MATHS

BOOKS - ARIHANT MATHS (ENGLISH)

COORDINATE SYSTEM AND COORDINATES

Example

1. Draw the polar coordinates $\left(2, \frac{\pi}{3}\right), \left(-2, \frac{\pi}{3}\right), \left(-2, -\frac{\pi}{3}\right)$ and $\left(2, -\frac{\pi}{3}\right)$ on the plane.

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2. Draw the polar oordinate $\left(3, \frac{5\pi}{4}\right)$ on the plane.

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3. Find the cartesian coordinates of the points whose polar coordinates are

$$\left(5, \pi - \tan^{-1}\left(\frac{4}{3}\right)\right)$$

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4. Find the cartesian coordinates of the points whose polar coordinates are

$\left(5\sqrt{2}, \frac{\pi}{4}\right)$

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5. Find the polar coordinates of the points whose cartesian coordinates are

$(-2, -2)$

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6. Find the polar coordinates of the points whose cartesian coordinates are

$(-3, 4)$

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7. Transform to Cartesian coordinates the equations: $r^2 = a^2 \cos 2\theta$

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8. Transform the equation $x^2 + y^2 = ax$ into polar form.

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

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10. 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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11. If P(x, y) is a point equidistant from the points A(6, -1) nad B(2, 3), show that x-y - 3.

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

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13. An equilateral triangle has one vertex at (0, 0) and another at $(3, \sqrt{3})$. What are the coordinates of the third vertex ?

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14. By using the concept of slope, show that the points (-2,-10, (4,0), (3,3) and (-3,2) are the vertices f a parallelogram.

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15. 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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16. Find the circumcentre of the triangle whose vertices are (-2, -3), (-1, 0) and (7, -6). Also find the radius of the circumircle.

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

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18. Show that the triangle, the coordinates of whose verticles are given by integers, can never be an equilateral triangle.

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19. 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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20. Let ABCD be a rectangle and P be any point in its plane. Show that $PA^2 + PC^2 = PB^2 + PD^2$ using coordinate geometry.

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21. Prove that the points $(0, 0)$, $\left(3, \frac{\pi}{2}\right)$ and $\left(3, \frac{\pi}{6}\right)$ are the vertices of an equilateral triangle.

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22. Find the coordinates of the point which divides the line segment joining the points $A(5, -2)$ and

$B(9, 6)$ in the ratio $3:1$

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23. 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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24. Determine the ratio in which the straight line $x - y - 2 = 0$ divides the line segment joining $(3, -1)$ and $(8, 9)$.

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25. The coordinates of three consecutive vertices of a parallelogram are (1, 3), (-1, 2) and (2, 5). Then find the coordinates of the fourth vertex.

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

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27. If the coordinates of the mid-points of the sides of a triangle are $(1, 2)(0, -1) and (2, -1)$. Find the coordinate of its vertices.

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

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29. The line segment joining the mid-points of any two sides of a triangle in parallel to the third side and equal to half of it.

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30. Find the coordinates of a point which divides externally the line joining (1, -3) and (-3, 9) in the ratio 1 : 3.

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31. 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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32. Using section formula show that the points (1,-1), (2, 1) and (4, 5) are collinear.

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33. 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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34. Find the harmonic conjugates of the point R(5, 1) with respect to the points P(2, 10) and Q(6, -2)

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35. 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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36. The vertices of a triangle are (1, 2), (h, -3) and (-4, k). Find the value of $\sqrt{\left\{(h+k)^2+(h+3k)^2\right\}}$. If the centroid of the triangle be at point (5, -1).

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37. If D(-2, 3), E (4, -3) and F (4, 5) are the mid-points of the sides BC, CA and AB of the sides BC, CA and AB of triangle ABC, then find $\sqrt{\left(|AG|^2 + |BG|^2 - |CG|^2\right)}$ where, G is the centroid of ΔABC.

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39. If G be the centroid of a triangle ABC, prove that,Â

AB2+BC2+CA2=3(GA2+GB2+GC2)

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40. The vertices of a triangle are (1, a), (2, b) and

$(c^2 - 3)$

Find the condition that the centroid may lie on the X-axis.

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41. The vertices of a triangle are $(1, a), (2, b)$ and $\left(c^2, -3\right)$. (i) Prove that its centroid can not lie on the y-axis. (ii) Find the condition that the centroid may lie on the x-axis for any value of $a, b, c \in \mathbb{R}$.

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42. Find the coordinates of incentre of the triangle whose are (4, -2), (-2, 4) and (5, 5).

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43. If $\left(\frac{3}{2}, 0\right), \left(\frac{3}{2}, 6\right)$ and $(-1, 6)$ are mid-points of the sides of a triangle, then find

Incentre of the triangle

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44. If $\left(\frac{3}{2}, 0\right), \left(\frac{3}{2}, 6\right)$ and $(-1, 6)$ are mid-points of the sides of a triangle, then find

Centroid of the triangle

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45. If a vertex of a triangle be $(1, 1)$ and the middle points of the sides through it be $(-2, 3)$ and $(5, 2)$, find the other vertices.

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46. If G is the centroid and l the in-centre of the triangle, with vertices $A(-36, 7), B(20, 7)$ and $C(0, -8)$, then, find the value of Gl

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47. If the coordinates of the mid-points of the sides of a triangle are $(1,\ 1),\ (2,\ -3)$ and $(3,\ 4)$, find the vertices of the triangle.

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48. In a ΔABC with vertices A(1,2), B(2,3) and C(3, 1) and

$$\angle A = \angle B = \cos^{-1}\left(\frac{1}{\sqrt{10}}\right), \angle C = \cos^{-1}\left(\frac{4}{5}\right),$$

then find the circumentre of ΔABC.

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49. Find the circumcentre of the triangle whose vertices are (2, 2), (4, 2) and (0, 4).

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50. Find the circumcentre of triangle ABC if $A(7, 4), B(3, -2)$ and $\angle C = \frac{\pi}{3}$.

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51. Find the orthocentre of ΔABC if $A \equiv (0, 0), B \equiv (3, 5)$ and $C \equiv (4, 7)$.

