MATHS

BOOKS - CENGAGE

COORDINATE SYSYEM

Examples

1. Find the coordinates of circumcentre of a triangle whose vertices are $(-3, 1), (0, -2)$ and $(1, 3)$

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

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

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

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6. The equation of curve referred to the new axes, axes retaining their directions, and origin $(4, 5)$ is $X^2 + Y^2 = 36$. Find the equation referred to the original axes.

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7. AD is the median on BC. Find the coordinates of the point D

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8. The equation of a curve referred to a given system of axes is $3x^2 + 2xy + 3y^2 = 10.$ Find its equation if the axes are rotated through an angle 45^0 , the origin remaining unchanged.

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9. If $h^2 = ab$ then the angle between the pair of straight lines given by $ax^2 + 2hxy + by^2 = 0$ is

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10. In $AD \perp BC$, prove that $AB^2 + CD^2 = BD^2 + AC^2$

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11. Find the coordinates of the circumcenter of the triangle whose vertices are $(A(5, -1), B(-1, 5),$ and $C(6, 6)$. Find its radius also.

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12. Prove that the points (0,0) $(3, \sqrt{3})$ and $(3, -\sqrt{3})$ are the vertices of an equilateral triangle.

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13. If O is the origin and if the coordinates of any two points $Q_1 and Q_2$ are $(x_1, y_1) and (x_2, y_2)$, respectively, prove that $OQ_1 \dot{O} Q_2 \cos\angle Q_1 O Q_2 = x_1 x_2 + y_1 y_2$.

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14. Given that $P(3, 1), Q(6. 5),$ and $R(x, y)$ are three points such that the angle PRQ is a right angle and the area of RQP is 7, find the number of such points R.

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15. Find the area of a triangle having vertices $A(3, 2), B(11, 8),$ and $C(8, 12)$.

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16. 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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17. Find the area of the quadrilateral $ABCD$ having vertices $A(1, 1), B(7, -3), C(12, 2)$, and $D(7, 21)$.

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

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19. If the coordiantes of two points A and B are (3,4) and (5, -2) respectively. Find the coordinates of any point P if PA = PB and area of $\Delta PAB = 10$ sq. units.

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20. If the vertices of a triangle have rational coordinates, then prove that the triangle cannot be equilateral.

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21. A point R with x-coordinate 4 lies on the line segment joining the points $P(2, -3, 4)$ and $Q(8, 0, 10)$. Find the coordinates of the point R.

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22. The sequence $\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}+\sqrt{2}}, \frac{1}{\sqrt{3}+2\sqrt{2}}$ form an ....

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23. Find the coordinates of the point which divides the line segments joining the points $(6, 3)$ and $(-4, 5)$ in the ratio $3:2$ (i) internally and (ii) externally.

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

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25. 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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26. Prove that the points $(-2, -1), (1, 0), (4, 3),$ and (1,2) are the vertices of a parallelogram. Is it a rectangle?

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27. Find the ratio in which the line segment joining the points $A(3, 8)$ and $B(-9, 3)$ is divided by the `Y-axis.

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28. If vertex A of triangle ABC is $(3, 5)$ and centroid is $(-1, 2)$, then find the midpoint of side BC.

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29. `P(3,4), Q(7,2) and R(-2, -1) are the vertices of PQR. Write down the slope of each side of the triangle.

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30. If $(x_i, y_i), i = 1, 2, 3,$ are the vertices of an equilateral triangle such that

$(x_1+2)^2+(y_1-3)^2=(x_2+2)^2+(y_2-3)^2=(x_3+2)^2+(y_2-3)^2=$

then find the value of $\frac{x_1+x_2+x_3}{y_1+y_2+y_3}$.

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31. If ABC having vertices $A(a\cos\theta_1, a\sin\theta_1), B(a\cos\theta_2 a\sin\theta_2), and C(a\cos\theta_3, a\sin\theta_3)$ is equilateral, then prove that $\cos\theta_1+\cos\theta_2+\cos\theta_3=\sin\theta_1+\sin\theta_2+\sin\theta_3=0.$

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32. Find the orthocentre of the triangle whose vertices are $(0, 0)$, $(3, 0)$, and $(0, 4)$.

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33. If circumcentre of a traingle is outside the traingle, then what is the type of traingle?

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34. If the circumcenter of an acute-angled triangle lies at the origin and the centroid is the middle point of the line joining the points (a^2+1, a^2+1) and $(2a, -2a)$, then find the orthocentre.

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35. Orthocenter and circumcenter of a $\mathrm{Delta}ABC$ are $(a, b)and(c, d)$, respectively. If the coordinates of the vertex A are (x_1, y_1), then find the coordinates of the middle point of BC.

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36. If a vertex of a triangle is $(1, 1)$, and the middle points of two sides passing through it are $-2, 3)$ and $(5, 2)$, then find the centroid and the incenter of the triangle.

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37. The vertices of a triangle are $A(-1, -7), B(5, 1) and C(1, 4)$. If the internal angle bisector of $\angle B$ meets the side AC in D, then find the length AD.

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38. Determine x so that the line passing through $3, 4) and (x, 5)$ makes an angle of 135^0 with the positive direction of the x-axis.

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39. Which line is having the greatest inclination with the positive direction of the x-axis? (a) Line joining the points (1, 3) and (4, 7) (b) Line $(c)(d)3x-4y+3=0(e)$ (f)

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40. If the point $(2, 3), (1, 1), and(x, 3x)$ are collinear, then find the value of $x,$ using slope method.

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41. If the points $(a, 0), (b, 0), (0, c)and(0, d)$ are concyclic $(a, b, c, d > 0)$, then prove that $ab = c\cdot\cdot$

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42. If three points are $A(-2, 1)B(2, 3), andC(-2, -4)$, then find the angle between $ABandBC$.

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43. Angle of a line with the positive direction of the x-axis is θ . The line is rotated about some point on it in anticlockwise direction by angle 45^0 and its slope becomes 3. Find the angle θ.

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44. Let $A(6, 4)andB(2, 12)$ be two given point. Find the slope of a line perpendicular to AB.

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45. If line $3x - ay - 1 = 0$ is parallel to the line $(a + 2)x - y + 3 = 0$ then find the value of a.

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46. If $A(2, -1) and B(6, 5)$ are two points, then find the ratio in which the food of the perpendicular from $(4, 1)$ to AB divides it.

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47. If $(b_2 - b_1)(b_3 - b_1) + (a_2 - a + 1)(a_3 - a_1) = 0$, then prove that the circumcenter of the triangle having vertices $(a_1, b_1), (a_2, b_2)$ and (a_3, b_3) is $\left(\frac{a_{2+a_3}}{2}, \frac{b_{2+b_3}}{2}\right)$

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48. Find the orthocentre of ABC with vertices $A(1, 0), B(-2, 1),$ and $C(5, 2)$

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49. Two medians drawn from the acute angles of a right angled triangle intersect at an angle $\frac{\pi}{6}$. If the length of the hypotenuse of the triangle is $3units,$ then the area of the triangle (in sq. units) is $\sqrt{3}$ (b) 3 (c) $\sqrt{2}$ (d) 9

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50. State which of the following statements are true.

