MATHS

BOOKS - CENGAGE MATHS (HINGLISH)

STRAIGHT LINE

Examples

1. Find the equation of line passing through point (2,3) which is

(i) parallel of the x-axis

(ii) parallel to the y-axis

2. Find the equation of line passing through point (2,-5) which is

(i) parallel to the line $3x + 2y - 4 = 0$

(ii) perpendicular to the line 3x + 2y - 4 =0

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3. Find the equation of the perpendicular bisector of the line segment joining the points $A(2, 3)$ and $B(6, -5)$.

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4. Find the locus of a point P which moves such that its distance from the line $y = \sqrt{3}x - 7$ is the same as its distance from $\left(2\sqrt{3}, -1\right)$

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5. Consider a triangle with vertices $A(1, 2), B(3, 1),$ and $C(-3, 0)$. Find the equation of altitude through vertex A. the equation of median through vertex A. the equation of internal angle bisector of $\angle A$.

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6. Find the coordinates of the foot of the perpendicular drawn from the point P(1,-2) on the line y = 2x +1. Also, find the image of P in the line.

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7. If the line $\left(\frac{x}{a}\right) + \left(\frac{y}{b}\right) = 1$ moves in such a way that $\left(\frac{1}{a^2}\right) + \left(\frac{1}{b^2}\right) = \left(\frac{1}{c^2}\right)$, where c is a constant, prove that the foot of the perpendicular from the origin on the straight line describes the circle $x^2 + y^2 = c^2$.

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8. In what ratio does the line joining the points (2, 3) and (4, 1) divide the segment joining the points (1, 2) and (4, 3)?

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9. $ABCD$ is a square whose vertices are $A(0, 0), B(2, 0), C(2, 2),$ and $D(0, 2)$. The square is rotated in the $XY - plane$ through an angle 30^0 in the anticlockwise sense about an axis passing though A perpendicular to the $XY - plane$. Find the equation of the diagonal BD of this rotated square.

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10. In a triangle $ABC,$ side AB has equation $2x + 3y = 29$ and side AC has equation $x + 2y = 16.$ If the midpoint of BC is 5, 6), then find the equation of $BC.$

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11. 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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12. If one of the sides of a square is $3x - 4y - 12 = 0$ and the center is $(0, 0)$, then find the equations of the diagonals of the square.

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13. A vertex of an equilateral triangle is $2, 3$ and the opposite side is $x + y = 2.$ Find the equations of other sides.

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14. A line $4x + y = 1$ passes through the point A(2,-7) and meets line BC at B whose equation is $3x - 4y + 1 = 0$, the equation of line AC such that $AB = AC$ is (a) 52x +89y +519=0(b) 52x +89y-519=0 c) 82x +52y+519=0 (d) 89x +52y -519=0

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15. 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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16. Find the equation of the line which intersects the y-axis at a distance of 2 units above the origin and makes an angle of 30^0 with the positive direction of the x-axis.

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17. Find the equation of a straight line cutting off and intercept -1 from y-axis and being equally inclined to the axes.

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18. Find the equation of a line that has -y-intercept 4 and is a perpendicular to the line joining $(2, -3)$ and $(4, 2)$.

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19. Find equation of the line passing through the point (2, 2) and cutting off intercepts on the axes whose sum is 9.

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20. Find the equation of the straight line that (i)makes equal intercepts on the axes and passes through the point (2;3) (ii) passes through the point (-5;4) and is such that the portion intercepted between the axes is devided by the point in the ratio $1:2$

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21. Line segment AB of fixed length c slides between coordinate axes such that its ends A and B lie on the axes. If O is origin and rectangle OAPB is completed, then show that the locus of the foot of the perpendicular drawn from P to AB is $x^{\frac{2}{3}} + y^{\frac{2}{3}} = c^{\frac{2}{3}}$.

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22. Reduce the line $2x - 3y + 5 = 0$ in slope-intercept, intercept, and normal forms.

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23. Find the equation of the line which satisfy the given conditions : Perpendicular distance from the origin is 5 units and the angle made by the perpendicular with the positive xaxis is $30o$.