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52. If a triangle has it's orthocenter at (1,1) and circumcentre (3/2,3/4) then centroid is:

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53. The vertices of a triangle are $A(x_1, x_1 \tan\theta_1), B(x_2, x_2 \tan\theta_2) and C(x_3, x_3 \tan\theta_3)$. if the circumcentre of $\mathrm{Delta}ABC$ coincides with the origin and $H(x, y)$ is the orthocentre, show that $\frac{y}{x} = \frac{\sin\theta_1 + s\int h\eta_2 + \sin\theta_3}{\cos\theta_1 + \cos\theta_2 + \cos\theta_3}$

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

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

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57. Prove that the coordinates of the vertices of an equilateral triangle can not all be rational.

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58. If the coordinates of two points A and B are $(3, 4)$ and $(5, -2)$ respectively. Find the coordinates of any point P, if

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59. Find the area of the triangle formed by the straight lines $7x - 2y + 10 = 0, 7x + 2y - 10 = 0$ and $9x + y + 2 = 0$ (without sloving the vertices of the triangle).

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60. If Δ_1 is the area of the triangle with vertices $(0, 0), (a \tan \alpha, b \cot \alpha), (a \sin \alpha, b \cos \alpha), \Delta_2$ is the area of the triangle with vertices $(a \sec^2 \alpha, b \cos ec^2 \alpha), (a + a \sin^2 \alpha, b + b \cos^2 \alpha)$

and Δ_3 is the area of the triangle with vertices $(0, 0), (a\tan\alpha, -b\cot\alpha), (a\sin\alpha, b\cos\alpha)$. Show that there is no value of α for which Δ_1, Δ_2 and Δ_3 are in GP.

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61. 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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62. The locus of the moving point P such that $2PA = 3PB$, where A is (0.0) and B is (4,-3), is

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63. 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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64. 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 $b^2 = a^2(1 - e^2)$.

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65. Find the equation of the locus of a point which moves so that the difference of its distances from the points (3, 0) and (-3, 0) is 4 units.

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66. The ends of the hypotenuse of a right angled triangle are (0,6) and (6,0) . Find the locus of the third vertex.

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67. 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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68. Find the locus of a point whose coordinate are given by $x = t + t^2, y = 2t + 1$, where t is variable.

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69. A stick of length 10 units rests against the floor and a wall of a room. If the stick begins to slide ontfloor then the locus of its middle point is:

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70. 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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71. A variable line cuts X-axis at A, Y -axix at B, where OA = a, OB = b (O as origin) such that $a^2 + b^2 = 1.$

Find the locus of

centroid of ΔOAB

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72. A variable line cuts x-axis at A, y-axis at B where $OA = a, OB = b$ (O as origin) such that then the locus of circumcentre of ΔOAB is-

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73. Two points $P and Q$ are given. R is a variable point on one side of the line PQ such that $\angle RPQ - \angle RQP$ is a positive constant 2α. Find the locus of the point R.

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74. Find the equation of the curve $2x^2 + y^2 - 3x + 5y - 8 = 0$ when the origin is transferred to the point $(-1, 2)$ without changing the direction of axes.

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75. 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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76. 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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77. At what point the origin be shifted, if the coordinates of a point (-1, 8) become (-7, 3) ?

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78. If the axes are turned through 45°, find the transformed form of the equation $3x^2 + 3y^2 + 2xy = 2.$

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79. Prove that if the axes be turned through $\frac{\pi}{4}$ the equation $x^2 - y^2 = a^2$ is transformed to the form $xy = \lambda$. Find the value of λ.

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80. Though what angle should the axes be rotated so that the equation $9x^2 - 2\sqrt{3}xy + 7y^2 = 10$ may be changed to $3x^2 + 5y^2 = 5$?

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81. 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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82. 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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83. 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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84. Find λ if $(\lambda, \lambda + 1)$ is an interior point of ΔABC where,$A \equiv (0, 3)$, $B \equiv (-2, 0)$ and $C \equiv (6, 1)$.

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85. Prove that the locus of the centroid of the triangle whose vertices are $(a\cos t, a\sin t), (b\sin t, -b\cos t)$, and $(1, 0)$, where t is a parameter, is circle.

A. $(3x-1)^2 + (3y)^2 = a^2 - b^2$

B. $(3x-1)^2 + (3y)^2 = a^2 + b^2$

C. $(3x+1)^2 + (3y)^2 = a^2 + b^2$

D. $(3x+1)^2 + 3y^2 = a^2 - b^2$

Answer: B

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86. Find the incentre of the triangle with vertices $A91, \sqrt{3})$, $B(0, 0)$ and $C(2, 0)$.

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

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

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

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

Answer: D

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87. The orthocentre of the triangle with vertices $(0, 0), (3, 4),$ and $(4, 0)$ is $\left(3, \frac{5}{4}\right)$ (b) $(3, 12)$ $\left(3, \frac{3}{4}\right)$ (d) $(3, 9)$

A. $\left(3, \frac{5}{4}\right)$

B. (3, 12)

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

D. (3, 9)

Answer: C

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88. If x_1, x_2, x_3 as well as y_1, y_2, y_3 are in GP, with the same common ratio, then the points $(x_1, y_1), (x_2, y_2)$ and (x_3, y_3)

A. lie on a straight line

B. lie on an ellipse

C. lie on a circle

D. are vertices of a triangle

Answer: A

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89. Let A be the image of (2, -1) with respect to Y - axis Without transforming the oringin, coordinate axis are turned at an angle 45° in the clockwise direction. Then, the coordiates of A in the new system are

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

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

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

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

Answer: A

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90. Let $S_1, S_2, \ldots.$ be squares such that for each $n \geq 1$, the length of a side of S_n equals the lengh of a diagonal of S_{n+1}. If the length of a side of S_1 is 10 cm and the area of S_n less than 1 sq cm. Then, find the value of n.