(i) $\{\} = \phi$

(ii) $\phi = 0$

(iii) $0 = \{0\}$

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51. Convert the following polar coordinates to its equivalent Cartesian coordinates.

(i) $(2, \pi)$

(ii) $(\sqrt{3}, \pi/6)$

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52. Convert the following polar coordinates to its equivalent Cartesian coordinates.

(i) $(2, \pi)$

(ii) $(\sqrt{3}, \pi/6)$

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53. Convert $y = 10$ into a polar equation.

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54. Express the polar equation $r - 2\cos\theta$ in rectangular coordinates.

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55. Convert $x^2 - y^2 = 4$ into a polar equation.

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56. Convert $r\sin\theta = r\cos\theta + 4$ into its equivalent Cartesian equation.

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57. Convert $r = \cos ec\theta e^{r\cos\theta}$ into its equivalent Cartesian equation.

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58. Find the maximum distance of any point on the curve $x^2 + 2y^2 + 2xy = 1$ from the origin.

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59. 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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60. Find the locus of a point, so that the join of (-5, 1) and (3, 2) subtends a right angle at the moving point.

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

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62. 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 $P\cdot$

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63. Two points $PandQ$ are given. R is a variable point on one side of the line PQ such that $\angle RPQ - \angle RQP$ is a positive constant $2\alpha\cdot$ Find the locus of the point $R\cdot$

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

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65. Find the locus of the point $(t^2 - t + 1, t^2 + t + 1), t \in R$.

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66. The locus of a moving point $P(a\cos^3\theta, a\sin^3\theta)$ is:

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67. If $A(\cos\alpha, \sin\alpha), B(\sin\alpha, -\cos\alpha), C(1, 2)$ are the vertices of ABC, then as α varies, find the locus of its centroid.

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68. If a, b, c are the pth, qth, rth terms, respectively, of an HP , show that the points $(bc, p), (ca, q),$ and (ab, r) are collinear.

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69. Find the area of a triangle formed by the points A(5, 2), B(4, 7) and C(7, -4).

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70. Find the coordinates of the foot of the perpendicular P from the origin to the plane 2x-3y+4z-6=0

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71. M is the foot of the perpendicular from a point P on a parabola $y^2 = 4ax$ to its directrix and SPM is an equilateral triangle, where S is the focus. Then find SP .

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72. If (x, y) and (x, y) are the coordinates of the same point referred to two sets of rectangular axes with the same origin and it $ux + vy,$ where u and v are independent of $xandy$, becomes $VX + UY,$ show that $u^2 + v^2 = U^2 + V^2.$

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73. What does the equation $2x^2 + 4xy - 5y^2 + 20x - 22y - 14 = 0$ become when referred to the rectangular axes through the point $(-2, -3)$, the new axes being inclined at an angle at 45^0 with the old axes?

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74. Prove the identitie $\frac{\cos\theta}{1 + \sin\theta} = \sec\theta - \tan\theta$

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76. Two rods are rotating about two fixed points in opposite directions. If they start from their position of coincidence and one rotates at the rate double that of the other, then find the locus of point of the intersection of the two rods.

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Exercise 1 1

1. What is the minimum area of a triangle with integral vertices ?

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2. What is length of the projection of line segment joining points $(2, 3)$ and $(7, 5)$ on x-axis.

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4. Find the equation to which the equation $x^2 + 7xy - 2y^2 + 17x - 26y - 60 = 0$ is transformed if the origin is shifted to the point $(2, -3)$, the axes remaining parallel to the original axies.

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5. Show that the equation $3x^2 - x + 7 = 0$ can not be satisfied by any real values of x.

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6. Given the equation $4x^2 + 2\sqrt{3}xy + 2y^2 = 1$. Through what angle should the axes be rotated so that the term xy is removed from the transformed equation.

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Exercise 1 2

1. The distance between the points $(a \cos \alpha, a \sin \alpha)$ and $(a \cos \beta, a \sin \beta)$ is

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2. If X ={-5,1,3,4} and Y={a,b,c} , then which of the following relations are function from X to Y ?

(i) $R_1 = \{(-5, a), (1, a), (3, b)\}$

(ii) $R_2 = \{(-5, b), (1, b), (3, a), (4, c)\}$

(iii) $R_3 = \{(-5, a), (1, a), (3, b), (4, c), (1, b)\}$

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3. If the points $(1, 1) : \left(0, \sec^2\theta\right);$ and $\left(\cos ec^2\theta, 0\right)$ are collinear, then find the value of θ

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4. If the area of the circle is A_1 and the area of the regular pentagon inscribed in the circle is $A_2,$ then find the ratio $\frac{A_1}{A_2}.$

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5. 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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6. Find the length of altitude through A of the triangle ABC, where $A \equiv (-3, 0) B \equiv (4, -1), C \equiv (5, 2)$

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7. Find the area of the pentagon whose vertices are $A(1, 1), B(7, 21), C(7, -3), D(12, 2),$ and $E(0, -3)$

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

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Exercise 1 3

1. If point $P(3, 2)$ divides the line segment AB internally in the ratio of $3:2$ and point $Q(-2, 3)$ divides AB externally in the ratio $4:3$ then find the coordinates of points A and B.

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2. If the point $(x, -1), (3, y), (-2, 3), and(-3, -2)$ taken in order are the vertices of a parallelogram, then find the values of $xandy\cdot$

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3. If the midpoints of the sides of a triangle are $(2, 1), (-1, -3), and(4, 5),$ then find the coordinates of its vertices.

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4. The line joining $A(b\cos\alpha b\sin\alpha)$ and $B(a\cos\beta, a\sin\beta)$ is produced to the point $M(x, y)$ so that AM and BM are in the ratio $b : a\cdot$ Then prove that $x + y\tan\left(\alpha + \frac{\beta}{2}\right) = 0.$

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5. If the middle points of the sides of a triangle are $(-2, 3), (4, -3), and(4, 5)$, then find the centroid of the triangle.

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6. The incentre of the triangle with vertices (1, $\sqrt{3}$) (0,0) (2,0) is

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7. If $(1, 4)$ is the centroid of a triangle and the coordinates of its any two vertices are $(4, -8)$ and $(-9, 7)$, find the area of the triangle.

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8. If ABC having vertices $A(a\cos\theta_1, a\sin\theta_1), B(a\cos\theta_2 a\sin\theta_2), andC(a\cos\theta_3, a\sin\theta_3)$ is equilateral, then prove that $\cos\theta_1 + \cos\theta_2 + \cos\theta_3 = \sin\theta_1 + \sin\theta_2 + \sin\theta_3 = 0.$

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9. If $(x_i, y_i), i = 1, 2, 3,$ are the vertices of an equilateral triangle such that

$(x_1 + 2)^2 + (y_1 - 3)^2 = (x_2 + 2)^2 + (y_2 - 3)^2 = (x_3 + 2)^2 + (y_2 - 3)^2 =$

then find the value of $\dfrac{x_1 + x_2 + x_3}{y_1 + y_2 + y_3}$.