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24. A straight line is drawn through the point P(2;3) and is inclined at an angle of 30° with the x-axis . Find the coordinates of two points on it at a distance 4 from point P.

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25. The line joining two points A(2,0) and B(3,1) is rotated about A in anticlockwise direction through an angle of 15°. find the equation of line in the new position. If b goes to c in the new position what will be the coordinates of C.

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26. A line through point A(1,3) and parallel to the line x-y+1 = 0 meets the line 2x-3y + 9 = 0 at point P. Find distance AP without finding point P.

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27. Two adjacent vertices of a square are (1, 2) and $(-2, 6)$ Find the other vertices.

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28. A Line through the variable point $A(1+k; 2k)$ meets the lines $7x+y-16=0; 5x-y-8=0$ and x-5y+8=0` at B;C;D respectively. Prove that AC;AB and AD are in HP.

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29. if P is the length of perpendicular from origin to the line $\frac{x}{a}+\frac{y}{b}=1$ then prove that $\frac{1}{a^2}+\frac{1}{b^2}=\frac{1}{p^2}$

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30. Find the coordinates of a point on $x + y + 3 = 0$, whose distance from $x + 2y + 2 = 0$ is $\sqrt{5}$.

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31. Find the least and greatest values of the distance of the point $(\cos\theta, \sin\theta), \theta \in R$, from the line $3x - 4y + 10 = 0$.

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32. Prove that the product of the lengths of the perpendiculars drawn from the points $\left(\sqrt{a^2 - b^2}, 0\right)$ and $\left(-\sqrt{a^2 - b^2}, 0\right)$ to the line $\frac{x}{a}\cos\theta + \frac{y}{b}\sin\theta = 1$ is b^2.

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33. Find the least value of $(x-1)^2+(y-2)^2$ under the condition 3x+4y -2 = 0.

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34. ABC is an equilateral triangle with $A(0,0)$ and $B(a,0)$, (a>0). L, M and N are the foot of the perpendiculars drawn from a point P to the side $AB, BC, andCA$, respectively. If P lies inside the triangle and satisfies the condition $PL^2=PM\dot{P}N,$ then find the locus of $P\cdot$

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35. Line L has intercepts $aandb$ on the coordinate axes. When the axes are rotated through a given angle keeping the origin fixed, the same line L has intercepts $pandq\cdot$ 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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36. Two sides of a square lie on the lines $x + y = 1 and x + y + 2 = 0$.

What is its area?

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37. Find equation of the line which is equidistant from parallel lines

$9x \quad + \quad 6y \qquad 7 \quad = \quad 0$ and $3x \quad + \quad 2y \quad + 6 \quad = \quad 0$.

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38. If one side of the square is $2x - y + 6 = 0$, then one of the vertices is $(2, 1)$. Find the other sides of the square.

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39. Prove that the area of the parallelogram contained by the lines

$4y - 3x - a = 0, 3y - 4x + a = 0, 4y - 3x - 3a = 0,$ and

$3y - 4x + 2a = 0$ is $\left(\frac{2}{7}\right)a^2$.

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40. The equation of straight line passing through (-2,-7) and having an intercept of length 3 between the straight lines : 4x + 3y = 12 , 4x + 3y = 3 are : (A) 7x + 24y + 182 = 0 (B) 7x + 24y + 18 = 0 (C) x + 2 = 0 (D) x - 2 = 0

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41. A line L is a drawn from $P(4, 3)$ to meet the lines $L - 1 and L_2$ given by $3x + 4y + 5 = 0$ and $3x + 4y + 15 = 0$ at points $A and B$, respectively. From A , a line perpendicular to L is drawn meeting the line L_2 at A_1. Similarly, from point B_1. Thus, a parallelogram $\forall_1 BB_1$ is formed. Then the equation of L so that the area of the parallelogram $\forall_1 BB_1$ is the least is $x - 7y + 17 = 0$ $7x + y + 31 = 0$ $x - 7y - 17 = 0$ $x + 7y - 31 = 0$

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42. Are the points $(3, 4)$ and $(2, -6)$ on the same or opposite sides of the line $3x - 4y = 8$?

