9$

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119. Prove that the area of the triangle whose vertices are $(t, t-2), (t+2, t+2) and (t+3, t)$ is independent of t.

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120. If $A(x, y), B(1, 2)$ and $C(2, 1)$ are the vertices of a triangle of area 6 square units, show that $x + y = 15$ or -9.

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121. Prove that the points $(a, b+c), (b, c+a)$ and $(c, a+b)$ are collinear.

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122. If the points $(x_1, y_1), (x_2, y_2)$ and (x_3, y_3) be collinear, show that:

$$\frac{y_2 - y_3}{x_2 x_3} + \frac{y_3 - y_1}{x_3 x_2} + \frac{y_1 - y_2}{x_1 x_2} = 0$$

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123. If the points $(a, b), (a_1, b_1)$ and $(a - a_1, b - b)$ are collinear, show that $\frac{a}{a_1} = \frac{b}{b_1}$

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124. Three points $A(x_1, y_1), B(x_2, y_2)$ and $C(x, y)$ are collinear. Prove that: $(x - x_1)(y_2 - y_1) = (x_2 - x_1)(y - y_1)$.

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125. Show that the points $(a, 0), (0, b)$ and $(1, 1)$ are collinear if $\frac{1}{a} + \frac{1}{b} = 1$

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126. Find the values of x if the points $(2x, 2x), (3, 2x+1)$ and $(1, 0)$ are collinear.

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127. Show that the straight line joining the points $A(0, -1)$ and $B(15, 2)$ divides the line joining the points $C(-1, 2)$ and $D(4, -5)$ internally in the ration $2:3$.

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128. Find the area of the triangle whose vertices are $(a+1)(a+2), (a+2), (a+2)(a+3), (a+3)$ and $(a+3)(a+4), (a+$

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129. The point A divides the join of $P(-5, 1) and Q(3, 5)$ in the ratio $k:1$. Find the two values of k for which the area of ABC where B is $(1, 5) and C(7, -2)$ is equal to 2 units.

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130. The coordinates of A, B, C, D are $(6, 3), (-3, 5), (4, -2)$ and $(x, 3x)$ respectively. If $\frac{\Delta DBC}{\Delta ABC}$= 1/2`, find x

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131. If the area of the quadrilateral whose angular points taken in order are $(1, 2), (-5, 6), (7, -4)$ and $(h, -2)$ be zero, show that $h = 3$.

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132. Find the area of the triangle whose vertices A, B, C are $(3, 4), (-4, 3), (8, 6)$ respectively and hence find the length of perpendicular from A to BC.

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133. The coordinates of the centroid of a triangle and those of two of its vertices are respectively $\left(\frac{2}{3}, 2\right), (2, 3), (-1, 2)$. Find the area of the triangle.

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134. The area of a triangle is 3 square units. Two of its vertices are $A(3, 1), B(1, -3)$ and the centroid of the triangle lies on x-axis. Find the coordinates of the third vertex C.

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135. The area of a parallelogram is 12 square units. Two of its vertices are the points $A(-1, 3)$ and $B(-2, 4)$. Find the other two vertices of the parallelogram, if the point of intersection of diagonals lies on x-axis on its positive side.

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136. The area of a triangle is $\frac{3}{2}$ square units. Two of its vertices are the points $A(2, -3)$ and $B(3, -2)$, the centroid of the triangle lies on the line $3x - y - 2 = 0$, then third vertex C is

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137. Prove that the quadrilateral whose vertices are $A(-2, 5), B(4, -1), C(9, 1)$ and $D(3, 7)$ is a parallelogram and find its area. If E divides AC in the ration $2:1$, prove that D, E and the middle point F of BC are collinear.

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138. Prove that points $(-3, -1), (2, -1), (1, 1)$ and $(-2, 1)$ taken in order are the vertices of a trapezium.

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139. Show that the line joining the centroid of a triangle to its vertices divide it into three triangles of equal area.

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140. Find the equation of the set of all points $P(x, y)$ such that the line OP is coincident with the line joining P and the point $(3, 2)$.

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141. Find the equation of the set of points equidistant from $(-1, -1)$ and $(4, 2)$

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142. Find the equation of the locus of a point P if the sum of squares of distances of the point P from the axes is p^2.

