MATHS

BOOKS - KC SINHA ENGLISH

CORDINATES AND STARIGHT LINES - FOR COMPETITION

Solved Examples

1. 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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2. The distance between two parallel lines is unity. A point P lies between the lines at a distance a from one of them. Find the length of a side of an equilateral triangle PQR, vertex Q of which lies on one of the parallel lines and vertex R lies on the other line.

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3. Find the position of point (4, 1) after it undergoes the transformations successively : Reflection about the line $y = x - 1$

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4. Find the position of point (4, 1) after it undergoes the transformations successively : Translation by one unit along x-axis in the positive direction.

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6. 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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7. 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 $\text{Delta}ABC$ 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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8. A line L intersects three sides BC, CA and AB of a triangle in P,Q,R respectively, show that $\frac{BP}{PC}.\frac{CQ}{QA}.\frac{AR}{RB} = -1$

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9. If $D, E, and F$ are three points on the sides $BC, AC, and AB$ of a triangle ABC such that $AD, BE, and CF$ are concurrent, then show that $BDxCExAFxEFxFB$.

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10. 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 $\frac{x_1 + x_2 + \ldots . + x_n}{n}$ and $\frac{y_1 + y_2 + \ldots . + y_n}{n}$

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

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

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13. Prove that that s triangle which has one of the angle as 30^0 cannot have all vertices with integral coordinates.

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14. The coordinatse of the vertices A, B and C of the triangle ABC taken in anticlockwise order are respectively $(x_r, y_r), r = 1, 2, 3.$ Prove that the angle A is acute or obtuse according as : $(x_1 - x_2)(x_1 - x_3) + (y_1 - y_2)(y_1 - y_3) > 0 \text{ or } < 0.$

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15. ABC is a triangle whose medians AD and BE are perpendicular to each other. If $AD = p$ and $BE = q$ then area of $\triangle ABC$ is

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16. Prove that a point can be found which is at the same distance from each of the four points : $\left(am_1, \frac{a}{m_1}\right), \left(am_2, \frac{a}{m_2}\right), \left(am_3, \frac{a}{m_3}\right) \text{and} \left(\frac{a}{m_1 m_2 m_3}, am_1 m_2 m_3\right)$

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17. If the algebraic sum of perpendiculars from n given points on a variable straight line is zero then prove that the variable straight line passes through a fixed point

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18. Find the coordinates of the vertices of a square inscribed in the triangle with vertices $A(0, 0)$, $B(2, 1)$ and $C(3, 0)$, given that two of its vertices are on the side AC`.

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19. If the equal sides AB and AC each of whose length is $2a$ of a righ aisosceles triangle ABC be produced to P and so that $BP. CQ = AB$, the line PQ always passes through the fixed point

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20. 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

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21. Let (h, k) be a fixed point, where $h > 0, k > 0.$ A straight line passing through this point cuts the positive direction of the coordinate axes at the point $PandQ$. Find the minimum area of triangle OPQ, O being the origin.

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22. A straight line through the point A $(-2, -3)$ cuts the line $x + 3y = 0$ and $x + y + 1 = 0$ at B and C respectively. If AB.AC $= 20$ then equation of the possible line is

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23. Show that if any line through the variable point $A(k+1, 2k)$ meets the lines $7x+y-16=0, 5x-y-8=0, x-5y+8=0$ at $B, C, D,$ respectively, the $AC, AB, and AD$ are in harmonic progression. (The three lines lie on the same side of point $A\dot{)}$.

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24. A line is such that its segment between the lines $5x-y+4=0$ and $3x+4y-4=0$ is bisected at the point (1,5). Obtain its equation.

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25. A variable line L passing through the point $B(2, 5)$ intersects the lines $2x^2-5xy+2y^2=0$ at P and Q. Find the locus of the point R on L such that distances BP, BR and BQ are in harmonic progression.

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27. Let ABC be a triangle with $AB = AC$. If D is the midpoint of BC, E is the foot of the perpendicular drawn from D to $AC, andF$ is the midpoint of DE, then prove that AF is perpendicular to BE.

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28. The line $x + y = p$ meets the x- and y-axes at $AandB$, respectively. A triangle APQ is inscribed in triangle OAB, O being the origin, with right angle at $Q\dot{P}$ and Q lie, respectively, on $OBandAB$. If the area of triangle APQ is $\frac{3}{8}th$ of the are of triangle OAB, the $\frac{AQ}{BQ}$ is equal to 2 (b) $\frac{2}{3}$ (c) $\frac{1}{3}$ (d) 3

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29. Two consecutive sides of a parallelogram are 4x+5y = 0 and 7x + 2y = 0. If the equation of one diagonal is 11x + 7y=9, find the equation of the other diagonal.

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30. One diagonal of a square is the portion of the line $7x + 5y = 35$ intercepted by the axes. Obtain the extremities of the other diagonal.

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31. A line $4x + y = 1$ through the point $A(2, -7)$ meets the line BC whose equation os $3x = 4y + 1 = 0$ at the point B. Find the equation to the line AC so that $AB = AC$.

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32. A ray of light is sent along the line $x - 2y - 3 = 0$ upon reaching the line $3x - 2y - 5 = 0$, the ray is reflected from it. Find the equation of the line containing the reflected ray.

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33. A man starts from the point $P(-3, 4)$ and will reach the point $Q(0, 1)$ touching the line $2x + y = 7$ at R. The coordinates R on the line so that he will travel in the shortest distance is

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34. A ray of light is sent along the line $2x - 3y = 5$. After refracting across the line $x + y = 1$ it enters the opposite side after torning by 15^0 away from the line $x + y = 1$. Find the equation of the line along which the refracted ray travels.

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35. The equations of two equal sides $ABandAC$ of an isosceles triangle ABC are $x + y = 5$ and $7x - y = 3$, respectively. Then the equation of side BC if $ar(ABC) = 5unit^2$ is $x - 3y + 1 = 0$ (b) $x - 3y - 21 = 0$ $3x + y + 2 = 0$ (d) $3x + y - 12 = 0$

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36. The equations of the sides AB and AC of a triangle ABC are $3x + 4y + 9 = 0$ and $4x - 3y + 16 = 0$ respectively. The third side passes through the point $D(5, 2)sucht$^BD : DC = 4 :5`. Find the equation of the third side.