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Exercise 1 4

1. The line joining the points $(x, 2x) and (3, 5)$ makes an obtuse angle with the positive direction of the x-axis. Then find the values of $x\cdot$

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2. If the line passing through $(4, 3) and (2, k)$ is parallel to the line $y = 2x + 3,$ then find the value of $k\cdot$

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3. The centroid of a triangle ABC is at the point $(1, 1, 1)$. If the coordinates of A and B are $(3, -5, 7)$ and $(-1, 7, -6)$, respectively, find the coordinates of the point C.

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4. For a given point A(0,0), ABCD is a rhombus of side 10 units where slope of AB is $\frac{4}{3}$ and slope of AD is $\frac{3}{4}$. The sum of abscissa and ordinate of point C (where C lies in first quadrant) is

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5. The line joining the points $A(2, 1), andB(3, 2)$ is perpendicular to the line $\left(a^2\right)x + (a+2)y + 2 = 0$. Find the values of $a\cdot$

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6. Find the angle between the line joining the points $(1, -2), (3, 2)$ and the line $x + 2y - 7 = 0$.

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7. The othocenter of ΔABC with vertices $B(1, -2)$ and $C(-2, 0)$ is $H(3, -1)$.Find the vertex A.

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8. Find the area of the triangle with vertices A(1,1,2)B(2,3,5) and C(1,5,5).

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Exercise 1 5

1. Convert the following polar coordinates to its equivalent Cartesian coordinates.

(i) $(2, \pi)$

(ii) $\left(\sqrt{3}, \pi/6\right)$

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2. Convert the following Cartesian coordinates to the cooresponding polar coordinates using positive r.

(i) $(1, -1)$

(ii) $(-3, -4)$

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3. Convert $2x^2 + 3y^2 = 6$ into the polar equation.

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4. Convert $r = 4 \tan \theta \sec \theta$ into its equivalent Cartesian equation.

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5. Find the minimum distance of any point on the line $3x + 4y - 10 = 0$ from the origin using polar coordinates.

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Exercise 1 6

1. Find the locus of a point whose distance from (a, 0) is equal to its distance from the y-axis.

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2. The coordinates of the point $A and B$ are (a,0) and $(-a, 0)$, respectively. If a point P moves so that $PA^2 - PB^2 = 2k^2$, when k is constant, then find the equation to the locus of the point P.

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3. Let A (2, -3) and B (-2, 1) be vertices of a triangle ABC. If the centroid of this triangle moves on the line 2x + 3y=1, then the locus of the vertex C is the line

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4. Q is a variable point whose locus is $2x+3y+4=0;$ corresponding to a particular position of Q, P is the point of section of OQ, O being the origin, such that $OP : PQ = 3 : 1.$ Find the locus of P.

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5. Find the locus of the middle point of the portion of the line $x\cos\alpha+y\sin\alpha=p$ which is intercepted between the axes, given that p

remains constant.

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6. 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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7. A point moves such that the area of the triangle formed by it with the points (1,5) and (3,-7) is 21 sq. units. Then locus of the point is

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8. A variable line through point $P(2,1)$ meets the axes at $AandB$. Find the locus of the circumcenter of triangle OAB (where O is the origin).

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9. A straight line is drawn through $P(3, 4)$ to meet the axis of x and y at $AandB$, respectively. If the rectangle $OACB$ is completed, then find the locus of C.

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Exercise Single

1. ABC is an isosceles triangle. If the coordinates of the base are $B(1, 3)$ and $C(-2, 7)$, the coordinates of vertex A can be (a)$(1, 6)$ (b) $\left(-\frac{1}{2}, 5\right)$ (c) $\left(\frac{5}{6}, 6\right)$ (d) none of these

A. (1,6)

B. $(-1/2, 5)$

C. $(-5/6, 6)$

D. none of these

Answer: C

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A. $\left(0, \frac{\tan^{-1.5}}{4}\right]$

B. $\left(0, \frac{\tan^{-1.5}}{4}\right)$

C. $\left(2\tan^{-1}\frac{5}{4}, 2\right)$

D. none of these

Answer: A

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3. Which of the following sets of points form an equilateral triangle? (a) $(1, 0), (4, 0), (7, -1)$ (b) $(0, 0), \left(\frac{3}{2}, \frac{4}{3}\right), \left(\frac{4}{3}, \frac{3}{2}\right)$ (c) $\left(\frac{2}{3}, \right), \left(0, \frac{2}{3}\right), (1, 1)$ (d) None of these

A. $(1, 0), (4, 0), (7, -1)$

B. $(0, 0), (3/2, 4/3), 4/3, 3/2)$

C. $(2/3, 0), (0, 2/3), (1, 1)$

D. none of these

Answer: D

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4. A particle p moves from the point $A(0, 4)$ to the point $10, \ -4)$. The particle P can travel the upper-half plane $\{(x, y) \mid y \geq 0\}$ at the speed of $1m/s$ and the lower-half plane $\{(x, y) \mid y \leq 0\}$ at the speed of 2 m/s. The coordinates of a point on the x-axis, if the sum of the squares of the travel times of the upper- and lower-half planes is minimum, are (a)(1, 0) (b) (2, 0) (c) (4, 0) (d) (5, 0)

A. (1,0)

B. (2,0)

C. (4,0)

D. (5,0)

Answer: B

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5. if x_1, x_2, x_3 as well as y_1, y_2, y_3 are in G.P. with same common ratio then prove that the points $(x_1, y_1), (x_2, y_2)$ and (x_3, y_3) are collinear.

A. equal in area

B. similar

C. congruent

D. none of these

Answer: A

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6. $OPQR$ is a square and M, N are the middle points of the sides $PQandQR$, respectively. Then the ratio of the area of the square to that of triangle OMN is (a)4:1 (b) 2:1 (c) 8:3 (d) 7:3

A. $4:1$

B. $2:1$

C. $8:3$

D. $7:3$

Answer: C

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7. A straight line passing through $P(3, 1)$ meets the coordinate axes at $AandB$. It is given that the distance of this straight line from the origin O is maximum. The area of triangle OAB is equal to $\frac{50}{3}s\dot{q}units$ (b) $\frac{25}{3}s\dot{q}units$ $\frac{20}{3}s\dot{q}units$ (d) $\frac{100}{3}s\dot{q}units$

A. $50/3$ sq.units

B. $25/3$ sq.units

C. $20/3$ sq.units

D. $100/3$ sq.units

Answer: A

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8. Let $A \equiv (3, -4), B \equiv (1, 2)$. Let $P \equiv (2k-1, 2k+1)$ be a variable point such that $PA + PB$ is the minimum. Then k is (a)7/9 (b) 0 (c) 7/8 (d) none of these

A. $7/9$

B. 0

C. $7/8$

D. none of these

Answer: C

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9. The polar coordinates equivalent to $\left(-3, \sqrt{3}\right)$ are

A. $\left(2\sqrt{3}, \frac{\pi}{6}\right)$

B. $\left(-2\sqrt{3}, \frac{5\pi}{6}\right)$

C. $\left(2\sqrt{3}, \frac{7\pi}{6}\right)$

D. $\left(2\sqrt{3}, \frac{5\pi}{6}\right)$

Answer: D

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10. If the point $(x_1 + t(x_2 - x_1), y_1 + t(y_2 - y_1))$ divides the join of (x_1, y_1) and (x_2, y_2) internally, then $t < 0$ (b) `01($d$)t=1`