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143. Find the equation of the set of all points which are equidistant from the points $(a^2 + b^2, a^2 - b^2)$ and $(a^2 - b^2, a^2 + b^2)$

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144. Square of the distance of the point from x-axis is double of its distance from the origin.

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145. Write the equation of locus of a point whose distance from y-axis is always equal to the double of its distance from x-axis.

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146. Find the equation of the set of points for which every ordinate is greater than the corresponding abscissa by a given distance d.

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147. If a point P moves such that its distance from $(a, 0)$ is always equal to $a + x$-coordinate of P, show that the locus of P is $y^2 = 4ax$.

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148. Show that the equation of the locus of a point which moves so that the sum of its distance from two given points $(k, 0)$ and $(-k, 0)$ is equal to $2a$ is : $\frac{x^2}{a^2} + \frac{y^2}{a^2 - k^2} = 1$

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149. If the sum of the distances of a moving point from two fixed points $(ae, 0)$ and $(-ae, 0)$ be $2a$, prove that the locus of the point is: $\frac{x^2}{a^2} + \frac{y^2}{a^2(1 - e^2)}$ =1

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150. Find the locus of a variable point $(at^2, 2at)$ where t is the parameter.

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151. If the coordinates of a variable point P be $\left(t+\frac{1}{t}, t-\frac{1}{t}\right)$, where t is a variable quantity, then find the locus of P.

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152. If the coordinates of a variable point P be $(\cos\theta+\sin\theta, \sin\theta-\cos\theta)$, where θ is a variable quantity, find the locus of P.

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153. If $A(\cos\theta, \sin\theta)$, $B(\sin\theta, \cos\theta)$, $C(1, 2)$ are the vertices of ΔABC. Find the locus of its centroid if θ varies.

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154. A point moves so that its distance from the point $(-2, 3)$ is always three times its distance from the point $(0, 3)$. Find the equation to its locus.

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155. A and B are two given points whose coordinates are $(-5, 3)$ and $(2, 4)$ respectively. A point P moves in such a manner that $PA : PB = 3 : 2$. Find the equation to the locus traed out by P.

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156. find the equation of the locus of a points such that sum of its distance from (0,3) and (0,-3) is 8.

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157. S is the point $(4, 0)$ and M is the foot of the perpendicular drawn from a point P to the y-axis. If P moves such that the distance PS and PM remain equal find the locus of P.

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158. If $A(1, 1)$ and $B(-2, 3)$ are two fixed points, find the locus of a point P so that area of ΔPAB is 9 units.

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159. Find the locus of a point such that the line segments having end points (2,0) and (-2,0) subtend a right angle at that point.

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160. If P is the middle point of the straight line joining a given point $A(1, 2)$ and Q, where Q is a variable point on the curve $x^2 + y^2 + x + y = 0$. Find the locus of P.

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161. $A(2, 3)$ is a fixed point and $Q(3\cos\theta, 2\sin\theta)$ a variable point. If P divides AQ internally in the ratio 3:1, find the locus of P.

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162. From the point $A(6, -8)$, all possible lines are drawn to cut the x-axis. Find the locus of their middle points.

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163. A stick of length l slides with its ends on two mutually perpendicular lines. Find the locus of the middle point of the stick.

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164. Prove that the locus of the point equidistant from two given points is the straight line which bisects the line segment joining the given points at right angles.

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165. Describe the locus of the point (x, y) satisfying the condition $x^2 + y^2 = a^2$.

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166. Describe the locus of the point (x, y) satisfying $(x-1)^2+(y-1)^2=2^2$.

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167. Examine whether point (1, 2) lies on the curve $4x^2-y^2=0$.

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168. Examing whether point $(2, -3)$ lies on the curve $x^2-2y^2+6xy+8=0$.

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169. If the equation $ax^2+2hxy+by^2=0$ and $bx^2-2hxy+ay^2=0$ represent the same curve, then show that $a+b=0$.

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170. Find the value of k if the point (1, 2) lies on the curve $(k-10)x^2+y^2-(k-7)x-(3k-27)y+11=0$

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