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37. The equations of two sides of a triangle are $3x - 2y + 6 = 0$ and $4x + 5y - 20$ and the orthocentre is (1,1). Find the equation of the third side.

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38. The equation of perpendicular bisectors of side AB, BC of triangle ABC are $x-y=5, x+2y=0$ respectively and $A(1,-2)$ then coordinate of C

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39. If the image of the point (x_1, y_1) with respect to the mirror $ax+by+c=0$ be (x_2, y_2) then.

(a) $\frac{x_2-x_1}{a} = \frac{ax_1+by_1+c}{a^2+b^2}$

(b) $\frac{x_2-x_1}{a} = \frac{y_2-y_1}{b}$

(c) $\frac{x_2-x_1}{a} = -2\left(\frac{ax_1+by_1+c}{a^2+b^2}\right)$

(d) None of these

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40. If the lines $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ cut the coordinae axes at concyclic points, then prove that $|a_1a_2| = |b_1b_2|$

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41. Equations of the diagonals of a rectangle are $y + 8x - 17 = 0$ and $y - 8x + 7 = 0$. If the area of the rectangle is 8 sq. units, then the equation of the sides of the rectangle is/are

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43. If $lx + my + n = 0$, where l, m, n are variables, is the equation of a variable line and l, m, n are connected by the relation $al + bm + cn = 0$

where a, b, c are constants. Show that the line passes through a fixed point.

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44. A triangle has two of its sides along the lines $y = m_1 x \& y = m_2 x$ where m_1, m_2 are the roots of the equation $3x^2 + 10x + 1 = 0$ and $H(6, 2)$ be the orthocentre of the triangle. If the equation of the third side of the triangle is $ax + by + 1 = 0$, then $a = 3$ (b) $b = 1$ (c) $a = 4$ (d) $b = -2$

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45. Two triangles ABC and PQR are such that the perpendiculars from A to QR ,B to RP and C to PQ are concurrent .Show that the perpendicular from P to BC ,Q to CA and R to AB are also concurrent .

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46. Let AB be a line segment of length 4 with A on the line $y = 2x$ and B on the line $y = x$. The locus of the middle point of the line segment is

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47. A rectangle PQRS has its side PQ parallel to the line y= mx and vertices P,Q, and S on the lines y=a, x=b, and x=-b, respectively. Find the locus of the vertex R.

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49. Let C_1 and C_2 be respectively, the parabolas $x^2 = y - 1$ and $y^2 = x - 1$ Let P be any point on C_1 and Q be any point on C_2 . Let P_1 and Q_1 be the refelections of P and Q, respectively with respect to the line y=x.

Arithemetic mean of $PP_1$and QQ_1 is always less than

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51. A variable line cuts n given concurrent straight lines at $A_1, A_2 \ldots A_n$ such that $\sum_{i=1}^{n} \frac{1}{OA_i}$ is a constant. Show that it always passes through a fixed point, O being the point of intersection of the lines

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52. The vertices B, C of a triangle ABC lie on the lines $4y = 3x$ and $y = 0$ respectively and the side BC passes through thepoint $P(0, 5)$. If ABOC is a rhombus, where O is the origin and the point P is inside the rhombus, then find the coordinates of `A'.

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53. Two sides of a rhombus lying in the first quandrant are given by 3x-4y=0 and 12x-5y=0 If the length of the longer diagonal is 12, then find the equation of the other two sides of the rhombus.

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54. If (α, α^2) lies inside the triangle formed by the lines $2x + 3y - 1 = 0, x + 2y - 3 = 0, 5x - 6y - 1 = 0$, then $2\alpha + 3\alpha^2 - 1 > 0$ $\alpha + 2\alpha^2 - 3 < 0$ $\alpha + 2\alpha^2 - 3 < 0$ (d) $6\alpha^2 - 5a + 1 > 0$

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55. Find the position of the origin with respect to theriangle whose sides are $x + 1 = 0, 3x - 4y - 5 = 0 \text{ and } 5x + 12y - 27 = 0.$

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57. For points $P \equiv (x_1, y_1)$ and $Q \equiv (x_2, y_2)$ of the coordinate plane, a new distance $d(P, Q) = |x_1 - x_1| + |y_1 - y_2|$. 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.

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59. 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.

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60. Consider three points $P \equiv (- \sin(\beta - \alpha), \ - \cos \beta), Q \equiv (\cos(\beta - \alpha), \sin \beta)$ and $R \equiv (\cos(\beta - \alpha + \theta), \sin(\beta - \theta))$, where $0 < \alpha, \beta, \theta < \pi / 4$. Then

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61. 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 the vertices of a triangle.

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62. The locus of the orthocenter of the triangle formed by the line (1+p)x-py+p(1+p) = 0, (1+q)x-qy+q(1+q) = 0 and y =0, whete $p \neq q,$ is

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63. 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

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64. The perpendicular bisector of the line segment joining $P(1, 4)$ and $Q(k, 3)$ has y - intercept -4 Then a possible value of k is

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65. The lines $p(p^2+1)xy+q=0$ and $(p^2+1)^2x+(p^2+1)y+2q=0$ are perpendicular to a common line for (1) no value of p (2) exactly one value of p (3) exactly two values of p (4) more than two values of p

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66. The number of integral values of m for which the x-coordinate of the point of intersection of the lines 3x+4y=9 and y=mx+1 is also an integer is

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Exercise

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

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3. If the point A is symmetric to the point $B(4, \ -1)$ with respect to the bisector of the first quadrant, then the length of AB is:

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4. A line through the point $A(2, 0)$ which makes an angle of 30^0 with the positive direction of x-axis is rotated about A in clockwise direction through an angle 15^0. Find the equation of the straight line in the new position.

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

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

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

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

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

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11. A line through the point $A(2, 0)$ which makes an angle of 30^0 with the positive direction of x-axis is rotated about A in clockwise direction through an angle 15^0. Find the equation of the straight line in the new position.

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12. A line through the point $P(1, 2)$ makes an angle of 60^0 with the positive directin of $x - a\xi s$ and is rotated about P in the clockwise direction through an angle 15^0. Find the equation of the straight line in the new position.

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13. The line $2x - y = 5$ turns about the point on it, whose ordinate and abscissae are equal through an angle of 45° in the anti-clockwise direction. Find the equation of the line in the new position.