A. $t < 0$

B. $0 < t < 1$

C. $t > 1$

D. $t = 1$

Answer: B

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11. P and Q are points on the line joining $A(-2, 5)$ and $B(3, 1)$ such that $AP = PQ = QB$. Then, the distance of the midpoint of PQ from the origin is 3 (b) $\frac{\sqrt{37}}{2}$ (b) 4 (d) 3.5

A. 3

B. $\sqrt{37/2}$

C. 4

D. 3.5

Answer: B

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12. In triangle ABC, angle B is right angled, $AC = 2$ and $A(2, 2)$, $B(1, 3)$ then the length of the median AD is

A. $\left(\frac{1}{2}\right)$

B. $\sqrt{\frac{5}{2}}$

C. $\frac{5}{\sqrt{2}}$

D. $\frac{1}{\sqrt{2}}$

Answer: B

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13. One vertex of an equilateral triangle is $(2, 2)$ and its centroid is $\left(-\frac{2}{\sqrt{3}}, \frac{2}{\sqrt{3}}\right)$ then length of its side is

A. $4\sqrt{2}$

B. $4\sqrt{3}$

C. $3\sqrt{2}$

D. $5\sqrt{2}$

Answer: A

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14. ABCD is a rectangle with $A(-1, 2)$, $B(3, 7)$ and $AB : BC = 4 : 3$. If P is the centre of the rectangle, then the distance of P from each corner is equal to

A. $\frac{\sqrt{14}}{2}$

B. $3\frac{\sqrt{41}}{4}$

C. $2\frac{\sqrt{41}}{3}$

D. $5\frac{\sqrt{41}}{8}$

Answer: D

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15. If $(2, \ -3), (6, \ -5)$ and $(\ -2, 1)$ are three consecutive vetcies of a rohombus, then its area is

A. 24

B. 36

C. 18

D. 48

Answer: D

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16. If A and B are square matrix of same order then $(A - B)^T$ is:

A. $\sqrt{7}$

B. $\sqrt{\left(3-\sqrt{2}\right)^2+\left(5-\sqrt{5}\right)^2}$

C. $s\sqrt{34}$

D. none of these

Answer: D

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17. Le n be the number of points having rational coordinates equidistant from the point $\left(0, \sqrt{3}\right)$, the

A. $n > 2$

B. $n \leq 1$

C. $n \leq 2$

D. $n = 1$

Answer: C

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18. Draw a triangle ABC of base $BC = 5.6cm, \angle A = 40^\circ$ and the bisector of $\angle A$ meets BC at D such that CD = 4 cm .

A. $(2, 2)$

B. $(3, 2)$

C. $(2, 3)$

D. $(1, 1)$

Answer: D

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19. If $A(0, 0), B(1, 0)$ and $C\left(\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$ then the centre of the circle for which the lines AB, BC, CA are tangents is

A. $\left(\frac{1}{2}, \frac{1}{4}\right)$

B. $\left(\frac{3}{2}, \frac{\sqrt{3}}{2}\right)$

C. $\left(\frac{1}{2}, \frac{1}{2\sqrt{3}}\right)$

D. $\left(\frac{1}{2}, -\frac{1}{\sqrt{3}}\right)$

Answer: C

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20. Statement 1: If in a triangle, orthocentre, circumcentre and centroid are rational points, then its vertices must also be rational points.

Statement : 2 If the vertices of a triangle are rational points, then the centroid, circumcentre and orthocentre are also rational points.

A. Statement 1 is true, Statement 2 is true and Statement 2 is correct explanation for Statement 1.

B. Statement 1 is true , Statement 2 is true and Statement 2 is not the correct exlpanation for Statement 1.

C. Statement 1 is true, Statement 2 is false.

D. Statement 1 is false, Statement 2 is true.

Answer: D

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21. about to only mathematics

A. P lies on the line segment RQ

B. Q lies on the segment PR

C. R lies on the line segment PR

D. P,Q,R are non-collinear

Answer: D

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22. If two vertices of a triangle are $(-2, 3)$ and $(5, -1)$ the orthocentre lies at the origin, and the centroid on the line $x+y=7$, then the third vertex lies at $(7, 4)$ (b) $8, 14)$ $(12, 21)$ (d) none of these

A. (7,4)

B. (8,14)

C. (12,21)

D. none of these

Answer: D

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23. The vertices of a triangle are $\left(pq, \frac{1}{pq}\right), (pq)\Big), \left(qr, \frac{1}{qr}\right)$, and $\left(rq, \frac{1}{rp}\right)$, where p, q and r are the roots of the equation $y^3 = 3y^2 + 6y + 1 = 0$. The coordinates of its centroid are $(1, 2)$ (b) $2, -1)$ $(1, -1)$ (d) $2, 3)$

A. $(1, 2)$

B. $(2, \ -1)$

C. $(1, \ -1)$

D. $(2, 3)$

Answer: B

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24. If the vertices of a triangle are $\left(\sqrt{5, 0}\right)$, $(\sqrt{3}, \sqrt{2})$, and $(2, 1)$, then the orthocentre of the triangle is $\left(\sqrt{5}, 0\right)$ (b) $(0, 0)$ (c) $\left(\sqrt{5} + \sqrt{3} + 2, \sqrt{2} + 1\right)$ (d) none of these

A. $\left(\sqrt{5}, 0\right)$

B. $(0, 0)$

C. $\left(\sqrt{5} + \sqrt{3} + 2, \sqrt{2} + 1\right)$

D. none of these

Answer: C

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25. Two vertices of a triangle are $(4, -3) \& (-2, 5)$. If the orthocentre of the triangle is at $(1, 2)$, find coordinates of the third vertex .

A. $(-33, -26)$

B. $(33, 26)$

C. $(26, 33)$

D. none of these

Answer: B

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26. In ABC, if the orthocentre is $(1, 2)$ and the circumcenter is (0, 0), then centroid of $ABC)$ is $\left(\frac{1}{2}, \frac{2}{3}\right)$ (b) $\left(\frac{1}{3}, \frac{2}{3}\right)$ $\left(\frac{2}{3}, 1\right)$ (d) none of these

A. $(1/2, 2/3)$

B. $(1/3, 2/3)$

C. $(2/3, 1)$

D. none of these

Answer: B

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27. A triangle ABC with vertices $A(-1, 0), B\left(-2, \frac{3}{4}\right)$, and $C\left(-3, -\frac{7}{6}\right)$ has its orthocentre at $H\cdot$ Then, the orthocentre of triangle BCH will be $(-3, -2)$ (b) $1, 3)$ $(-1, 2)$ (d) none of these

A. $(-3, -2)$

B. $(1, 3)$

C. $(-1, 2)$

D. none of these

Answer: D

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28. If a triangle ABC, $A \equiv (1, 10)$, circumcenter $\equiv \left(-\frac{1}{3}, \frac{2}{3}\right)$, and orthocentre $\equiv \left(\frac{11}{4}, \frac{4}{3}\right)$, then the coordinates of the midpoint of the side opposite to A are $\left(1, -\frac{11}{3}\right)$ (b) $(1, 5)$ $(1, -3)$ (d) $(1, 6)$