A. 7

B. 8

C. 9

D. 10

Answer: B::C::D

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

A. right angled

B. equilateral

C. isosceles

D. scalene

Answer: A::C::D

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92. 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

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93. If $A\left(\alpha, \frac{1}{\alpha}\right), B\left(\beta, \frac{1}{\beta}\right), C\left(\gamma, \frac{1}{\gamma}\right)$ be the vertices of a ΔABC, where α, β are the roots of $x^2 - 6ax + 2 = 0, \beta, \gamma$ are the roots of $x^2 - 6bx + 3 = 0$ and γ, α are the roots of $x^2 - 6cx + 6 = 0$, a, b, c being positive.

The coordinates of orthocentre of ΔABC is

A. 1

B. 2

C. 3

D. 5

Answer: B

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94. If $A\left(\alpha, \frac{1}{\alpha}\right), B\left(\beta, \frac{1}{\beta}\right), C\left(\gamma, \frac{1}{\gamma}\right)$ be the vertices of a ΔABC, where α, β are the roots of $x^2 - 6ax + 2 = 0, \beta, \gamma$ are the roots of $x^2 - 6bx + 3 = 0$ and γ, α are the roots of

$x^2 - 6cx + 6 = 0$, a, b, c being positive.

The coordinates of orthocentre of ΔABC is

A. $\left(1, \frac{11}{9}\right)$

B. $\left(\frac{1}{3}, \frac{11}{18}\right)$

C. $\left(2, \frac{11}{18}\right)$

D. $\left(\frac{2}{3}, \frac{11}{19}\right)$

Answer: C

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95. If $A\left(\alpha, \frac{1}{\alpha}\right), B\left(\beta, \frac{1}{\beta}\right), C\left(\gamma, \frac{1}{\gamma}\right)$ be the vertices of a ΔABC, where α, β are the roots of

$x^2 - 6ax + 2 = 0, \beta, \gamma$ are the roots of $x^2 - 6bx + 3 = 0$ and γ, α are the roots of $x^2 - 6cx + 6 = 0$, a, b, c being positive.

The coordinates of orthocentre of ΔABC is

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

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

C. $\left(-\frac{1}{5}, -5\right)$

D. $\left(-\frac{1}{6}, -6\right)$

Answer: D

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96. If the points $(-2, 0), \left(-1, \frac{1}{\sqrt{3}}\right)$ and $(\cos\theta, \sin\theta)$ are collinear, then the number of value of $\theta \in [0, 2\pi]$ is

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97. Statement I : The area of the triangle formed by the points A(100, 102), B(102, 105), C(104, 107) is same as the area formed by A'(0, 0), B' (2, 3), C'(4, 5).

Statement II : The area of the triangle is constant wih respect to translation.

A. Statement I is true, Statement II is true, Statement II is a correct explanation for Statement I.

B. Statement I is true, Statement II is true, Statement II is not a correct explanation for Statement I.

C. Statement I is true, Statement II is false.

D. Statement I is false, Statement II is true.

Answer: A

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98. Statement I : If centroid and circumcentre of a triangle are known its orthocentre can be found

Statement II : Centroid, orthocentre and circumcentre of a triangle are collinear.

A. Statement I is true, Statement II is true, Statement II is a correct explanation for Statement I.

B. Statement I is true, Statement II is true, Statement II is not a correct explanation for Statement I.

C. Statement I is true, Statement II is false.

D. Statement I is false, Statement II is true.

Answer: B

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99. The four points $A(\alpha, 0), B(\beta, 0), C(\gamma, 0)$ and $D(\delta, 0)$ are such that α, β are the roots of equation $ax^2 + 2hx + b = 0,$ and γ, δ are the roots of equation $a'x^2 + 2h'x + b' = 0$. Show that the sum of the ratios in which C and D divide AB is zero, if $ab' + a'b = 2hh'$.

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100. If m_1 and m_2 are roots of equation $x^2 + (\sqrt{3} + 2)x + \sqrt{3} - 1 = 0$ the the area of the triangle formed by lines $y = m_1 x, y = m_2 x, y = c$ is:

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101. 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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102. The distance between the two parallel lines is 1 unit. A point A is chosen to lie between the lines at a distance 'd' from one of them Triangle ABC is equilateral with B on one line and C on the other parallel line. The length of the side of the equilateral triangle is

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103. 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

$(-7, -11)$ $(-6, -9)$ $(2, 7)$ $(3, 9)$

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104. Let S be a square of unit area. Consider any quadrilateral which has one vertex on each side of S. If a, b, c and d denote the lengths of sides of the quadrilateral, prove that $2 \leq a_2 + b_2 + c_2 + d_2 \leq 4$

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105. The circumcentre of a triangle having vertices $A(a, a\tan\alpha), B(b, b\tan\beta), C(c, c\tan\gamma)$ is at origin, where $\alpha+\beta+\gamma=\pi$. Then the orthocentre lies on

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Exercise For Session 1

1. The polar coordinates of the point whose cartesian coordinates are (-1, -1) is

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

B. $\left(\sqrt{2}, \frac{3\pi}{4}\right)$

C. $\left(\sqrt{2}, -\frac{\pi}{4}\right)$

D. $\left(\sqrt{2}, -\frac{3\pi}{4}\right)$

Answer: D

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2. The cartesian coordinates of the point whose polar coordinates are $\left(13, \pi - \tan^{-1}\left(\frac{5}{12}\right)\right)$ is

A. (12, 5)

B. (-12, 5)

C. (-12, -5)

D. (12, -5)

Answer: B

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3. The transform equation of $r^2\cos^2\theta = a^2\cos 2\theta$ to cartesian form is $(x^2+y^2)x^2 = a^2\lambda$, then value of λ is