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14. The line $x + 2y = 4$ is-translated parallel to itself by 3 units in the sense of increasing x and is then rotated by 30° in the clockwise direction about the point where the shifted line cuts the x-axis.Find the equation of the line in the new position

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15. AB is a side of a regular hexagon $ABCDEF$ and is of length a with A as the origin and AB and AE as the x-axis andy-axis respectively. Find the equation of lines AC, AF and BE

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16. A straight road is at a distance of $5\sqrt{2}$ miles from a place. The shortest distance of the road from the place is in the N.E. direction. Do the following villages which (i) is 6 miles East and 4 miles North from the place lie on the road or no, (ii) is 4 miles East and 3 miles North from the place, lie on the road or not?

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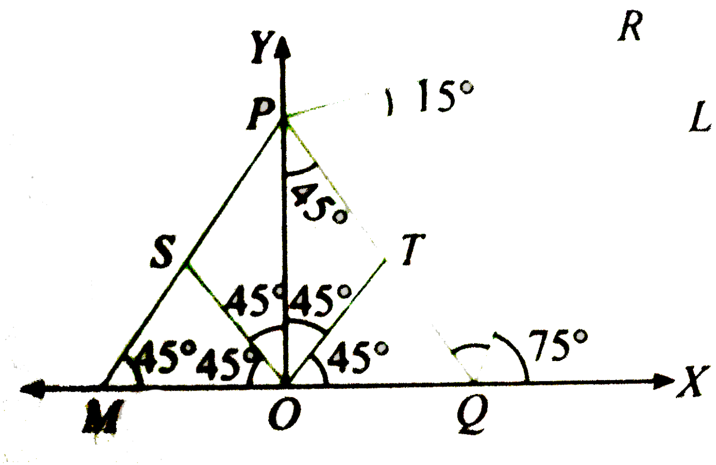
17. In the given figure, PQR is an euilateral triangle and OSPT is a square. If OT $= 2\sqrt{2}$ units, find the equation of lines OT, OS, SP, QR, PR, and PQ.



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18. Two particles start from the point (2,-1), one moves 2 units along the line x+y = 1 and the other moves 5 units along the line x-2y = 4. If the particles move upward w.r.t coordinates axes, then find their new positions.

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19. One end of a thin straight elastic string is fixed at $A(4, -1)$ and the other end B is at $(1, 2)$ in the unstretched condition. If the string is stretched to triple its length to the point C, then find the coordinates of this point.

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20. The line PQ whose equation is x-y = 2 cuts the x-axis at P, and Q is (4,2). The line PQ is rotated about P through 45° in the anticlockwise direction. The equation of the line PQ in the new position is

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21. The extremities of a diagonal of a squaer are $(1, 1), (-2, -1)$. Obtain the other two vertices and the equation of the other diagonal.

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22. The straight line passing through $P(x_1, y_1)$ and making an angle α with x-axis intersects $Ax + By + C = 0$ in Q then PQ =______________

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23. A line which the positive direction of x-axis is drawn through the point $P(3, 4)$, to cut the curve $y^2 = 4x$ at Q and R. Show that the lengths of the segments PQ and PR are numerical values of the roots of the equation $r^2 \sin^2 \theta + 4r(2 \sin \theta - \cos \theta) + 4 = 0$

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24. The lines $2x + 3y + 19 = 0$ and $9x + 6y - 17 = 0$, cut the coordinate axes at concyclic points.

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25. A straight line L is perpendicular to the line $5x - y = 1$. The area of the triangle formed by line L, and the coordinate axes is 5. Find the equation of line L.

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26. The line $2x + 3y = 12$ meets the x-axis at A and y-axis at B. The line through (5,5) perpendicular to AB meets the x-axis and the line AB at C and E respectively. If O is the origin of coordinates, find the area of figure OCEB.

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28. A light beam, emanating from the point (3,10) reflects from the straight line $2x + y - 6 = 0$ and, then passes through the point (7,2) .Find the equations of the incident and reflected beams .

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29. Let $A \equiv (3, 2)$ and $B \equiv (5, 1)$. ABP is an equilateral triangle is constructed one the side of AB remote from the origin then the orthocentre of triangle ABP is :

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30. 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 $\text{Delta}ABC$ 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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31. The circumcentre of a triangle with vertices $(a, a\tan\alpha)$, $B(b, b\tan\beta)$ and $C(c, c\tan\gamma)$ lies at the origin, where $0 < \alpha\beta, \gamma < \pi/2$ and $a + \beta + \gamma = \pi$. Show that its orthocentre lies on the line $4\cos\left(\frac{\alpha}{2}\right)\cos\left(\frac{\beta}{2}\right)\cos\left(\frac{\gamma}{2}\right)x - 4\sin\left(\frac{\alpha}{2}\right)\sin\left(\frac{\beta}{2}\right)\sin\left(\frac{\gamma}{2}\right)y = y$

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32. Determine whether the origin lies inside or outside the triangle whose sides are given by the equations $7x - 5y - 11 = 0, 8x + 3y + 31 = 0, x + 8y - 19 = 0.$

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33. The equations of two sides of a square are $3x + 4y - 5 = 0$ and $3x + 4y - 15 = 0$. The third side has a point (6, 5) on it. Find the equation of this third side and the remaining side of the square.

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34. Show that the reflection of the line $px + qy + r = 0$ in the line $x + y + 1 = 0$ is the line $qx + py + (p + q - r) = 0$, where $p \neq -q$.

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35. A rhombus has two of its sides parallel to the lines $y = 2x + 3$ and $y = 7x + 2$. If the diagonals cut at (1, 2) and one vertex is on the y-axis, find the possible values of the coordinate of that vertex.

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36. if x and y coordinates of a point P in $x-y$plane are given by $x=(u\cos\alpha)t, y=(u\sin\alpha)t-\frac{1}{2}gt^2$where t is a aprameter and u, α, g the constants. Then the locus of the point P is a parabola then whose vertex is:

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37. A variable line through the point $\left(\frac{6}{5}, \frac{6}{5}\right)$ cuts the coordinate axes at the points A and B respectively. If the point P divides AB internally in the ratio $2:1$, then the equation of the locus of P is

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38. A straight line moves in such a way that the length of the perpendicular upon it from the origin is always p. Find the locus of the centroid of the triangle which is formed by the line and the axes.