A. $(1, -11/3)$

B. $(1/5)$

C. $(1, -3)$

D. $(1, 6)$

Answer: A

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29. In ABC, the coordinates of B are $(0, 0)$, $AB = 2, \angle ABC = \frac{\pi}{3}$, and the middle point of BC has coordinates $(2, 0)$. The centroid o the triangle is $\left(\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$ (b) $\left(\frac{5}{3}, \frac{1}{\sqrt{3}}\right)$ $\left(4 + \frac{\sqrt{3}}{3}, \frac{1}{3}\right)$ (d) none of these

A. $(1/2, \sqrt{3}/2)$

B. $(5/3, 1/\sqrt{3})$

C. $(4 + \sqrt{3}/3, 1/3)$

D. none of these

Answer: B

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30. If the origin is shifted to the point $\left(\frac{ab}{a-b}, 0\right)$ without rotation, then the equation $(a-b)\left(x^2+y^2\right) - 2abx = 0$ becomes $(a-b)\left(x^2+y^2\right) - (a+b)xy + abx = a^2$ $(a+b)\left(x^2+y^2\right) = 2ab$ $\left(x^2+y^2\right) = \left(a^2+b^2\right)$ $(a-b)^2\left(x^2+y^2\right) = a^2b^2$

A. $(a-b)(x^2+y^2)-(a+b)xy+abx=a^2$

B. $(a+b)(x^2+y^2)=2ab$

C. $(x^2+y^2)=(a^2+b^2)$

D. $(a-b)^2(x^2+y^2)=a^2b^2$

Answer: D

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31. A light ray emerging from the point source placed at $P(2,3)$ is reflected at a point Q on the y-axis. It then passes through the point $R(5,10)$. The coordinates of Q are $(0,3)$ (b) $(0,2)$ $(0,5)$ (d) none of these

A. (0,3)

B. (0,2)

C. (0,5)

D. none of these

Answer: C

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32. Point $P(p, 0), Q(q, 0), R(0, p), S(0, q)$ from (a)parallelogram (b)rhombus (c)cyclic quadrilateral (d) none of these

A. parallelogram

B. rhombus

C. cyclic quadrilateral

D. none of these

Answer: C

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33. A rectangular billiard table has vertices at $P(0, 0), Q(0, 7), R(10, 7)$, and $S(10, 0)$. A small billiard ball starts at $M(3, 4)$, moves in a straight line to the top of the table, bounces to the right side of the table, and then comes to rest at $N(7, 1)$. The $y-$ coordinate of the point where it hits the right side is 3.7 (b) 3.8 (c) 3.9 (d) 4

A. 3.7

B. 3.8

C. 3.9

D. 4

Answer: A

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34. ABCD is a square Points $E(4, 3)$ and $F(2, 5)$ lie on AB and CD, respectively,such that EF divides the square in two equal parts. If the coordinates of A are $(7, 3)$,then the coordinates of other vertices can be

A. $(7, 2)$

B. $(7, 5)$

C. $(-1, 3)$

D. $(-1, 5)$

Answer: D

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35. If one side of a rhombus has endpoints (4, 5) and (1, 1), then the maximum area of the rhombus is 50 sq. units (b) 25 sq. units 30 sq. units (d) 20 sq. units

A. 50 sq.units

B. 25 sq.units

C. 30 sq.units

D. 20 sq.units

Answer: B

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36. A rectangle $ABCD$, where $A \equiv (0, 0), B \equiv (4, 0), C \equiv (4, 2) D \equiv (0, 2)$, undergoes the following transformations successively: $f_1(x, y) \overrightarrow{y, x}$ $f_2(x, y) \overrightarrow{x + 3y, y}$ $f_3(x, y) \overrightarrow{(x - y)/2, (x + y)/2}\Big)$ The final figure will be

A. a square

B. a rhombus

C. a rectangle

D. a parallelogram

Answer: D

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37. If a straight line through the origin bisects the line passing through the given points $(a \cos \alpha, a \sin \alpha)$ and $(a \cos \beta, a \sin \beta)$, then the lines

A. are perpendicular

B. are parallel

C. have an angle between them of $\pi/4$

D. none of these

Answer: A

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38. Let $A_r, r = 1, 2, 3, \quad$, be the points on the number line such that $OA_1, OA_2, OA_3.$ are in $GP,$ where O is the origin, and the common ratio of the GP be a positive proper fraction. Let $M,$ be the middle point of the line segment $A_rA_{r+1}.$ Then the value of $\sum_{r=1}^{\infty} OM_r$ is equal to $\dfrac{OA_1(OSA_1 - OA_2)}{2(OA_1 + OA_2)}$ (b) $\dfrac{OA_1(OA_1 - OA_2)}{2(OA_1 + OA_2)}$ $\dfrac{OA_1}{2(OA_1 - OA_2)}$ (d) ∞

A. $\dfrac{OA_1(OA_1 - OA_2)}{2(OA_1 + OA_2)}$

B. $\dfrac{OA_1(OA_1 + OA_2)}{2(OA_1 - OA_2)}$

C. $\dfrac{OA_1}{2(OA_1 - OA_2)}$

D. $\propto$

Answer: B

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39. The vertices of a parallelogram $ABCD$ are $A(3, 1), B(13, 6), C(13, 21),$ and $D(3, 16)$. If a line passing through the origin divides the parallelogram into two congruent parts, then the slope of the line is

A. $11/12$

B. $11/8$

C. $25/8$

D. $13/8$

Answer: B

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40. Point A and B are in the first quadrant; point O is the origin. If the slope of OA is 1, the slope of OB is 7, and $OA = OB$, then the slope of AB is a. $-\frac{1}{5}$ (b) $-\frac{1}{4}$ (c) $-\frac{1}{3}$ (d) $-\frac{1}{2}$

A. $-1/5$

B. $-1/4$

C. $-1/3$

D. $-1/2$

Answer: D

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41. Let a,b,c be in A.P and x,y,z be in G.P.. Then the points (a, x), (b, y) and (c, z) will be collinear if

A. $x^2 = y$

B. $x = y = z$

C. $y^2 = z$

D. $x = z^2$

Answer: B

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42. If $\sum_{i-1}^{4} (\xi 2 + yi2) \leq 2x_1x_3 + 2x_2x_4 + 2y_2y_3 + 2y_1y_4,$ the points $(x_1, y_1), (x_2, y_2), (x_3, y_3), (x_4, y_4)$ are the vertices of a rectangle collinear the vertices of a trapezium none of these

A. the vertices of a rectangle

B. collinear

C. the vertices of a trapezium

D. none of these

Answer: A

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43. The vertices A and D of square $ABCD$ lie on the positive sides of $x -$ and $y - a\xi s,$ respectively. If the vertex C is the point $(12, 17)$, then the coordinates of vertex B are $(14, 16)$ (b) (15, 3) $17, 5)$ (d) $(17, 12)$

A. (14,16)

B. (15,3)

C. (17,5)

D. (17,12)

Answer: C

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44. Through the point $P(\alpha, \beta)$, where $\alpha\beta > 0,$ the straight line $\frac{x}{a} + \frac{y}{b} = 1$ is drawn so as to form a triangle of area S with the axes. If $ab > 0,$ then the least value of S is $\alpha\beta$ (b) $2\alpha\beta$ (c) $3\alpha\beta$ (d) none