A. $y^2 - x^2$

B. $x^2 - y^2$

C. xy

D. x^2y^2

Answer: B

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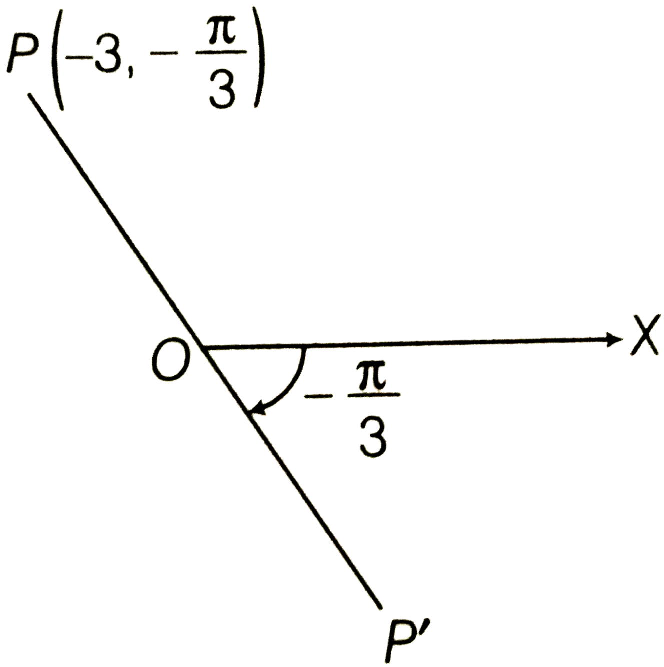
4. The coordinates of P' in the figure is



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

B. $\left(3, -\frac{\pi}{3}\right)$

C. $\left(-3, -\frac{\pi}{3}\right)$

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

Answer: B

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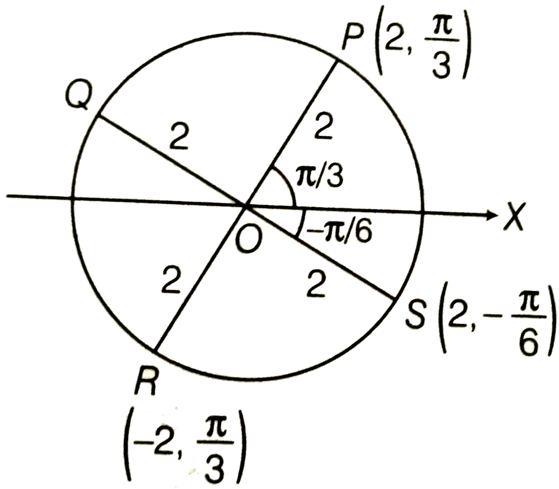
5. The cartesian coordinates of the point Q in the figure is



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

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

C. $(-\sqrt{3}, -1)$

D. $(\sqrt{3}, -1)$

Answer: B

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6. A point lies on X-axis at a distance 5 units from Y-axis. What are its coordinates ?

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7. A point lies on Y-axis at a distance 4 units from X-axis. What are its coordinates ?

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8. A point lies on negative direction of X-axis at a distance 6 units from Y-axis. What are its coordinates ?

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9. Transform the equation y = x tan α to polar form.

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10. Transform the equation r = 2 a cos θ to cartesian form.

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Exercise For Session 2

1. If the distance between the points (a, 2) and (3, 4) be 8, then a equals to

A. $2 + 3\sqrt{3}$

B. $2 - 3\sqrt{15}$

C. $2 \pm 3\sqrt{15}$

D. $3 \pm 2\sqrt{15}$

Answer: D

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2. The three points (-2, 2), (8, -2) and (-4, -3) are the vertices of

A. an isosceles triangle

B. an equilateral triangle

C. a right angled triangle

D. None of these

Answer: C

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3. The distance between the points $\left(3, \frac{\pi}{4}\right)$ and $\left(7, \frac{5\pi}{4}\right)$

A. 8

B. 10

C. 12

D. 14

Answer: B

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

A. 3, 5

B. $-3, 5$

C. $3, \ -5$

D. $-3, \ -5$

Answer: B

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5. The points $(a+1, 1)$, $(2a+1, 3)$ and $(2a+2, 2a)$ are collinear if

A. $a = \ -1, 2$

B. $a = \frac{1}{2}, 2$

C. a = 2, 1

D. $a = -\frac{1}{2}, 2$

Answer: D

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6. Let $A = (3, 4)$ and B is a variable point on the lines $|x|$ =6. IF $AB \leq 4$, then find the number of position of B with integral coordinates.

A. 5

B. 6

C. 10

D. 12

Answer: A

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7. The number of points on X-axis which are at a distance c units $(c < 3)$ from (2, 3) is

A. 1

B. 2

C. 0

D. 3

Answer: C

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8. The point on the axis of y which its equidistant from (-1, 2) and (3, 4), is

A. (0, 3)

B. (0, 4)

C. (0, 5)

D. (0, -6)

Answer: C

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9. Find the distance between the points $\left(at_1^2, 2at_1\right)$ and $\left(at_2^2, 2at_2\right)$, where t_1 and t_2 are the roots of the equation $x^2 - 2\sqrt{3}x + 2 = 0$ and $a > 0$.

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10. If P and Q are two points whose coordinates are $\left(at^2, 2at\right) and \left(\frac{a}{t^2}, \frac{2a}{t}\right)$ respectively and S is the point (a,0). Show that $\frac{1}{SP} + \frac{1}{sQ}$ is independent of t.

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

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

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

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15. The opposite vertices of a square are (2, 6) and (0, -2). Find the coordinates of the other vertices.

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16. If the point (x, y) is equidistant from the points $(a_b, b - a)$ and $(a - b, a + b)$, prove that $bx = ay$.

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17. if a and $b$between 0 and 1 such that the points $(a, 1).(1, b)$ and $(0, O)$ from If 'a' and 'b' are real numbers an equilateral triangle then the values of 'a' and 'b' respectively

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18. An equilateral triangle has two vertices at the points $(3, 4)$ and $(-2, 3)$, find the coordinates of the third vertex.