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

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40. The vertices of a triangle ABC are the points $(0, b), (-a, 0), (a, 0)$. Find the locus of a point P which moves inside the triangle such that the product of perpendiculars from P to AB and AC is equal to the square of the perpendicular to BC.

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41. Find the locus of the point at which two given portions of the straight line subtend equal angle.

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42. A point is moving in such a way that sum of the squares of perpendiculars drawn from it to the sides of an equilaeral triangle is constant. Prove that its locus is a circle.

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43. Find the locus of the middle points of the segment of a line passing through the point of intersection of lines $ax + by + c = 0$ and $lx + my + n = 0$ and intercepted between the axes.

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44. A point P move along the y-axis. Another point Q moves so that the fixed straight line $x \cos \alpha + y \sin \alpha = p$ is the perpendicular bisector of the line segment PQ.Find the locus of Q.

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45. The vertices $BandC$ of a triangle ABC lie on the lines $3y = 4xandy = 0$, respectively, and the side BC passes through the point $\left(\frac{2}{3}, \frac{2}{3}\right)$. If $ABOC$ is a rhombus lying in the first quadrant, O being the origin, find the equation of the line BC.

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46. ABC is a right angled triangle, right-angled at A. The coordinates of B and C are (6, 4) and ((14, 10) respectively. The angle between the side AB and x-axis is 45^0. Find the coordinates of A.

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47. 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 $b : a$. Then prove that $x + y\tan\left(\frac{\alpha+\beta}{2}\right) = 0.$

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48. The equation of the side AB and AC of a triangle ABC are $3x + 4y + 9$ and $4x - 3y + 16 = 0$ respectively. The third side passes through the point $D(5, 2)$ such that $BD : DC = 4 : 5$. Find the equation of the third side.

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49. Let n be the number of points having rational coordinates at a fixed distance fromt the point $(0, \sqrt{3})$. Then

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50. If poitns $A(3, 5)$ and B are equidistant from $H(\sqrt{2}, \sqrt{5})$ and B has rational coordinates,then $AB =$

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51. Find the number of point (x, y) having integral coordinates satisfying the condition $x^2 + y^2 < 25$

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52. ABC is an equilateral triangle such that the vertices B and C lie on two parallel lines 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 equilatereal triangle is

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53. 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

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54. Let $A \equiv (-4, 0), B \equiv (-1, 4)$. C and D are points which are symmetric to points A and B respectively with respect to y-axis, then area of the quadrilateral $ABCD$ is (A) 8 sq units (B) 12 sq. units (C) 20 sq. units (D) none of these

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55. 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.

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56. 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 the vertices of a triangle.

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57. $P(3, 1), Q(6, 5)$ and $R(x, y)$ are three points such that PRQ is a right angle and the area of ΔRQP is 7 sq.unit. Find the number of such points R.

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58. Let $\alpha = Lt_{m \to \infty} Lt_{n \to \infty} \cos^{2m} \lfloor n\pi x,$ where x is rational, $\beta = Lt_{m \to \infty} Lt_{n \to \infty} \cos^{2m} \lfloor n\pi x,$ where \'x\' is irrational, then the area of the triangle having vertices $(\alpha, \beta), (-2, 1)$ and $(2, 1)$ is (A) 2 (B) 4 (C) 1 (D) none of these

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59. The incenter of the triangle with vertices $(1, \sqrt{3}), (0, 0),$ and $(2, 0)$ is $\left(1, \frac{\sqrt{3}}{2}\right)$ (b) $\left(\frac{2}{3}, \frac{1}{\sqrt{3}}\right)$ $\left(\frac{2}{3}, \frac{\sqrt{3}}{2}\right)$ (d) $\left(1, \frac{1}{\sqrt{3}}\right)$

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60. If $P(1, 2)Q(4, 6), R(5, 7),$ and $S(a, b)$ are the vertices of a parallelogram $PQRS,$ then (a)$a = 2, b = 4$ (b) $a = 3, b = 4$ (c) $a = 2, b = 3$ (d) $a = 1, b = -1$

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61. If a point P moves such that the sum of its distances from two perpendicular lines is less than or equal to 2 and S be the region consisting of all such points P, then area of the region S is : (A) 4 sq.untis (B) 8 sq. units (C) 6 sq. units (D) none of these

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63. If the algebraic sum of the perpendicular distances from the points $(3, 1), (-1, 2)$ and $(1, 3)$ to a variable line be zero, and $\begin{vmatrix} x^2+1 & x+1 & x+2 \\ 2x+3 & 3x+2 & x+4 \\ x+4 & 4x+3 & 2x+5 \end{vmatrix} = mx^4 + nx^3 + px^2 + qx + r$ be an identity in x, then the variable line always passes through the point (A) $(-r, m)$ (B) $(-m, r)$ (C) (r, m) (D) $(2r, m)$

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64. A man starts from the point $P(-3, 4)$ and reaches point $Q(0, 1)$ touching X - axis at R such that $PR + RQ$ is minimum , then the point R is

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65. Let $P \equiv (a, b), Q \equiv (c, d)$ and $0 < a < b < c < d, L \equiv (a, 0), M \equiv (c, 0), R$ lies on x-axis such that $PR = RQ$ is minimum, then R divides LM (A) internally in the ration $a : b$ (B) internally in the ration $b : c$ (C) internally in the ration $b : d$ (D) internally in the ratio $d : b$

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66. If $a = \frac{\tan\theta}{\tan 3\theta}$, then the point $P(a, a^2)$ (A) necessarily lies in the acute angle between the lines $y = 3x$ and $3y = x$ (B) may lie on line $3y = x$ or $y = 3x$ (C) necessarily lies in the obtuse angle between the lines $3y = x$ and $y = 3x$ (D) $a\varepsilon\left(\frac{1}{3}, 3\right)$

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67. If α an integer and $P(\alpha, \alpha^2)$ is a point in the interior of the quadrilateral

$x = 0, y = 0, 4x + y - 21 = 0$ and $3x + y - 4 = 0,$ and $(1 + ax)^n = 1 -$

then $\alpha =$ (A) a (B) $-a$ (C) a^2 (D) none of these

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68. If a, b, c are variables such that $21a + 40b + 56c = 0$ then the family of lines $ax + by + c = 0$ passes through (A) $\left(\frac{7}{14}, \frac{9}{4}\right)$ (B) $\left(\frac{4}{7}, \frac{3}{8}\right)$ (C) $\left(\frac{3}{8}, \frac{5}{7}\right)$ (D) $(2, 3)$