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43. Find the set of positive values of b for which the origin and the point (1, 1) lie on the same side of the straight line, $a^2x + aby + 1 = 0, \forall a \in R\cdot$

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44. If the point $(a^2, a + 1)$ lies in the angle between the lines $3x - y + 1 = 0$ and $x + 2y - 5 = 0$ containing the origin, then find the value of $a\cdot$

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45. If the point (a, a) is placed in between the lines $|x + y| = 4,$ then find the values of $a\cdot$

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46. The complete set of real values of 'a' such that the point lies triangle $p(a, \sin a)$ lies inside the triangle formed by the lines $x - 2y + 2 = 0; x + y = 0$ and $x - y - \pi = 0$

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47. Determine all the values of α for which the point (α, α^2) lies inside the triangle formed by the lines. $2x + 3y - 1 = 0 \quad x + 2y - 3 = 0 \quad 5x - 6y - 1 = 0$

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48. Sketch the origin in which the points satisfying the following inequality lie.

$(i) 2x - 3y - 5 > 0$ $\quad$ $(\text{ii}) \quad -3x + 4y + 7 > 0$

$(iii) x > 2$ $\quad$ $(\text{iv}) \quad y > -3$

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49. Sketch the origin in which the points satisfying the following inequalities lie.

$(i)|x + y| < 2$ $\quad$ $(\text{ii}) \quad |2x - y| > 3$ $\quad$ $(\text{iii}) \quad |x| > |y|$

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50. Find the values of b for which the points $(2b + 3, b^2)$ lies above of the line 3x-4y-a(a-2) = 0 $\forall a \in R$.

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51. Plot the region of the points P (x,y) satisfying $|x| + |y| < 1.$

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52. Plot the region of the points P(x,y) satisfying $2 >$ max.

$\{|x|, |y|\}.$

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53. IF one of the vertices of a square is (3,2) and one of the diagonalls is along the line 3x+4y+8=0, then find the centre of the square and other vertices.

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54. In $\triangle ABC$, vertex A is (1, 2). If the internal angle bisector of $\angle B$ is $2x - y + 10 = 0$ and the perpendicular bisector of AC is y = x, then find the equation of BC

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55. Find the locus of image of the veriable point $(\lambda^2, 2\lambda)$ in the line mirror x-y+1=0, where λ is a peremeter.

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56. 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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57. For the straight lines $4x + 3y - 6 = 0$ and $5x + 12y + 9 = 0,$ find the equation of the bisector of the obtuse angle between them, bisector of the acute angle between them, and bisector of the angle which contains (1, 2)

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58. The equations of bisectors of two lines $L_1 \& L_2$ are $2x - 16y - 5 = 0$ and $64x + 8y + 35 = 0$. If the line L_1 passes through $(-11, 4)$, the equation of acute angle bisector of L_1 & L_2 is:

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59. If $x + y = 0$ is the angle bisector of the angle containing the point (1,0), for the line $3x + 4y + b = 0; 4x + 3y + b = 0, 4x + 3y - , b = 0$ then

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60. Two equal sides of an isosceles triangle are given by $7x - y + 3 = 0$ and $x + y = 3$, and its third side passes through the point $(1, -10)$. Find the equation of the third side.

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61. 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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62. Two sides of a rhombus lying in the first quadrant are given by $3x - 4y = 0and12x - 5y = 0$. If the length of the longer diagonal is 12, then find the equations of the other two sides of the rhombus.

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63. If the line $ax + by = 1$ passes through the point of intersection of $y = x\tan\alpha + p\sec\alpha, y\sin(30^\circ - \alpha) - x\cos(30^\circ - \alpha) = p,$ and is inclined at 30° with $y = \tan\alpha x$, then prove that $a^2 + b^2 = \frac{3}{4p^2}$.

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64. Find the value of λ , if the line $3x - 4y - 13 = 0, 8x - 11y - 33 = 0 and 2x - 3y + \lambda = 0$ are concurrent.

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65. If the lines $a_1 x + b_1 y + 1 = 0,\ a_2 x + b_2 y + 1 = 0\ and\ a_3 x + b_3 y + 1 = 0$ are concurrent, show that the points $(a_1, b_1),\ (a_2, b_2) and\ (a_3, b_3)$ are collinear.