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19. If P be any point in the plane of square ABCD, prove that

$PA^2 + PC^2 = PB^2 + PD^2$

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Exercise For Session 3

1. The coordinates of the middle points of the sides of a triangle are (4, 2), (3, 3) and (2, 2), then coordinates of centroid are

A. (3, 7/3)

B. (3, 3)

C. (4, 3)

D. (3, 4)

Answer: A

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2. The incentre of the triangle whose vertices are (-36, 7), (20, 7) and (0, -8) is

A. (0, -1)

B. (-1, 0)

C. (1, 1)

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

Answer: B

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3. If the orthocentre and centroid of a triangle are (-3, 5) and (3, 3) then its circumcentre is

A. (6, 2)

B. (3, -1)

C. (-3, 5)

D. (-3, 1)

Answer: A

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4. An equilateral triangle has each side to a. If the coordinates of its vertices are $(x_1, y_1), (x_2, y_2)$ and (x_3, y_3) then the square of the determinat $\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix}$ equals

A. $3a^4$

B. $\dfrac{3a^4}{2}$

C. $\dfrac{3}{4}a^4$

D. $\dfrac{3}{8}a^4$

Answer: C

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5. The vertices of a triangle are A(0, 0), B(0, 2) and C(2, 0). The distance between circumcentre and orthocentre is

A. $\sqrt{2}$

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

C. 2

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

Answer: A

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6. Area of the triangle with vertices $(a, b), (x_1, y_1)$ and (x_2, y_2) where a, x_1, x_2 are in G.P. with common ratio r and b, y_1, y_2, are in G.P with common ratio s, is

A. (a) $ab(r-1)(s-1)(s-r)$

B. (b) $\frac{1}{2}ab(r+1)(s+1)(s-r)$

C. (c) $\frac{1}{2}ab(r-1)(s-1)(s-r)$

D. (d) $ab(r+1)(s+1)(r-s)$

Answer: C

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7. The points $(x+1, 2), (1, x+2), \left(\frac{1}{x+1}, \frac{2}{x+1}\right)$ are collinear, then x is equal to

A. -4

B. -8

C. 4

D. 8

Answer: A

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8. The vertices of a triangle are (6, 0), (0, 6) and (6, 6). The distance between its circumcentre and centroid is :

A. $2\sqrt{2}$

B. 2

C. $\sqrt{2}$

D. 1

Answer: C

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

A. $\left(1, \dfrac{\sqrt{3}}{2}\right)$

B. $\left(\dfrac{2}{3}, \dfrac{1}{\sqrt{3}}\right)$

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

D. $\left(1, \dfrac{1}{\sqrt{3}}\right)$

Answer: D

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10. The vertices of a triangle are (0, 0), (1,0) and (0,1).

Then excentre opposite to (0, 0) is

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

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

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

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

Answer: B

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11. If $\alpha, \beta\gamma$ are the real roots of the equation $x^3 - 3px^2 + 3qx - 1 = 0$, then find the centroid of the triangle whose vertices are $\left(\alpha, \frac{1}{\alpha}\right), \left(\beta, \frac{1}{\beta}\right)$ and $\left(\gamma, \frac{1}{\gamma}\right)$.

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12. 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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13. Find the coordinates of the orthocentre of the triangle whose vertices are (1, 2), (2, 3) and (4, 3).

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14. Show that the area of the triangle with vertices $(\lambda, \lambda - 2), (\lambda + 3, \lambda)$ and $(\lambda + 2, \lambda + 2)$ is independent of λ.

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

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16. Prove that the points (a, b), (c, d) and (a-c, b-d) are collinear, if ad = bc.

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17. If the points $(x_1, y_1), (x_2, y_2)$, and (x_3, y_3) are collinear show that

$$\frac{y_2 - y_3}{x^2 x_3} + \frac{y_3 - y_1}{x_3 x_1} + \frac{y_1 - y_2}{x_1 x_2} = 0$$

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18. The coordinates of points A,B,C and D are $(-3, 5), (4, -2), (x, 3x)$ and (6, 3) respectively and Area of $\frac{\Delta ABC}{\Delta BCD} = \frac{2}{3}$,find x.

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19. 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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Exercise For Session 4

1. The equation of the locus of points equidistant from $(-1-1)$ and $(4, 2)$ is

A. $3x - 5y - 7 = 0$

B. $5x + 3y - 9 = 0$

C. $4x + 3y + 2 = 0$

D. $x - 3y + 5 = 0$

Answer: B

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2. The equation of the locus of a point which moves so that its distance from the point (ak, 0) is k times its distance from the point $\left(\frac{a}{k}, 0\right)(k \neq 1)$ is

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

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

C. $xy = a^2$

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

Answer: D

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

A. xy = 8

B. $2x^2 - y^2 = 8$

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

D. $2x^2 + 3y^2 = 5$

Answer: C

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

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

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

C. xy = 3

D. $x^2 + 2y^2 = 3$

Answer: B

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5. If a point moves such that twice its distance from the axis of x exceeds its distance from the axis of y by 2, then its locus is

A. $x - 2y = 2$

B. $x + 2y = 2$

C. $2y - x = 2$

D. $2y - 3x = 5$

Answer: C

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6. The equation $4xy - 3x^2 = a^2$ become when the axes are turned through an angle $\tan^{-1} 2$ is

A. $x^2 + 4y^2 = a^2$

B. $x^2 - 4y^2 = a^2$

C. $4x^2 + y^2 = a^2$

D. $4x^2 - y^2 = a^2$

Answer: B

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7. Transform the equation $x^2 - 3xy + 11x - 12y + 36 = 0$ to parallel axes through the point (-4, 1) becomes $ax^2 + bxy + 1 = 0$ then $b^2 - a =$

A. $\frac{1}{4}$

B. $\frac{1}{16}$

C. $\frac{1}{64}$

D. $\frac{1}{256}$

Answer: C

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

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9. Find the equation of the locus of the points twice as from (-a, 0) as from (a, 0).

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10. OA and OB are two perpendicular straight lines. A straight line AB is drawn in such a manner that $OA + OB = 8$. Find the locus of the mid point of AB.

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11. The ends of a rod of length l move on two mutually perpendicular lines. Find the locus of the point on the rod which divides it in the ratio 1 : 2.

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12. The coordinates of three points O, A, B are (0, 0), (0,4) and (6, 0) respectively. A point P moves so that the area of ΔPOA is always twice the area of ΔPOB. Find the equation to both parts of the locus of P.

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13. 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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14. The equation $x^2+2xy+4=0$ is transformed to the parallel axes through the point $(6, \lambda)$. For what value of λ its new form passes through the new origin ?