A. $\alpha\beta$

B. $2\alpha\beta$

C. $3\alpha\beta$

D. none

Answer: B

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45. The locus of the moving point whose coordinates are given by $\left(e^t + e^{-t}, e^t - e^{-t}\right)$ where t is a parameter, is $xy = 1$ (b) $x + y = 2$ $x^2 - y^2 = 4$ (d) $x^2 - y^2 = 2$

A. $xy = 1$

B. $x + y = 2$

C. $x^2 - y^2 = 4$

D. $x^2 - y^2 = 2$

Answer: C

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46. The locus of a point reprersented by $x = \frac{a}{2}\left(\frac{t+1}{t}\right), y = \frac{a}{2}\left(\frac{t-1}{1}\right)$, where $t \in R - \{0\}$, is $x^2 + y^2 = a^2$ (b) $x^2 - y^2 = a^2$ $x + y = a$ (d) $x - y = a$

A. $x^2 + y^2 = a^2$

B. $x^2 - y^2 = a^2$

C. $x + y = a$

D. $x - y = a$

Answer: C

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47. The maximum area of the triangle whose sides a, b and $5\sin\theta),$ and $(5\sin\theta, -5\cos\theta),$ where $\theta \in R$. The locus of its orthocentre is $(x+y-1)^2+(x-y-7)^2=100$ $(x+y-7)^2+(x-y-1)^2=100$ $(x+y-7)^2+(x+y-1)^2=100$ $(x+y-7)^2+(x-y+1)^2=100$

A. 1

B. $1/2$

C. 2

D. $3/2$

Answer: A

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48. Vertices of a variable triangle are $(3, 4)$; $(5\cos\theta, 5\sin\theta)$ and $(5\sin\theta, -5\cos\theta)$ where θ is a parameter then the locus of its circumcentre is

A. $(x+y-1)^2+(x-y-7)^2=100$

B. $(x+y-7)^2+(x-y-1)^2=100$

C. $(x+y-7)^2+(x+y-1)^2=100$

D. $(x+y-7)^2+(x-y+1)^2=100$

Answer: D

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49. From a point, P perpendicular PM and PN are drawn to x and y axes, respectively. If MN passes through fixed point (a,b), then locus of P is

A. $xy=ax+by$

B. $xy=ab$

C. $xy=bx+ay$

D. $x+y=xy$

Answer: C

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50. The locus of point of intersection of the lines $y + mx = \sqrt{a^2m^2 + b^2}$ and $my - x = \sqrt{a^2 + b^2m^2}$ is

A. $x^2 + y^2 = \frac{1}{a^2} + \frac{1}{b^2}$

B. $x^2 + y^2 = a^2 + b^2$

C. $x^2 + y^2 = a^2 - b^2$

D. $\frac{1}{x^2} + \frac{1}{y^2} = a^2 - b^2$

Answer: B

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51. If the roots of the equation $(x_1^2 - a^2)m^2 - 2x_1y_1m + y_1^2 + b^2 = 0(a > b)$ are the slopes of two perpendicular lies intersecting at $P(x_1, y_1)$, then the locus of P is

A. $x^2 + y^2 = a^2 + b^2$

B. $x^2 + y^2 = a^2 - b^2$

C. $x^2 - y^2 = a^2 + b^2$

D. $x^2 - y^2 = a^2 - b^2$

Answer: B

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52. Through point $P(-1, 4)$, two perpendicular lines are drawn which intersect x-axis at Q and R. find the locus of incentre of ΔPQR.

A. $x^2 + y^2 + 2x - 8y - 17 = 0$

B. $x^2 - y^2 + 2x - 8y + 17 = 0$

C. $x^2 + y^2 - 2x - 8y - 17 = 0$

D. $x^2 - y^2 + 8x - 2y - 17 = 0$

Answer: B

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53. The number of integral points (x,y) (i.e, x and y both are integers) which lie in the first quadrant but not on the coordinate axes and also on the straight line $3x + 5y = 2007$ is equal to

A. 133

B. 135

C. 138

D. 140

Answer: A

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54. The foot of the perpendicular on the line $3x + y = \lambda$ drawn from the origin is C. If the line cuts the x and the y-axis at $A and B$, respectively, then $BC : CA$ is

(a)$1:3$

(b) $3:1$

(c) $1:9$

(d) $9:1$

A. $1:3$

B. $3:1$

C. $1:9$

D. $9:1$

Answer: D

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55. The image of $P(a, b)$ on the line $y = -x$ is Q and the image of Q on the line $y = x$ is R . Then the midpoint of PR is $(a+b, b+a)$ $\left(\frac{a+b}{2}, \frac{b+2}{2}\right)$ $(a-b, b-a)$ (d) $(0, 0)$

A. $(a+b, b+a)$

B. $((a+b)/2,(b+2)/2)$

C. $(a-b, b-a)$

D. $(0,0)$

Answer: D

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56. If the equation of the locus of a point equidistant from the points (a_1, b_1) and (a_2, b_2) is $(a_1 - a_2)x + (b_1 - b_2)y + c = 0$, then the value of c is $aa2 - a22 + b12 - b22$ $\sqrt{a12 + b12 - a22 - b22}$ $\frac{1}{2}(a12 + a22 + b12 + b22)$ $\frac{1}{2}(a22 + b22 - a12 - b12)$

A. $a_1^2 - a_2^2 + b_1^2 - b_2^2$

B. $\sqrt{a_1^2 + b_1^2 - a_2^2 - b_2^2}$

C. $\frac{1}{2}\left(a_1^2 + a_2^2 + b_1^2 + b_2^2\right)$

D. $\frac{1}{2}\left(a_1^2 + b_2^2 + a_1^2 + b_2^2\right)$

Answer: D

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57. Consider three lines as follows. $L_1 : 5x - y + 4 = 0$ $L_2 : 3x - y + 5 = 0$ $L_3 : x + y + 8 = 0$ If these lines enclose a triangle ABC and the sum of the squares of the tangent to the interior angles can be expressed in the form $\frac{p}{q}$, where $pandq$ are relatively prime numbers, then the value of $p + q$ is 500 (b) 450 (c) 230 (d) 565

A. 500

B. 450

C. 230

D. 465

Answer: D

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58. Consider a point A(m,n) , where m and n are positve intergers. B is the reflection of A in the line $y = x$, C is the reflaction of B in the y axis, D is the reflection of C in the x axis and E is the reflection of D is the y axis. The area of the pentagon ABCDE is.

