MATHS

BOOKS - RD SHARMA MATHS (HINGLISH)

BRIEF REVIEW OF CARTESIAN SYSTEM OF RECTANGULAR COORDINATES

Solved Examples And Exercises

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

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2. Find the coordinates of the circumcentre of the triangle whose vertices are $(8, 6), (8 - 2)$ and $(2, -2)$ Also, find its circum-radius.

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

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4. Find the area of the quadrilateral $ABCD$ whose vertices are respectively $A(1, 1), B(7, -3), C(12, 2)$ and $D(7, 21)$.

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

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6. Let the opposite angular points of a square be $(3, 4) and (1, -1)$. Find the coordinates of the remaining angular points.

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7. 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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8. If the axes are shifted to the point $(1, -2)$ without rotation, what do the following equations become? $2x^2 + y^2 - 4x + 4y = 0$

$y^2 - 4x + 4y + 8 = 0$

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9. Shift the origin to a suitable point so that the equation $y^2 + 4y + 8x - 2 = 0$ will not contain term of y and the constant term.

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10. For what value of k are the points $(k, 2 - 2k)$ $(k + 1, 2k)$ and $(-4 - k, 6 - 2k)$ are collinear?

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11. If the coordinates of the mid-points of the sides of a triangle are $(1, 1), (2, -3) and (3, 4)$. Find its (i) centroid

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12. Find the point to which the origin should be shifted so that the equation $y^2 - 6y - 4x + 13 = 0$ is transformed to the form $y^2 + Ax = 0$.

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13. 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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14. A point moves so that the sum of its distances from $(ae, 0) and (- ae, 0)$ is $2a,$

prove that the equation to its locus is $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$, where $b^2=a^2\left(1-e^2\right)$.

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15. A point moves so that the sum of its distances from $(ae,0) and (-ae,0)$ is $2a$, prove that the equation to its locus is $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$, where $b^2=a^2\left(1-e^2\right)$.

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16. Find the equation of the locus of a point which moves such that the ratio of its distances from $(2, 0) and (1, 3)$ is $5 : 4.$

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17. Find the equation to the locus of a point equidistant from the points $A(1, 3) and B(- 2, 1).$

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18. The sum of the squares of the distances of a moving point from two fixed points $(a, 0) and (- a, 0)$ is equal to a constant quantity $2c^2$. Find the equation to its locus.

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19. Find the locus of a point, such that the join of $(- 5, 1) and (3, 2)$ subtends a right angle at the moving point.

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20. Find the locus of a point such that the sum of its distances from the points $(0, 2) and (0, -2)$ is 6.

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21. Find the locus of the mid-point of the portion of the line $x\cos\alpha + y\sin\alpha = p$ which is intercepted between the axes.

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22. $A(5, 3), B(3, -2)$ are two fixed points; find the equation to the locus of a point P which moves so that the area of the triangle PAB is 9 units.

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23. Show that four points $(0, -1), (6, 7), (-2, 3) and (8, 3)$ are the vertices of a rectangle. Also, find its area.

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

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25. The vertices of a triangle are $A(1, 1),\ B(4, 5) and\ C(6, 13)$. Find $\cos A$.

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26. If the vertices of a triangle having integral coordinates . Prove that triangle can't be equileteral .

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27. 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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28. The coordinates of A, B, C are $(6, 3), (-3, 5), (4, -2)$, respectively, and P is any point (x, y). Show that the ratio of the area of PBC to that of ABC is $\frac{|x + y - 2|}{7}$.

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29. Find the coordinates of points lying on the line joining $P(3, -4)$ and $Q(-2, 5)$ that is twice as far from P as Q

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30. Determine the ratio in which the line $3x + y - 9 = 0$ divides the segment joining the points (1,3) and $(2, 7)$.

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31. Prove that: $(4, -1), (6, 0), (7, 2)$ and $(5, 1)$ are the vertices o a rhombus. Is it a square?

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32. if the coordinates of the mid points of the Sides of a triangle are $(1, 2), (0, -1)$ and $(2, -1)$.Find the coordinates of its vertices `:

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33. Two vertices of a triangle are $(3, -5) and (-7, 4)$. If its centroid is $(2, -1)$, find the third vertiex.

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34. If the line segment joining the points $P(x_1, y_1) and\, Q(x_2, y_2)$ subtends an angle α at the origin O, prove that : $OP\dot{O}Q \cos\alpha = x_1x_2 + y_1y_2$.

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35. Four points $A(6, 3),\ B(-3, 5),\ C(4, -2) and\, D(x, 3x)$ are given in such a way that $\frac{\Delta DBC}{\Delta ABC} = \frac{1}{2}$,find x

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36. The points $A(2, 0),\ B(9, 1),\ C(11, 6) and\ D(4, 4)$ are the vertices of a quadrilateral $ABCD$. Determine whether ABCD is a rhombus or not.

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37. Find the coordinates of the centre of the circle inscribed in a triangle whose angular points are $(-36, 7), (20, 7)$ and $(0, -8)$.