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15. Show that if the axes be turned through $7\frac{1}{2}^{\circ}$, the equation $\sqrt{3}x^2 + (\sqrt{3} - 1)xy - y^2 = 0$ become free of xy in its new form.

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16. Find the angle through which the axes may be turned so that the equation $Ax + By + C = 0$ may reduce to the form x = constant, and determine the value of this constant.

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17. Transform $12x^2 + 7xy - 12y^2 - 17x - 31y - 7 = 0$ to rectangular axes through the point (1, -1) inclined at an angle $\tan^{-1}\left(\frac{4}{3}\right)$ to the original axes.

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Exercise Single Option Correct Type Questions

1. Vertices of a variable triangle are $(3, 4)$, $(5\cos\theta, 5\sin\theta)$ and $(5\sin\theta, -5\cos\theta)$, where $\theta \in R$. Locus of its orthocentre is

A. $x^2 + y^2 + 6x + 8y - 25 = 0$

B. $x^2 + y^2 - 6x + 8y - 25 = 0$

C. $x^2 + y^2 + 6x - 8y - 25 = 0$

D. $x^2 + y^2 - 6x - 8y - 25 = 0$

Answer: D

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2. If a rod AB of length 2 units slides on coordinate axes in the first quadrant. An equilateral triangle ABC is completed with C on the side away from O. Then, locus of C is

A. $x^2 + y^2 - xy + 1 = 0$

B. $x^2 + y^2 - xy\sqrt{3} + 1 = 0$

C. $x^2 + y^2 + xy\sqrt{3} - 1 = 0$

D. $x^2 + y^2 - xy\sqrt{3} - 1 = 0$

Answer: D

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3. The sides of a triangle are $3x + 4y$, $4x + 3y$ and $5x + 5y$ units, where $x > 0$, $y > 0$. The triangle is

A. right angled

B. acute angled

C. obtuse angled

D. isosceles

Answer: C

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4. Let P and Q be the points on the line joining $A(-2, 5)$ and B(3, 1) such that $AP = PQ = QB$. Then, the mid-point of PQ is

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

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

C. (2, 3)

D. (-1, 4)

Answer: A

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5. A triangle ABC right angled at A has points A and B as (2, 3) and (0, -1) respectively. If BC = 5 units, then the point C is

A. (4, 2)

B. (-4, 2)

C. (-4, 4)

D. (4, -4)

Answer: A

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6. The locus of a point P which divides the line joining (1, 0) and $(2\cos\theta, 2\sin\theta)$ internally in the ratio 2 : 3 for all θ is

A. a straight line

B. a circle

C. a pair of straight lines

D. a parabola

Answer: B

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7. The points with coordinates $(2a, 3a), (3b, 2b)$ and (c, c) are collinear

A. for no value of a, b, c

B. for all values of a, b, c

C. if a, $\frac{c}{5}$, b are in HP

D. if $a, \frac{2c}{5}, b$ are in HP

Answer: D

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8. The vertices of a triangle are (0, 3), (-3, 0) and (3, 0).

The coordinates of its orthocentre are

A. (0, -2)

B. (0, 2)

C. (0, 3)

D. (0, -3)

Answer: C

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9. ABC is an equilateral triangle such that the vertices B and C lie on two parallel at a distance 6. If A lies between the parallel lines at a distance 4 from one of them then the length of a side of the equilateral triangle.

A. 8

B. $\sqrt{\frac{88}{3}}$

C. $\frac{4\sqrt{7}}{\sqrt{3}}$

D. None of these

Answer: C

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10. A, B, C are respectively the points (1,2), (4, 2), (4, 5). If T_1, T_2 are the points of trisection of the line segment BC, the area of the Triangle AT_1T_2 is

A. 1

B. $\frac{3}{2}$

C. 2

D. $\frac{5}{2}$

Answer: B

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11. (i) The points (-1, 0), (4, -2) and $(\cos 2\theta, \sin 2\theta)$ are collinear

(ii) The points (-1,0), (4, -2) and $\left(\frac{1-\tan^2\theta}{1+\tan^2\theta}, \frac{2\tan\theta}{1+\tan^2\theta}\right)$ are collinear

A. both statemnts are equivalent

B. statement (i) has more solution than statement (ii) for θ

C. statement (ii) has more solution than statement (i) for θ

D. None of the above

Answer: B

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12. If $\alpha_1, \alpha_2, \alpha_3, \beta_1, \beta_2, \beta_3$ are the values of n for which $\sum_{r=0}^{n-1} x^{2r}$ is divisible by $\sum_{r=0}^{n-1} x^r$, then the triangle having vertices $(\alpha_1, \beta_1), (\alpha_2, \beta_2)$ and (α_3, β_3) cannot be (Option 1) an isosceles triangle Option 2) a right angled isosceles triangle Option 3) a right angled triangle Option 4) an equilateral triangle

A. an isosceles triangle

B. a right angled isosceles triangle

C. a right angled triangle

D. an equilateral triangle

Answer: D

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13. 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. 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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14. If

$$\sum_{i-1}^{4}\left(x1^2+y1^2\right)\leq 2x_1x_3+2x_2x_4+2y_2y_3+2y_1y_4,$$

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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15. Without change of axes the origin is shifted to (h, k), then from the equation $x^2 + y^2 - 4x + 6y - 7 = 0$, the term containing linear powers are missing, then point (h, k) is

A. (a) (3, 2)

B. (b) (-3, 2)

C. (c) (2, -3)

D. (d) (-2, -3)

Answer: C

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Exercise More Than One Correct Option Type Questions

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. (-1, 0)

C. (-11, -8)

D. (7, 10)

Answer: B::C::D

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

A. ax = by

B. bx = ay

C. $x^2 - y^2 = 2(ax + by)$

D. P can be (a, b)

Answer: B::D

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3. about to only mathematics

A. centroid

B. incentre

C. circumcentre

D. orthocentre

Answer: A::C::D

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4. Show that the following points are the vertices of a rectangle.