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69. Consider a triangle PQR with $P \equiv (0, 0), Q \equiv (a, 0), R \equiv (0, b)$. Then the centroid, orthocentre and circumcentre (A) lies on a straight line (B) form a scalene triangle with area $\frac{a}{2}|ab|$ (C) form a right-angled triangle with area $\frac{1}{2}|ab|$ (D) none of these

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70. The equaiton of the line which bisects the obtuse angle between the lines $x - 2y + 4 = 0$ and $4x - 3y + 2 = 0$ (A) $(4 - \sqrt{5})x - (3 - 2(\sqrt{5})y + (2 - 4\sqrt{5}) = 0$ (B) $(3 - 2\sqrt{5})x - (4 - \sqrt{5})y + (2 + 4(\sqrt{5}) = 0$ (C) $(4 + \sqrt{5}x - (3 + 2(\sqrt{5})y + (2 + 4(\sqrt{5}) = 0$ (D) none of these

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71. If two sides of a triangle are represented by $2x - 3y + 4 = 0$ and $3x + 2y - 3 = 0$, then its orthocentre lies on the line : (A) $x - y + \frac{8}{15} = 0$ (B) $3x - 2y + 1 = 0$ (C) $9x - y + \frac{9}{13} = 0$ (D) $4x + 3y + \frac{5}{13} = 0$

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72. Equation of the line equidistant from $3x + 4y - 25 = 0$ and $3x + 4y + 25 = 0$ is

(A) $6x + 4y + 5 = 0$ (B) $3x + 4y = 0$ (C) $3x - 4y + 5 = 0$ (D) $6x + 8y + 5 = 0$

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73. The equation of a line through $(2, -4)$ which cuts the axes so that the intercepts are equal in magnitude is :

(A) $x+y+2=0$ (B) $x-y+2=0$ (C) $x+y+6=0$ (D) $x+y-6=0$

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74. If a line is perpendicular to the line $5x-y=0$ and forms a triangle with coordinate axes of area 5 sq. units, then its equation is :

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75. Find the equation of a straight line through the intersection of $2x-3y+4=0$ and $3x+4y-5=0$ and parallel to Y -axis

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76. A variable line intersects the co-ordinate axes at A and B and passes through a fixed point (a, b).then the locus of the vertex C of the rectangle $OACB$ where O is the origin is

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77. The family of lines $(l+3m)x+2(l+m)y=(m-l)$, where $l\neq0$ passes through a fixed point having coordinates (A) $(2,\ -1)$ (B) (0, 1) (C) $(1,\ -1)$ (D) $(2, 3)$

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78. The equation of the line passing through (1,2) and having a distance equal to 7 units from the points (8,9) is

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79. If $a,\ b, c$ are in A.P., then the line $ax+by+c=0$ passes through a fixed point. write the coordinates of that point.

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80. The coordinates of the vertices A and B of an isosceles triangle $ABC(AC = BC)$ are $(- 2, 3)$ and $(2, 0)$ respectively. A line parallel to AB and having a y-intercept equal to $\frac{43}{12}$ passes through C, then the coordinatse of C are : (A) $\left(- \frac{3}{4}, 1\right)$ (B) $\left(1, \frac{17}{6}\right)$ (C) $\left(\frac{2}{3}, \frac{4}{5}\right)$ (D) $(1, 0)$

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81. The equaiton of the line perpendicular to $2x + 6y + 5 = 0$ and having the length of x-intercept equal to 3 units can be (A) $y = 3x + 5$ (B) $2y = 6x + 1$ (C) $y = 3x + 9$ (D) none of these

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82. The point on the line $3x - 2y = 1$ which is closest to the origin is (A) $\left(\frac{3}{13}, - \frac{2}{13}\right)$ (B) $\left(\frac{5}{11}, \frac{2}{11}\right)$ (C) $\left(\frac{3}{5}, \frac{2}{5}\right)$ (D) none of these

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83. Verify the following: (5,-1,1),(7,-4,7), (1,-6,10) and (-1,-3,4) are the vertices of a rhombus.

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84. Find the distance of the point (2,5) from the line $3x + y + 4 = 0$ measured parallel to the line $3x - 4y + 8 = 0$

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85. If $A(-1, 0), B(1, 0)$ and $C(3, 0)$ are three given points, then the locus of point D satisfying the relation $DA^2 + DB^2 = 2DC^2$ is (A) a straight line parallel to x-axis (B) a striaght line parallel to y-axis (C) a circle (D) none of these

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86. A point (1, 1) undergoes reflection in the x-axis and then the coordinates axes are rotated through an angle of $\frac{\pi}{4}$ in anticlockwise direction. The final position of the point in the new coordinate system is

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87. If the point $(1, a)$ lies in between the lines $x+y=1$ and $2(x+y)=3$ then a lies in

(i)$(-\infty, 0) \cup (1, \infty)$ (ii)$\left(0, \frac{1}{2}\right)$ (iii)$(-\infty, 0) \cup \left(\frac{1}{2}, \infty\right)$ (iv) none of these

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88. $A=\left(\sqrt{1-t^2}+t, 0\right)$ and $B=\left(\sqrt{1-t^2}-t, 2t\right)$ are two variable points then the locus of mid-point of AB is

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89. The equation of a straight line passing through (3, 2) and cutting an intercept of 2 units between the lines $3x + 4y = 11$ and $3x + 4y = 1$ is

(A) $2x + y - 8 = 0$ (B) $3y - 4x + 6 = 0$ (C) $3x + 4y - 17 = 0$ (D) $2x - y - 4 = 0$

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90. The coordinates of the foot of perpendicular drawn from the point (2, 4) on the line $x + y = 1$ are (A) $\left(\frac{1}{2}, \frac{1}{2}\right)$ (B) $\left(-\frac{1}{2}, \frac{3}{2}\right)$ (C) $\left(\frac{1}{4}, \frac{3}{4}\right)$ (D) $\left(\frac{3}{2}, -\frac{1}{2}\right)$

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91. The equation of straight line equally inclined to the axes and equidistant from the point $(1, -2)$ and $(3, 4)$ is:

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92. The equation $\sqrt{x^2 + 4y^2 - 4xy + 4} + x - 2y = 1$ represent a (A) straight line (B) circle (C) parabola (D) pair of lines

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93. If a ΔABC remains always similar to a given triangle and the point A is fixed and the point B always moves on a given straight line, then locus of C is (A) a circle (B) a straight line (C) a parabola (D) none of these

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95. A variable line through the point (p, q) cuts the x and y axes at A and B respectively. The lines through A and B parallel to y-axis and x-axis respectively meet at P. If the locus of P is $3x + 2y - xy = 0$, then

(A) $p = 2, q = 3$ (B) $p = 3, q = 2$ (C) $p = 2, q = -3$ (D) $p = -3, q = -2$

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96. If $f(x + y) = f(x)f(y) \forall x, y \in R$ and f(1) = 2 , then area enclosed by $3|x| + 2|y| \leq 8$ is

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98. The point $(-4, 5)$ is vertex of a square and one of its diagonal is $7x - y + 8 = 0$. The equation of other diagonal is

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99. If (α, β) be the circumcentre of the triangle whose sides are $3x - y = 5, x + 3y = 4$ and $5x + 3y + 1 = 0$, then (A) $11\alpha - 21\beta = 0$ (B) $11\alpha + 21\beta = 0$ (C) $\alpha + 2\beta = 0$ (D) none of these

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100. if $\frac{x}{a} + \frac{y}{b} = 1$ is a variable line where $\frac{1}{a^2} + \frac{1}{b^2} = \frac{1}{c^2}$ (c is constant) then the locus of foot of the perpendicular drawn from origin

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101. If the lines $ax + by + c = 0, bx + cy + a = 0$ and $cx + ay + b = 0(a, b, c$ being distinct) are concurrent, then

(A) $a + b + c = 0$

(B) $a + b + c = 1$

(C) $ab + bc + ca = 1$

(D) $ab + bc + ca = 0$

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102. If a, b, c are the pth, qth, rth terms respectively of an $H.P.$, then the lines $bcx + py + 1 = 0, cax + qy + 1 = 0$ and $abx + ry + 1 = 0$ (A) are concurrent (B) form a triangle (C) are parallel (D) none of these

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103. If a, b, c are in A.P. then the family of lines $ax + by + c = 0$ (A) passes through a fixed point (B) cuts equal intercepts on both the axes (C) forms a triangle with the axes with area $= \frac{1}{2}|a + c - 2b|$ (D) none of these

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104. The value of a for which the image of the point (a,a-1) w.r.t. the mirror $3x + y = 6a$ is the point $\left(a^2 + 1, a\right)$ is

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105. Prove that the lines $ax + by + c = 0, bx + cy + a = 0$ and $cx + ay + b = 0$ are concurrent if $a + b + c = 0$ or $a + b\omega + c\omega^2 + c\omega = 0$ where ω is a complex cube root of unity .

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106. 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

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107. The line $x + y = 4$ divides the line joining the points $(- 1, 1)$ and $(5, 7)$ in the ratio

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108. The vertex of an equilateral triangle is $(2, 3)$ and the equation of the opposite side is $x + y = 2$. Then, the other two sides are $y - 3 = \left(2 \pm \sqrt{3}\right)(x - 2)$.

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109. Find the equation of the bisector of the acute angle between the lines $3x - 4y + 7 = 0$ and $12x + 5y - 2 = 0$.

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110. If one of the diagonals of a square is along the line $x = 2y$ and one of its vertices is (3, 0), then its sides through this vertex are given by the equations (A) $y-3x+9=0, 3y+x-3=0$ (B) $y+3x+9=0, 3y+x-3=0$ (C) $y-3x+9=0, 3y-x+3=0$

(D) $y-3x+9=0, 3y+x+9=0$

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111. The orthocentre of triangle with vertices $\left(2, \frac{\sqrt{3}-1}{2}\right), \left(\frac{1}{2}, -\frac{1}{2}\right), \left(2, , -\frac{1}{2}\right)$

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112. A line through $A(-5, -4)$ meets the lines $x+3y+2=0, 2x+y+4=0andx-y-5=0$ at the points $B, CandD$ rspectively, if $\left(\frac{15}{AB}\right)^2+\left(\frac{10}{AC}\right)^2=\left(\frac{6}{AD}\right)^2$ find the equation of the line.

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113. The normal form of the eqatuion of the line $x+\sqrt{3y}=4$ is (A) $x\cos 60^{0}+y\sin 60^{0}=2$ (B) $x\cos 24^{0}-y\sin 24^{0}-2$ (C) $x\cos 240^{0}+y\sin 240^{0}-2$ (D) none of these

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114. The equation of the line bisecting the obtuse angle between $y-x=2$ and $2y+x=5$ is (A) $\frac{y-x-2}{\sqrt{2}}=\frac{2y-x-5}{\sqrt{5}}$ (B) $\frac{y-x-2}{\sqrt{2}}=\frac{-2y-x+5}{\sqrt{5}}$ (C) $\frac{y-x-2}{\sqrt{2}}=\frac{2y+x-5}{\sqrt{5}}$ (D) none of these

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115. The equation of the diagonal through origin of the quadrilateral formed by the lines $x=0, y=0, x+y-1=0$ and $6x+y-3=0,$ is

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116. A line passes through the point (2,2) and is perpendicular to the lines $3x + y = 3$. Its y-intercept is $1/3$ b. 2/3 c. 1 d. 4/3

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117. If the sum of the distances of a moving point in a plane from the axes is 1, then find the locus of the point.

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119. Find the equation of the line passing through the point (2, 3) and making an 3 intercept of length 2 units between the lines $y + 2x = 3$ and $y + 2x = 5$.