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66. Show that the straight lines given by $x(a + 2b) + y(a + 3b) = a$ for different values of $a and b$ pass through a fixed point.

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67. Let $ax + by + c = 0$ be a variable straight line, whre $a, bandc$ are the 1st, 3rd, and 7th terms of an increasing AP, respectively. Then prove that the variable straight line always passes through a fixed point. Find that point.

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68. Prove that all the lines having the sum of the interceps on the axes equal to half of the product of the intercepts pass through the point. Find the fixed point.

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69. Find the straight line passing through the point of intersection of $2x + 3y + 5 = 0, 5x - 2y - 16 = 0$, and through the point $(-1, 3)\cdot$

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70. Consider a family of straight lines $(x+y)+\lambda(2x-y+1)=0$. Find the equation of the straight line belonging to this family that is farthest from $(1, \ -3)\cdot$

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71. Let the sides of a parallelogram be U=a, U=b,V=a' and V=b', where U=lx+my+n, V=l'x+m'y+n'. Show that the equation of the diagonal through the point of intersection of

$U=a, V=a'$ and $U=b, V=b'$ is given by $\begin{vmatrix} U & V & 1 \\ a & a' & 1 \\ b & b' & 1 \end{vmatrix} = 0.$

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72. Find the values of non-negative real number $h_1, h_2, h_3, k_1, k_2, k_3$ such that the algebraic sum of the perpendiculars drawn from the points

$(2, k_1), (3, k_2), \cdot 7, k_3), (h_1, 4), (h_2, 5), (h_3, -3)$ on a variable line passing through (2, 1) is zero.

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73. Show that the lines $4x + y - 9 = 0, x - 2y + 3 = 0, 5x - y - 6 = 0$ make equal intercepts on any line of slope 2.

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74. The equations of two sides of a triangle are $3y - x - 2 = 0 and y + x - 2 = 0$. The third side, which is variable, always passes through the point $(5, -1)$. Find the range of the values of the slope of the third side, so that the origin is an interior point of the triangle.

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75. Find the locus of the circumcenter of a triangle whose two sides are along the coordinate axes and the third side passes through the point of intersection of the line $ax + by + c = 0$ and $lx + my + n = 0$.

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76. 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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77. A diagonal of rhombus $ABCD$ is member of both the families of lines $(x + y - 1) + \lambda(2x + 3y - 2) = 0$ and rhombus is (3, 2). If the area of the rhombus is $12\sqrt{5}$ sq. units, then find the remaining vertices of the rhombus.

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78. Let ABC be a given isosceles triangle with $AB = AC$. Sides $ABandAC$ are extended up to $EandF$, respectively, such that $BExCF = AB^2$. Prove that the line EF always passes through a fixed point.

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79. Let $L_1 = 0andL_2 = 0$ be two fixed lines. A variable line is drawn through the origin to cut the two lines at R and $S\dot{P}$. is a point on the line AB such that $\frac{(m+n)}{OP} = \frac{m}{OR} + \frac{n}{OS}$. Show that the locus of P is a straight line passing through the point of intersection of the given lines R, S, R are on the same side of O).

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80. Let points A,B and C lie on lines y-x=0, 2x-y=0 and y-3x=0, respectively. Also, AB passes through fixed point P(1,0) and BC passes through fixed point Q(0,-1). Then prove that AC also passes through a fixed point and find that point.

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81. Consider two lines $L_1 and L_2$ given by $x - y = 0$ and $x + y = 0$, respectively, and a moving point $P(x, y)$. Let $d(P, L_1), i = 1, 2,$ represents the distance of point P from the line L_i. If point P moves in a certain region R in such a way that $2 \leq d(P, P_1) + d(P, L_1) \leq 4$, find the area of region R.

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82. 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.

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83. A line through $A(-5, -4)$ meets the lines $x + 3y + 2 = 0, 2x + y + 4 = 0 and x - y - 5 = 0$ at the points $B, C and D$ 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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84. 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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Exercise 2 1

1. Find the equation of the right bisector of the line segment joining the points (3,4) and (-1,2).

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2. If the coordinates of the points A, B, C and D be $(a, b), (a', b'), (-a, b)$ and $(a', -b')$ respectively, then the equation of the line bisecting the line segments AB and CD is

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3. If the coordinates of the vertices of triangle ABC are $(-1, 6), (-3, -9)$ and $(5, -8)$, respectively, then find the equation of the median through C.