(i) A(-4, -1), B(-2, -4), C(4, 0) and D(2, 3)

(ii) A(2, -2), B(14, 10), C(11, 13) and D(-1, 1)

(iii) A(0, -4), B(6, 2), C(3, 5) and D(-3, -1)

A. parallelogram

B. rectangle

C. rhombus

D. square

Answer: A::B

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5. The medians AD and BE of the triangle ABC with vertices A(0, b), B(0, 0) and C(a, 0) are mutually perpendicular if

A. (a) $b = a\sqrt{2}$

B. (b) $a = b\sqrt{2}$

C. (c) $b = -a\sqrt{2}$

D. (d) $a = -b\sqrt{2}$

Answer: B::D

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6. The points $A(x, y), B(y, z)$ and $C(z, x)$ represents the vertices of a right angled triangle, if

A. (a) x = y

B. (b) y = z

C. (c) z = x

D. (d) x = y = z

Answer: A::B::C

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7. Let the base of a triangle lie along the line x = a and be of length a. The area of this triangles is a^2, if the vertex lies on the line

A. $x = -a$

B. x = 0

C. $x = \frac{a}{2}$

D. x = 2a

Answer: B::D

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Exercise Passage Based Questions

1. ABC is a triangle right angled at A, $AB = 2AC$, $A = (1, 2)$, $B(-3, 1)$. The vertices of the triangles are in anticlockwise sense. BCEF is a square with vertices in clockwise sense. Area of triangle ACF is:

A. 51/8

B. 51/4

C. 31/5

D. 21/4

Answer: B

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2. ABC is a triangle right angled at $A, AB = 2AC, A = (1, 2), B(-3, 1)$. The vertices of the triangles are in anticlockwise sense. BCEF is a square with vertices in clockwise sense. Area of triangle ACF is:

A. $-\frac{1}{4}$

B. $-\frac{3}{4}$

C. $-\frac{5}{4}$

D. $-\frac{7}{4}$

Answer: D

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3. Let $O(0, 0), A(2, 0), and B\left(1\frac{1}{\sqrt{3}}\right)$ be the vertices of a triangle. Let R be the region consisting of all those points P inside OAB which satisfy $d(P, OA) \leq \min[d(p, OB), d(P, AB)]$, where d denotes the distance from the point to the corresponding line. Sketch the region R and find its area.

A. $\sqrt{3}$

B. $\frac{1}{\sqrt{3}}$

C. 3

D. $2-\sqrt{3}$

Answer: D

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4. Let $O(0,0), A(2,0), and B\left(1\frac{1}{\sqrt{3}}\right)$ be the vertices of a triangle. Let R be the region consisting of all those points P inside OAB which satisfy $d(P, OA) \leq \min[d(p, OB), d(P, AB)]$, where d denotes the distance from the point to the corresponding line. Sketch the region R and find its area.

A. $4-\sqrt{3}$

B. $4+\sqrt{3}$

C. $4+3\sqrt{3}$

D. $2+4\sqrt{(2-\sqrt{3})}$

Answer: D

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5. Let $O(0,0)$, $A(2,0)$, $andB\left(1\frac{1}{\sqrt{3}}\right)$ be the vertices of a triangle. Let R be the region consisting of all those points P inside OAB which satisfy $d(P, OA) \leq \min\left[d(p, OB), d(P, AB)\right]$, where d denotes the distance from the point to the corresponding line. Sketch the region R and find its area.

A. $2-\sqrt{3}$

B. $2+\sqrt{3}$

C. $2\sqrt{3}$

D. $4+\sqrt{3}$

Answer: A

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Exercise Single Integer Answer Type Questions

1. If the area of the triangle formed by the points $(2a, b), (a+b, 2b+a)$ and (2b, 2a) be Δ_1 and the area of the triangle whose vertices are $(a+b, a-b), (3b-a, b+3a)$ and $(3a-b, 3b-a)$ be Δ_2, then the value of Δ_2 / Δ_1 is

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2. The diameter of the nine point circle of the triangle with vertices $(3, 4), (5\cos\theta, 5\sin\theta)$ and $(5\sin\theta, -5\cos\theta)$, where $\theta \in R$, is

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3. The ends of the base of an isosceles triangle are $(2\sqrt{2}, 0)$ and $(0, \sqrt{2})$. One side is of length $2\sqrt{2}$. If Δ be the area of triangle, then the value of $[\Delta]$ is (where [.] denotes the greatest integer function)

4. If (x, y) is the incentre of the triangle formed by the points (3, 4), (4, 3) and (1, 2), then the value of x^2 is

5. Let P and Q be points on the line joining A(-2, 5) and B(3, 1) such that AP = PQ = QB. If mid-point of PQ is (a, b), then the value of $\frac{b}{a}$ is

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Exercise 5

1. Consider the triangle with vertices $A(0, 0)$, $B(5, 12)$ and $C(16, 12)$.

	Column I		Column II
A.	If (λ, μ) are the coordinates of centroid of triangle ABC, then $(\lambda + \mu)$ is divisible by	(p)	3
B.	If (λ, μ) are the coordinates of circumcentre of triangle ABC, then 2λ is divisible by	(q)	5
C.	If (λ, μ) are the coordinates of incentre of triangle ABC, then μ is divisible by	(r)	7
D.	If (λ, μ) are the coordinates of excentre opposite to vertex B, then $\lambda + \mu$ is divisible by	(s)	9

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2. The vertices of a triangle are $A(-10, 8)$, $B(14, 8)$ and $C(-10, 26)$. Let G, I, H, O be the centroid, incentre, orthocentre, circumcentre respectively of ΔABC.

	Column I		Column II
A.	The inradius r is	(p)	a prime number
B.	The circumradius R is	(q)	an even number
C.	The area of ΔIGH is	(r)	a composite number
D.	The area of ΔOGI is	(s)	a perfect number

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Exercise Statement I And Ii Type Questions

1. The vertices of a triangle an $A(1, 2), B(-1, 3)$ and C(3, 4). Let D, E, F divide BC, CA, AB respectively in the same ratio.

Statement I : The centroid of triangle DEF is (1, 3).

Statement II : The triangle ABC and DEF have the same centroid.