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120. Line L has intercepts $a and b$ on the coordinate axes. When the axes are rotated through a given angle keeping the origin fixed, the same line L has intercepts $p and q$. Then $a^2+b^2=p^2+q^2$ $\frac{1}{a^2}+\frac{1}{b^2}=\frac{1}{p^2}+\frac{1}{q^2}$ $a^2+p^2=b^2+q^2$ (d) $\frac{1}{a^2}+\frac{1}{p^2}=\frac{1}{b^2}+\frac{1}{q^2}$

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121. The distance between the parallel lnes $y=2x+4$ and $6x=3y-5$ is

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122. The pair of points which lie on the same side of the straight line $3x-3y-7=0$ is (A) $(0,\ -1)(0,0)$ (B) $(0,1),(3,0)$ (C) $(-1,\ -1),(3,7)$ (D) $(24,\ -3),(1,1)$

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123. The equation of the base of an equilateral triangle ABC is $x + y = 2$ and the vertex is $(2, \ -1)$. The area of the triangle ABC is:

$\frac{\sqrt{2}}{6}$ (b) $\frac{\sqrt{3}}{6}$ (c) $\frac{\sqrt{3}}{8}$ (d) None of these

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124. Three lines $3x + 4y + 6 = 0, \sqrt{2}x + \sqrt{3}y + 2\sqrt{2} = 0$ and $4x + 7y + 8 = 0$ are (A) sides of triangle (B) concurrent (C) parallel (D) none of these

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125. $P(3, 1), Q(6, 5)$ and $R(x, y)$ are three points such that PRQ is a right angle and the area of ΔRQP is 7 sq.unit. Find the number of such points R.

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126. Let PS be the median of the triangle with vertices $P(2, 2), Q(6, -1) and R(7, 3)$ Then equation of the line passing through $(1, -1)$ and parallel to PS is $2x - 9y - 7 = 0$ $2x - 9y - 11 = 0$ $2x + 9y - 11 = 0$ $2x + 9y + 7 = 0$

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127. The orthocentre of the triangle formed by the lines $xy = 0$ and $x + y = 1$ is $\left(\frac{1}{2}, \frac{1}{2}\right)$ (b) $\left(\frac{1}{3}, \frac{1}{3}\right)$ $(0, 0)$ (d) $\left(\frac{1}{4}, \frac{1}{4}\right)$

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128. 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

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131. The equation to a pair of opposite sides of a parallelogram are $x^2 - 5x + 6 = 0$ and $y^2 + 5 = 0$. The equations to its diagonals are $x + 4y = 13, y = 4x - 7$ (b) $4x + y = 13, 4y = x - 7$ $4x + y = 13, y = 4x - 7$ (d) $y - 4x = 13, y + 4x - 7$

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132. Equation(s) of the straight line(s), inclined at 30° to the x-axis such that the length of its (each of their) line segment(s) between the coordinates axes is 10 units, is (are)

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133. A ray of light travelling along the line $x + y = 1$ is incident on the X - axis and after refraction the other side of the X - axis by turning $\pi / 6$ by turning away from the X - axis .The equation of the line along which the refracted ray travels is

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134. The incident ray is along the line 24x+7y+5=0. Find the equation of mirrors.

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136. A straight line passing through the point$(2, 2)$ and the axes enclose an area λ. The intercepts on the axes made by the line are given by the two roots of:

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137. Let L be the line $2x + y - 2 = 0$. The axes are rotated by 45° in clockwise direction then the intercepts made by the line L on the new axes are respectively

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138. The sides of a triangle are the straight line x+y=1, 7y=x, and $\sqrt{3}y + x = 0$. Then which of the following is an interior point of the triangle?

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139. A (1,3) and C(7,5) are two opposite vertices of a square. The equation of side through A is

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140. If $by + cy = a$, where a, b, c are of the same sign, be a line such that the area enclosed by the line and the axes of reference is $1/8\text{unit}^2$, then

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141. If $6a^2 - 3b^2 - c^2 + 7ab - ac + 4bc = 0$ then the family of lines $ax + by + c, |a| + |b| \neq 0$ is concurrent at

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142. One diagonal of a square is the portion of the line $\sqrt{3}x + y = 2\sqrt{3}$ intercepted by the axes. Obtain the extremities of the other diagonal is

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144. A straight line L is perpendicular to the line 5x-y=1. The aera of the triangle formed by line L and the coordinate area is 5. Find the equation of line L.

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145. Find all points on $x + y = 4$ that lie at a unit distance from the line $4x + 3y - 10 = 0$.

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146. One side of a square makes an angle α with x axis and one vertex of the square is at origin. Prove that the equations of its diagonals are $x(\sin\alpha + \cos\alpha) = y(\cos\alpha - \sin\alpha)$ or $x(\cos\alpha - \sin\alpha) + y(\sin\alpha + \cos\alpha) = a$, where a is the length of the side of the square.

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147. Let the algebraic sum of the perpendicular distance from the points (2, 0), (0,2), and (1, 1) to a variable straight line be zero. Then the line passes through a fixed point whose coordinates are___

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

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149. If (α, β) is the foot of perpendicular from (x_1, y_1) to line $lx + my + n = 0$, then (A) $\frac{x_1 - \alpha}{l} = \frac{y_1 - \beta}{m}$ (B) $\frac{x - 1 - \alpha}{l}\Big) = \frac{lx_1 + my_1 + n}{l^2 + m^2}$ (C) $\frac{y_1 - \beta}{m} = \frac{lx_1 + my_1 + n}{l^2 + m^2}$ (D) $\frac{x - \alpha}{l} = \frac{l\alpha + m\beta + n}{l^2 + m^2}$

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150. The condition to be imposed on β, so that $(0, \beta)$ lies on or insideof the triangle having equation of sides as $y + 3x + 2 = 0, 3y - 2x - 5 = 0$ and $4y + x - 14 = 0$, is

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151. The equations of two equal sides $ABandAC$ of an isosceles triangle ABC are $x + y = 5$ and $7x - y = 3$, respectively. Then the equation of side BC if $ar(ABC) = 5unit^2$ is $x - 3y + 1 = 0$ (b) $x - 3y - 21 = 0$ $3x + y + 2 = 0$ (d) $3x + y - 12 = 0$

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152. Two sides of a triangle are $(a+b)x+(a-b)y-2ab=0$ and $(a-b)x+(a+b)y-2ab=0$. If the triangle is isosceles and the third side passes through point $(b-a, a-b)$, then the equation of third side can be

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153. 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.

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154. Let P, Q, R be three non-collinear points having rational coordinatse. (1) Coordinates of incentre of ΔPQR are rational (2)

Incentre of a triangle is the point of intersection of internal bisectors of angle of the triangle. (A) Both 1 and 2 are true and 2 is the correct explanation of 1 (B) Both 1 and 2 are true and 2 is not a correct explanation of 1 (C) 1 is true but 2 is false (D) 1 is false but 2 is true

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155. Let O be the origin and $P \equiv (a, a^2)$. (1) If $P(a, a^2)$ lies in the first quadrant between the lines $y = x$ and $y = 2x$, then $1 < a < 2$. (2) Slope of OP is a.