A. $2m(m+n)$

B. $m(m+3n)$

C. $m(2m+3n)$

D. $2m(m+3n)$

Answer: B

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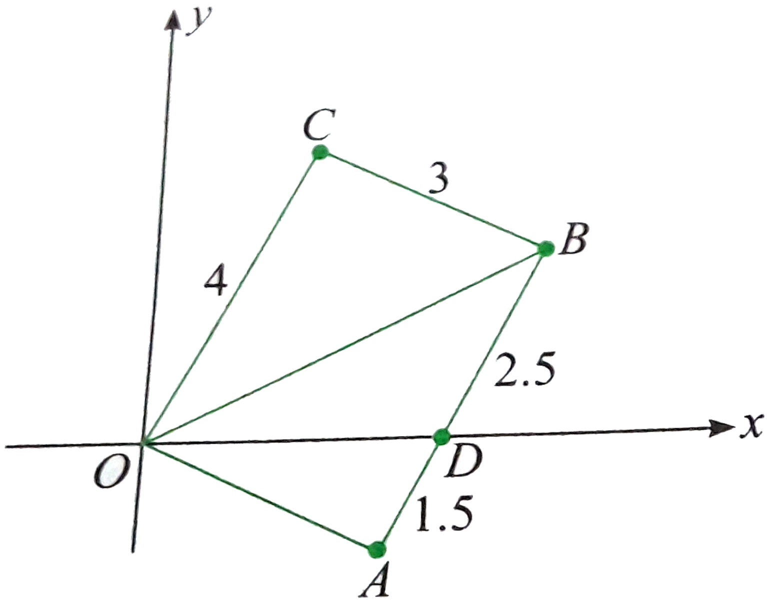
59. In the given figure, OABC is a rectangle. Slope of OB is



A. $1/4$

B. $1/3$

C. $1/2$

D. Cannot be determined

Answer: C

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Exercise Multiple

1. If $(-6, -4), (3, 5), (-2, 1)$ are the vertices of a parallelogram, then the remaining vertex can be $(0, -1)$ (b) $7, 9)$ $(-1, 0)$ (d) $(-11, -8)$

A. $(0, -1)$

B. (7,10)

C. (-1,0)

D. $(-11, -8)$

Answer: B::C::D

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2. Let $0 \equiv (0, 0), A \equiv (0, 4), B \equiv (6, 0)$. Let P be a moving point such that the area of triangle POA is two times the area of triangle POB. The locus of P will be a straight line whose equation can be $x + 3y = 0$ (b) $x + 2y = 0$ $2x - 3y = 0$ (d) $3y - x = 0$

A. $x + 3y = 0$

B. $x + 2y = 0$

C. $2x - 3y = 0$

D. $3y - x = 0$

Answer: A::D

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3. If $(-4, 0)$ and $(1, -1)$ are two vertices of a triangle of area $4squnits$, then its third vertex lies on $y = x$ (b) $5x + y + 12 = 0$ (c) $x + 5y - 4 = 0$ (d) $x + 5y + 12 = 0$

A. $y = x$

B. $5x + y + 12 = 0$

C. $x + 5y - 4 = 0$

D. $x + 5y + 12 = 0$

Answer: C::D

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4. The area of triangle ABC is $20cm^2$. The coordinates of vertex A are $-5, 0)$ and those of B are $(3, 0)$. The vertex C lies on the line $x - y = 2$. The coordinates of C are $(5, 3)$ (b) $(- 3, - 5)$ $(- 5, - 7)$ (d) $(7, 5)$

A. (5,3)

B. (-3,-5)

C. (-5,-7)

D. (7,5)

Answer: B

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5. If ABC having vertices $A(a\cos\theta_1, a\sin\theta_1), B(a\cos\theta_2 a\sin\theta_2), andC(a\cos\theta_3, a\sin\theta_3)$ is equilateral, then prove that $\cos\theta_1 + \cos\theta_2 + \cos\theta_3 = \sin\theta_1 + \sin\theta_2 + \sin\theta_3 = 0.$

A. $\cos\theta_1 + \cos\theta_2 + \cos\theta + 3 = 0$

B. $\sin\theta_1 + \sin\theta_2 + \sin\theta_3 = 0$

C. $\tan\theta_1 + \tan\theta_2 + \tan\theta_3 = 0$

D. $\cot\theta_1 + \cot\theta_2 + \cot\theta_3 = 0$

Answer: A::B

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6. The points $A(0, 0), B(\cos\alpha, \sin\alpha)$ and $C(\cos\beta, \sin\beta)$ are the vertices of a right-angled triangle if $\frac{\sin(\alpha-\beta)}{2} = \frac{1}{\sqrt{2}}$ (b) $\frac{\cos(\alpha-\beta)}{2} = -\frac{1}{\sqrt{2}}$ $\frac{\cos(\alpha-\beta)}{2} = \frac{1}{\sqrt{2}}$ (d) $\frac{\sin(\alpha-\beta)}{2} = -\frac{1}{\sqrt{2}}$

A. $\sin.\ \frac{\alpha-\beta}{2}=\frac{1}{\sqrt{2}}$

B. $\cos.\ \frac{\alpha-\beta}{2}=\frac{1}{\sqrt{2}}$

C. $\cos.\ \frac{\alpha-\beta}{2}=-\frac{1}{\sqrt{2}}$

D. $\sin.\ \frac{\alpha-\beta}{2}=-\frac{1}{\sqrt{2}}$

Answer: A::C::D

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7. The ends of a diagonal of a square are $(2,\ -3)$ and $(-1, 1)$. Another vertex of the square can be a.$\left(-\frac{3}{2},\ -\frac{5}{2}\right)$ (b) $\left(\frac{5}{2}, \frac{1}{2}\right)$ $\left(\frac{1}{2}, \frac{5}{2}\right)$ (d) none of these

A. $(-3,\ /2,\ -5/2)$

B. $(5/2, 1/2)$

C. $(1/2, 5/2)$

D. none of these

Answer: A::B

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8. If all the vertices of a triangle have integral coordinates, then the triangle may be (a) right-angled (b) equilateral (c) isosceles (d) none of these

A. right-angled

B. equilateral

C. isosceles

D. none of these

Answer: A::C

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9. In a $ABC, A \equiv (\alpha, \beta), B \equiv (1, 2), C \equiv (2, 3),$ point A lies on the line $y = 2x + 3,$ where α, β are integers, and the area of the triangle is S such that $[S] = 2$ where $[\ .]$ denotes the greatest integer function. Then the possible coordinates of A can be $(-7, -11)$ (b) $(-6, -9)$ $(2, 7)$ (d) $(3, 9)$

A. $(-7, -11)$

B. $(-6, -9)$

C. (2,7)

D. (3,9)

Answer: A::B::C::D

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10. In an acute triangle ABC , if the coordinates of orthocentre H are $(4, b)$, of centroid G are $(b, 2b - 8)$, and of circumcenter S are $(-4, 8)$, then b cannot be .

A. 4

B. 8

C. 12

D. -12

Answer: A::B::C::D

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11. Evaluate $\int_{-1}^{3}[x]dx$,where [.] denotes the greatest integer function.

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12. about to only mathematics

A. (0,3)

B. (0,5/2)

C. (0,0)

D. (0,6)

Answer: B::C

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13. A right angled triangle ABC having a right angle at C, CA=b and CB=a, move such that h angular points A and B slide along x-axis and y-axis respectively. Find the locus of C

A. $ax+by+1=0$

B. $ax+by=0$

C. $ax^2 \pm 2bt + y^2 = 0$

D. $ax-by=0$

Answer: B::D

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Exercise Comprehension

1. Study the diagram. The line l is perpendicular to line m Does PE bisect CG?

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2. For points $P \equiv (x_1, y_1)$ and $Q \equiv (x_2, y_2)$ of the coordinate plane, a new distance $d(P, Q) = |x_1 x_1| + |y_1 - y_2|\cdot$ Let $O = (0, 0)$ and $A = (3, 2)$. Prove that the set of points in the first quadrant which are equidistant (with respect to the new distance) from O and A consists of the union of a line segment of finite length and an infinite ray. Sketch this set in a labelled diagram.