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4. Find the equation of the line perpendicular to the line $\frac{x}{a} - \frac{y}{b} = 1$ and passing through a point at which it cuts the x-axis.

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5. If the middle points of the sides $BC, CA,$ and AB of triangle ABC are $(1, 3), (5, 7),$ and $(-5, 7),$ respectively, then find the equation of the side AB.

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6. Find the equations of the lines which pass through the origin and are inclined at an angle $\tan^{-1} m$ to the line $y = mx + \cdot$

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7. If (-2,6) is the image of the point (4,2) with respect to line L=0, then L is:

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8. Find the area bounded by the curves $x + 2|y| = 1$ and $x = 0$.

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9. Find the equation of the straight line passing through the intersection of the lines $x - 2y = 1$ and $x + 3y = 2$ and parallel to $3x + 4y = 0$.

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10. If the foot of the perpendicular from the origin to a straight line is at $(3, -4)$, then find the equation of the line.

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11. A straight line through the point $(2, 2)$ intersects the lines $\sqrt{3}x + y = 0$ and $\sqrt{3}x - y = 0$ at the point A and B, respectively. Then find the equation of the line AB so that triangle OAB is equilateral.

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12. The equation of the straight line passing through the point $(4. 3)$ and making intercepts on the co ordinate axes whose sum is -1, is

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13. A straight line through the point A(3, 4) is such that its intercept between the axes is bisected at A. Its equation is :

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14. 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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15. One side of a rectangle lies along the line $4x + 7y + 5 = 0$. Two of its vertices are $(-3, 1) and (1, 1)$. Find the equations of the other three sides.

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16. A line $L_1 \equiv 3y - 2x - 6 = 0$ is rotated about its point of intersection with the y-axis in the clockwise direction to make it L_2 such that the are formed by L_1, L_2 the x-axis, and line $x = 5$ is $\frac{49}{3} squnits$ if its point of intersection with $x = 5$ lies below the x-axis. Find the equation of L_2.

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17. The diagonals AC and BD of a rhombus intersect at $(5, 6)$. If $A \equiv (3, 2)$, then find the equation of diagonal BD.

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18. Find the equation of the straight line which passes through the origin and makes angle 60^0 with the line $x + \sqrt{3}y + \sqrt{3} = 0$.

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19. A line intersects the straight lines $5x - y - 4 = 0$ and $3x - 4y - 4 = 0$ at A and B, respectively. If a point $P(1, 5)$ on the line AB is such that $AP : PB = 2 : 1$ (internally), find point A.

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20. In the given figure, PQR is an equilateral 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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21. Two fixed points A and B are taken on the coordinates axes such that $OA = a$ and $OB = b$. Two variable points A' and B' are taken on the same axes such that $OA' + OB' = OA + OB$. Find the locus of the point of intersection of AB' and $A'B$.

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22. A regular polygon has two of its consecutive diagonals as the lines $\sqrt{3}x + y - \sqrt{3}$ and $2y = \sqrt{3}$. Point $(1, c)$ is one of its vertices. Find the equation of the sides of the polygon and also find the coordinates of the vertices.

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23. Find the direction in which a straight line must be drawn through the point $(1, 2)$so that its point of intersection with the line $x + y4$may be at a distance of 3 units from this point.

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Exercise 2 2

1. Two particles start from point (2, -1), one moving two units along the line x+ y = 1 and the other 5 units along the line x - 2y = 4, If the particle move towards increasing y, then their new positions are:

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2. The center of a square is at the origin and its one vertex is $A(2, 1)\cdot$ Find the coordinates of the other vertices of the square.

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3. 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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4. The centroid of an equilateral triangle is (0,0). If two vertices of the triangle lie on x+y $= 2\sqrt{2}$, then find all the possible vertices fo triangle.