(A) Both 1 and 2 are true and 2 is the correct explanation of 1

(B) Both 1 and 2 are true and 2 is not a correct explanation of 1

(C) 1 is true but 2 is false

(D) 1 is false but 2 is true

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156. If the lines $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ cut the coordinae axes at concyclic points, then prove that $|a_1a_2| = |b_1b_2|$

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157. (1) The straight lines $(2k+3)x+(2-k)y+3=0$, where k is a variable, pass through the fixed point $\left(-\frac{3}{7}, -\frac{6}{7}\right)$.

(2) The family of lines $a_1x+b_1y+c_1+k(a_2x+b_2y+c_2)=0$, where k is a variable, passes through the point of intersection of lines $a_1x+b_1y+c_1=0$ and $a_2x+b_2y+c_2=0$

(A) Both 1 and 2 are true and 2 is the correct explanation of 1

(B) Both 1 and 2 are true and 2 is not a correct explanation of 1

(C) 1 is true but 2 is false

(D) 1 is false but 2 is true

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158. If the lines $y=3x+1$ and $2y=x+3$ are equally inclined to the line $y=mx+4$, then $m=$

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159. Show that the four lines $ax \pm by \pm c = 0$ enclose a rhombus whose area is $\frac{2c^2}{|ab|}$

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160. Prove that the area of the parallelogram formed by the lines $x \cos \alpha + y \sin \alpha = p, x \cos \alpha + ys \in \alpha = q, x \cos \beta + y \sin \beta = randx \cos$

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161. The image of line $2x + y = 1$ in line $x + y + 2 = 0$ is : (A) $x + 2y - 7 = 0$ (B) $2x + y - 7 = 0$ (C) $x + 2y + 7 = 0$ (D) $2x + y + 7 = 0$

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162. Image of ellipse $4x^2 + 9y^2 = 36$ in the line $y = x$ is :

(A) $9x^2 + 4y^2 = 36$

(B) $3x^2 + 2y^2 = 36$

(C) $2x^2 + 3y^2 = 36$

(D) none of these

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163. The mirror image of the parabola $y^2 = 4x$ in the tangent to the parabola at the point (1,2) is

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165. Two consecutive sides of a parallelogram are 4x+5y = 0 and 7x + 2y = 0. If the equation of one diagonal is 11x + 7y=9, find the equation of the other diagonal.

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166. Lines $L_1 \equiv ax + by + c = 0$ and $L_2 \equiv lx + my + n = 0$ intersect at the point P and make an angle θ with each other. Find the equation of a line different from L_2 which passes through P and makes the same angle θ with L_1.

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167. The equation of sides BC, CA, AB of a triangle ABC are $ax + by + c = 0, lx + my + n = 0$ and $px + qy + r = 0$ respectively, then the line : $\dfrac{px + qy + r}{ap + bq} = \dfrac{lx + my + n}{al + mb}$ is (A) perpendicular to AB (B) perpendicular to AC (C) perpendicular to BC (D) none of these

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168. If a and b are parameters, then each line of the family of lines $x(a+2b)+y(a-3b)=a-b$ passes through the point whose distance from origin is : (A) $\frac{3}{5}$ (B) $\frac{\sqrt{13}}{5}$ (C) $\frac{\sqrt{11}}{5}$ (D) $\frac{4}{5}$

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170. A line cuts the x-axis at $A(7,0)$ and the y-axis at $B(0,\ -5)$ A variable line PQ is drawn perpendicular to AB cutting the x-axis in P and the y-axis in Q. If AQ and BP intersect at R, find the locus of R.

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171. A straight line l passes through a fixed point (6, 8). If locus of the foot of perpendicular on line l from origin is a circle, then radius of this circle is ... .

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172. A line is such that its segment between the lines $5x - y + 4 = 0$ and $3x + 4y - 4 = 0$ is bisected at the point (1,5). Obtain its equation.

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173. A straight line L is perpendicular to the line 5x-y=1. The aera of the triangle formed by line L and the coordinate area is 5. Find the equation of line L.

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174. A line $4x + y = 1$ through the point $A(2, -7)$ meets the line BC whose equation os $3x = 4y + 1 = 0$ at the point B. Find the equation to the line AC so that $AB = AC$.

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175. Let AB be a line segment of length 4 with A on the line $y = 2x$ and B on the line $y = x$. Determine the locus of the mid-points of all such line segments.

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176. 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.

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177. 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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178. The equations of two sides of a triangle are $3x - 2y + 6 = 0 \, and \, 4x + 5y - 20 \, and$ the orthocentre is (1,1). Find the equation of the third side.

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179. Let the four consecutive compartments made by the lines $2x - 3y + 1 = 0$ and $3x - 5y + 2 = 0$ be I, II, III and IV respectively. Let (0, 0) belong to compartment I. We associate four numbers 100, 200, 300 and 400 to the compartments I, II, III and IV respectively. Then the number associated to the compartment in which $(-1, 1)$ belong is ...

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180. A ray of light is sent along the line $x - 2y - 3 = 0$. On reaching the line $3x - 2y - 5 = 0$, the ray is reflected from it. If the equation of reflected ray be $ax - 2y = c$, where a and c are two prime numbers differing by 2, then $a + c =$

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181. Consider the lines given by : $L_1 : x + 3y - 5 = 0$, $L_2 : 3x - ky - 1 = 0$, $L_3 : 5x + 2y - 12 = 0$ If a be the value of k for which lines L_1, L_2, L_3 do not form a triangle and c be the value of k for which one of L_1, L_2, L_3 is parallel to at least one of the other lines, then $abc =$

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182. A ray of light emanating from $(-4, 3)$ after reflection from x-axis at $(\alpha, 0)$ is normal to circle $x^2 + y^2 - 10x - 2y + 25 = 0$, then $4\alpha =$

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183. If the quadrilateral formed by the lines $ax+by+c=0, 6\sqrt{3}x+8\sqrt{3}y+k=0$, $ax+by+k=0$ and $6\sqrt{3}x+8\sqrt{3}y+c=0$ has diagonals at right angles, then the value of $a^2+b^2=\ldots$

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