A. 2sq.units

B. 4 sq.units

C. 6 sq.units

D. noen of these

Answer: B

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3. Evaluate $\int_0^3 [x]dx$,where [.] denotes the greatest integer function.

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4. Evaluate $\int \frac{x}{5x^2 - 2} dx$

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5. Evaluate $\int \frac{x-1}{x+1} dx$

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6. Let ABCD is a square with sides of unit length. Points E and F are taken om sides AB and AD respectively so that AE= AF. Let P be a point inside the square ABCD.The maximum possible area of quadrilateral CDFE is-

A. $1/8$

B. $1/4$

C. $5/8$

D. $3/8$

Answer: C

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7. Let ABCD be a square with sides of unit lenght. Points E and F are taken on sides AB and AD, respectively,so that $AE = AF$. Let P be a point inside the squre ABCD.

The value of $(PA)^2 - (PB)^2 + (PC)^2 - (PD)^2$ is equal to

A. 3

B. 2

C. 1

D. 0

Answer: D

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8. Let ABCD be a square with sides of unit lenght. Points E and F are taken on sides AB and AD, respectively,so that $AE = AF$. Let P be a point inside the squre ABCD.

Let a line passing through point A divides the sqaure ABD into two parts so that the area of one portion is double the other. then the length of the protion of line inside the square is

A. $\sqrt{10}/3$

B. $\sqrt{13}/3$

C. $\sqrt{11}/3$

D. $2/\sqrt{3}$

Answer: B

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9. Let ABC be an acute- angled triangle and AD, BE, and CF be its medians, where E and F are at (3,4) and (1,2) respectively. The centroid of ΔABC , $G(3, 2)$.

The coordinates of D are

A. (7,-4)

B. (5,0)

C. (7,4)

D. (-3,0)

Answer: B

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10. Let ABC be an acute- angled triangle and AD, BE, and CF be its medians, where E and F are at (3,4) and (1,2) respectively. The centroid of ΔABC, $G(3, 2)$.

The coordinates of D are

A. $4\sqrt{2}$

B. $3\sqrt{2}$

C. $6\sqrt{2}$

D. $2\sqrt{3}$

Answer: C

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Exercise Matrix

1. Consider the triangle whose vertices are (-1,0),(5,-2) and (8,2). Find the centroid of the triangle.

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2. Consider the triangle whose vertices are (0,6) , (8,12) and (8,0). Find the centroid of the triangle.

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3. Evaluate $\int (3x+2)^5 dx$

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4. Evaluate $\int_0^2 \left(4x^2+3x+2\right) dx$

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Exercise Numerical

1. Line AB passes through point (2,3) and intersects the positive x and y-axes at A(a,0) and B(0,b) respectively. If the area of ΔAOB is 11. then the value of $4b^2 + 9a^2$ is

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2. A point A divides the join of $P(-5, 1)$ and $Q(3, 5)$ in the ratio $k : 1$. Then the integral value of k for which the area of ABC, where B is $(1, 5)$ and C is $(7, -2)$, is equal to 2 units in magnitude is___

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3. The distance between the circumcenter and the orthocentre of the triangle whose vertices are $(0, 0), (6, 8),$ and $(-4, 3)$ is L. Then the value of $\frac{2}{\sqrt{5}}L$ is________

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4. A man starts from the point $P(-3, 4)$ and reaches the point $Q(0, 1)$ touching the x-axis at $R(\alpha, 0)$ such that $PR + RQ$ is minimum. Then α and $|\alpha|$.

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5. Let $A(0, 1), B(1, 1), C(1, -1), D(-1, 0)$ be four points. If P is any other point, then $PA + PB + PCPD \geq d$, when $[d]$ is where $[.]$ represents greatest integer.

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6. Differentiate $y = 4\cos\left(6x^2 + 5\right)$.

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7. If the area of the triangle formed by the points $(2a, b)(a + b, 2b + a)$, and $(2b, 2a)$ is $2qunits$, then the area of the triangle whose vertices are $(1 + b, a - b), (3b - a, b + 3a)$, and $(3a - b, 3b - a)$ will be_____

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8. Lines L_1 and L_2 have slopes m and n, respectively, suppose L_1 makes twice as large angle with the horizontal (mesured counter clockwise from the positive x-axis as does L_2 and L_1 has 4 times the slope of L_2. If L_1 is not horizontal, then the value of the proudct mn equals.

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9. If lines $2x - 3y + 6 = 0$ and $kx + 2y + 12 = 0$ cut the coordinate axes in concyclic points, then the value of $|k|$ is

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10. Evaluate $\int_0^8 x^{\frac{5}{3}} dx$

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11. The value of a for which the image of the point $(a, a-1)$ w.r.t the line mirror $3x + y = 6a$ is the point $(a^2 + 1, a)$ is (A) 0 (B) 1 (C) 2 (D) none of these

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12. The maximum area of the convex polyon formed by joining the points $A(0, 0), B(2t^2, 0), C(18, 2), D\left(\frac{8}{r^2}, 4\right)$ and $E(0, 2)$ where $t \in R - \{0\}$ and interior angle at vertex B is greater than or equal to 90° is

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Jee Main Previous Year

1. The lines $p(p^2+1)x - y + q = 0$ and $(p^2+1)^2 x + (p^2+1)y + 2q = 0$ are perpendicular to a common line for

A. no value of p.

B. exactly one value of p.

C. exactly two values of p.

D. more than two values of p.

Answer: B

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2. If the line 2x + y = k passes through the point which divides the line segment joining the points (1, 1) and (2, 4) in the ratio 3 : 2, then k equals

A. $\frac{29}{5}$

B. 5

C. 6

D. $\frac{11}{5}$

Answer: C

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3. Evaluate $\int \frac{2^x + 3^x}{5^x} dx$

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4. Let k be an integer such that the triangle with vertices $(k, -3k), (5, k)$ and $(-k, 2)$ has area $28 sq.$ units. Then the orthocentre of this triangle is at the point : $\left(1, -\frac{3}{4}\right)$ (2) $\left(2, \frac{1}{2}\right)$ (3) $\left(2, -\frac{1}{2}\right)$ (4) $\left(1, \frac{3}{4}\right)$

A. $\left(2, \frac{1}{2}\right)$

B. $\left(2, -\frac{1}{2}\right)$

C. $\left(1, \frac{3}{4}\right)$

D. $\left(1, \ -\frac{3}{4}\right)$

Answer: A

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5. In ΔABC, then show that $r(r_1 + r_2 + r_3) = ab + bc + ac - s^2$.

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6. Find the LCM and GCD for the following and verify that $p(x) \times q(x) = LCM \times GCD, 7x^2y, 28xy^2$

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