A. Statement I is true, Statement II is true, Statement II is a correct explanation for Statement I.

B. Statement I is true, Statement II is true, Statement II is not a correct explanation for Statement I.

C. Statement I is true, Statement II is false.

D. Statement I is false, Statement II is true.

Answer: A

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2. Statement 1 : Let the vertices of a ABC be $A(-5, -2), B(7, 6),$ and $C(5, -4)$. Then the coordinates of the circumcenter are $(1, 2)\cdot$ Statement 2 : In a right-angled triangle, the midpoint of the hypotenuse is the circumcenter of the triangle.

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3. A line segment AB is divided internally and externally in the same ratio at P and Q respectively and M is the mid-point of AB. Statement I : MP, MB, MQ are in G.P. Statement II : AP, AB and AQ are in H.P.

A. True

B. False

C.

D.

Answer: A

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4. Transform the equation $x^2 - 3xy + 11x - 12y + 36 = 0$ to parallel axes through the point (-4, 1) becomes $ax^2 + bxy + 1 = 0$ then $b^2 - a =$

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Exercise 7

1. If $A(x_1, y_1), B(x_2, y_2)$ and $C(x_3, y_3)$ are the vertices of a ΔABC and (x, y) be a point on the internal bisector of angle A, then prove that

$$b\begin{vmatrix} x & y & 1 \\ x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \end{vmatrix} + c\begin{vmatrix} x & y & 1 \\ x_1 & y_1 & 1 \\ x_3 & y_3 & 1 \end{vmatrix} = 0$$

where, AC = b and AB = c.

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2. Find the area of the triangle whose vertices are (2,3,0) , (2,1,1) and (0,0,6)

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3. If by change of axes without change of origin, the expression $ax^2 + 2hxy + by^2$ becomes

$a_1x_1^2 + 2h_1x_1y_1 + b_1y_1^2$, prove that

$a + b = a_1 + b_1$

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4. If by change of axes without change of origin, the expression $ax^2 + 2hxy + by^2$ becomes $a_1x_1^2 + 2h_1x_1y_1 + b_1y_1^2$, prove that

$(a - b)^2 + 4h^2 = (a_1 - b_1)^2 + 4h_1^2$

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Exercise Subjective Type Questions

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

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2. A line L intersects three sides BC, CA and AB of a triangle in P,Q,R respectively, show that

$$\frac{BP}{PC}\cdot\frac{CQ}{QA}\cdot\frac{AR}{RB} = -1$$

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3. If the points $\left(\frac{a^3}{a-1}, \frac{a^2-3}{a-1}\right), \left(\frac{b^3}{b-1}, \frac{b^2-3}{b-1}\right), \left(\frac{c^3}{c-1}, \frac{c^2-3}{c-1}\right)$ are collinear for 3 distinct values a, b, c and $a \neq 1, b \neq 1, c \neq 1$, then find the value of $abc - (ab + bc + ca) + 3(a + b + c)$.

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4. If $A_1, A_2, A_3, \ldots, A_n$ are n points in a plane whose coordinates are $(x_1, y_1), (x_2, y_2), (x_3, y_3), \ldots, (x_n, y_n)$ respectively. A_1A_2 is bisected in the point $G_1 : G_1A_3$ is divided at G_2 in the ratio $1 : 2$, G_3A_5 at G_4 in the1 : 4 and so on untill all the points are exhausted. Show that the coordinates of the final point so obtained are $\frac{x_1 + x_2 + \dots . + x_n}{n}$ and $\frac{y_1 + y_2 + \dots . + y_n}{n}$

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5. If by change of axes without change of origin, the expression $ax^2 + 2hxy + by^2$ becomes $a_1x_1^2 + 2h_1x_1y_1 + b_1y_1^2$, prove that

$ab - h^2 = a_1b_1 - h_1^2$

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Exercise Questions Asked In Previous 13 Years Exam

1. If a vertex of a triangle is (1, 1) and the mid-points of two side through this vertex are (-1, 2) and (3, 2), then centroid of the triangle is

A. $\left(\frac{1}{3}, \frac{7}{3}\right)$

B. $\left(1, \frac{7}{3}\right)$

C. $\left(-\frac{1}{3}, \frac{7}{3}\right)$

D. $\left(-1, \frac{7}{3}\right)$

Answer: B

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2. Let $O(0, 0)$, $P(3, 4)$, and $Q(6, 0)$ be the vertices of triangle OPQ. Find the point R inside the triangle OPQ such that the triangles OPR, PQR, OQR are of equal areas.

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

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

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

D. $\left(\frac{4}{3}, \frac{2}{3}\right)$

Answer: C

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3. Let A(h, k), B(1, 1) and C(2, 1) be the vertices of a right angled triangle with AC as its hypotenuse. If the area of the triangle is 1, then the set of values which k can take is given by (1) $\{1, 3\}$ (2) $\{0, 2\}$ (3) $\{-1, 3\}$ (4) $\{-3, -2\}$

A. {1, 3}

B. {0, 2}

C. {-1, 3}

D. {-3, -2}

Answer: C

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4. Three distinct point A, B and C are given in the 2-dimensional coordinates plane such that the ratio of the distance of any one of them from the point $(1, 0)$ to the distance from the point $(-1, 0)$ is equal to $\frac{1}{3}$. Then, the circumcentre of the triangle ABC is at the point

A. (a) $\left(\frac{5}{4}, 0\right)$

B. (b) $\left(\frac{5}{2}, 0\right)$

C. (c) $\left(\frac{5}{3}, 0\right)$

D. (d) $(0, 0)$

Answer: A

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5. The x-coordinate of the incentre of the triangle that has the coordinates of mid points of its sides as (0, 1), (1, 1) and (1, 0) is

A. $2+\sqrt{2}$

B. $2-\sqrt{2}$

C. $1+\sqrt{2}$

D. $1-\sqrt{2}$

Answer: B

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6. The number of points, having both co-ordinates as integers, that lie in the interior of the triangle with vertices $(0, 0)$, $(0, 41)$ and $(41, 0)$ is

A. 820

B. 780

C. 901

D. 86 1

Answer: B

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