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38. The base of an equilateral triangle with side $2a$ lies along the y-axis such that the mid point of the base is at the origin. Find the vertices of the triangle.

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39. Find the distance between $P(x_1,\ y_1) and\ Q(x_2, y_2)$ when i. PQ is

parallel to the y-axis ii. PQ is parallel to the x-axis.

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

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41. Find the equation to the locus of a point which moves so that the sum of its distances

from (3,0) and (-3,0) is less than 9.

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42. Find the locus of the point of intersection of lines $x\cos\alpha + y\sin\alpha = a$ and $x\sin\alpha - y\cos\alpha = b$($\alpha$ is a variable).

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43. A rod of length l slides with its ends on two perpendicular lines. Find the locus of its

midpoint.

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44. If O is the origin and Q is a variable points on $x^2 = 4y$. Find the locus of the mid pint of OQ.

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45. Find the locus of a point equidistant from the point (2,4) and the y-axis.

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46. Find the locus of a point such that the sum of its distances from the points $(0, 2) and (0, -2)$ is 6.

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47. Find the locus of a point which is equidistant from (1,3) and x-axis.

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48. Find the locus of a point which moves such that its distance from the origin is three times its distance from x-axis.

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49. 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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50. If $A(-1,1) and\ B(2,3)$ are two fixed points, find the locus of a point P so that the area of $\Delta PAB = 8sq.$ units.

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51. If O is the origin and Q is a variable point on $y^2 = x.$ Find the locus of the mid point of $OQ.$

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52. At what point should the origin be shifted if the coordinates of a point $(4, 5)$ become $(-3, 9)$?

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53. What does the equation $(x-a)^2+(y-b)^2=r^2$ become when the axes are transferred to parallel axes through the pint $(a-c,\ b)$?

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54. What does the equation $(a-b)\left(x^2+y^2\right)-2abx=0$ become if the origin is shifted to the point $\left(\frac{ab}{a-b}, 0\right)$ without rotation?

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55. Find what the following equation become when the origin is shifted to the point (1,1): $x^2+xy-3x-y+2=0$

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56. Find what the following equation become when the origin is shifted to the point (1,1):

$xy - x - y + 1 = 0$

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57. Find what the following equation become when the origin is shifted to the point (1,1):

$x^2 - y^2 - 2x + 2y = 0$

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58. Find what the following equation become when the origin is shifted to the point (1,1): $xy - y^2 - x + y = 0$

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59. Find the point to which the origin should be shifted so that the equation $y^2 - 6y - 4x + 13 = 0$ is transferred to the form $y^2 + Ax = 0$

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60. Find what the following equations become when the origin is shifted to the point (1,1):

$x^2 + xy - 3y^2 - y + 2 = 0$

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61. Find what the following equations become when the origin is shifted to the point (1,1):

$xy - x - y + 1 = 0$

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62. Find what the following equations become when the origin is shifted to the point (1,1):

$xy - y^2 - x + y = 0$

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63. Find what the following equations become when the origin is shifted to the point (1,1):

$x^2 - y^2 - 2x + 2y = 0$

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64. Find the point to which the origin should be shifted after a translation of axes so that the following equations will have no first degree term: $y^2 + x^2 - 4x - 8y + 3 = 0$

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65. Find the point to which the origin should be shifted after a translation of axes so that the following equations will have no first degree term: $x^2 + y^2 - 5x + 2y - 5 = 0$

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66. Find the point to which the origin should be shifted after a translation of axes so that the following equations will have no first degree term: $x^2 - 12x + 4 = 0$

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67. Verify that the area of the triangle with vertices (4,6), (7,10) and (1,-2) remains invariant

under the translation of axes when the origin is shifted to the point (-2,1).

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68. The vertices of a triangle are $O(0, 0),\ A(a, 0) and\ B(0, b)$. Write the coordinates of its circumcentre.

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69. Write the coordinates of the orthocentre of the triangle formed by points (8,0), (4,6) and (0,0)

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70. Three vertices of a parallelogram, taken in order, are (-1, -6), (2,-5) and (7,2). Write the coordinates of its fourth vertex.

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71. If the points $(a, 0), (at12,\ 2at_1) and\ at22,\ 2at_2)$ are collinear, write the value of $t_1 t_2$.

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72. Write the co ordinates of the circumcentre of a triangle whose centroid and orthocenter are at $(3, 3)$ and $(-3, 5)$ respectively

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73. Write the coordinates of the incentre of the triangle having its vertices at (0,0), (5,0) and (0,12).

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74. If the points (1,-1), (2,-1) and (4,-3) are the mid points of the sides of a triangle then write the coordinates of its centroid.

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75. Write the area of the triangle having vertices at $(a, b+c),\ (b, c+a),\ (c, a+b)$.

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Others

1. At what point the origin be shifted so that the equation $x^2 + y^2 - 3x + 2 = 0$ does not contain any first degree term and constant term?

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2. Verify that the area of the triangle with vertices (2, 3), (5, 7) and (-3 -1) remains invariant under the translation of axes when the origin is shifted to the point (-1, 3).

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