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Exercise 2 3

1. Find the points on $y - a\xi s$ whose perpendicular distance from the line $4x - 3y - 12 = 0$ is 3.

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2. If p and p' are the distances of the origin from the lines $x\sec\alpha + y \ \ \text{cosec}\alpha = k$ and $x\cos\alpha - y \ \ \sin\alpha = k$

$\cos 2\alpha, thenprovet\hat{4}p^2 + p'^2 = k^2.$

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3. Prove that the lengths of the perpendiculars from the points $(m^2, 2m), (mm', m + m'),$ and $(m'^2, 2m')$ to the line $x + y + 1 = 0$ are in GP.

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4. The ratio in which the line 3x+4y+2=0 divides the distance between 3x+4y+5=0 and 3x+4y-5=0 is?

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5. Find the incentre of a triangle formed by the lines $x\cos\frac{\pi}{9} + y\sin\frac{\pi}{9} = \pi$, $x\cos\frac{8\pi}{9} + y\sin\frac{8\pi}{9} = \pi$ and $x\cos\frac{13\pi}{9} + y\sin\left(\frac{13\pi}{9}\right.$

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6. Find the equations of lines parallel to $3x - 4y - 5 = 0$ at a unit distance from it.

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7. Find the equation of a straight line passing through the point $(-5, 4)$ and which cuts off an intercept of $\sqrt{2}$ units between the lines $x + y + 1 = 0$ and $x + y - 1 = 0$.

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Exercise 2 4

1. The point $(8, -9)$ with respect to the lines $2x+3y-4=0$ and $6x+9y+8=0$ lies on the same side of the lines the different sides of the line one of the line none of these

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2. How the following paris of points are placed w.r.t the line 3x-8y-7=0?

$(i)(-3, -4)$ and $(1, 2)$ $\quad$ $(ii)(-1, -1)$ and $(3, 7)$

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3. Find the range of $(\alpha, 2+\alpha)$ and $\left(\frac{3\alpha}{2}, a^2\right)$ lie on the opposite sides of the line $2x+3y=6$.

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4. If the point $P(a^2, a)$ lies in the region corresponding to the acute angle between the lines $2y = x$ and $4y = x$, then find the values of a.

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5. If (a, 3a) is a variable point lying above the straight line 2x+y+4 =0 and below the line x+4y-8=0, then find the values of a.

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6. Find the values of α such that the variable point $(\alpha, \tan\alpha)$ lies inside the triangle whose sides are

$$y = x + \sqrt{3} - \frac{\pi}{3}, x + y + \frac{1}{\sqrt{3}} + \frac{\pi}{6} = 0 \text{ and } x - \frac{\pi}{2} = 0$$

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7. Find the area of the region in which points satisfy

$3 \leq |x| + |y| \leq 5.$

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8. Find the area of the region formed by the points satisfying

$|x| + |y| + |x + y| \leq 2.$

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Exercise 2 5

1. Find the equation of the bisector of the obtuse angle between the lines

$3x - 4y + 7 = 0$ and $12x + 5y - 2 = 0.$

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2. The incident ray is along the line $3x - 4y - 3 = 0$ and the reflected ray is along the line $24x + 7y + 5 = 0$. Find the equation of mirrors.

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3. If the two sides of rhombus are $x + 2y + 2 = 0$ and $2x + y - 3 = 0$, then find the slope of the longer diagonal.

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4. In triangle ABC , the equation of the right bisectors of the sides AB and AC are $x + y = 0$ and $y - x = 0$, respectively. If $A \equiv (5, 7)$, then find the equation of side BC.

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5. Show that the reflection of the line $ax + by + c = 0$ on the line $x + y + 1 = 0$ is the line $b + ay + (a + b - c) = 0$ where $a \neq b$.

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6. The joint equation of two altitudes of an equilateral triangle is $(\sqrt{3}x - y + 8 - 4\sqrt{3})(-\sqrt{3}x - y + 12 + 4\sqrt{3}) = 0$ The third altitude has the equation

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7. The equations of the perpendicular bisectors of the sides $ABandAC$ of triangle ABC are $x - y + 5 = 0$ and $x + 2y = 0$, respectively. If the point A is $(1, -2)$, then find the equation of the line BC.

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8. Two sides of a rhombus ABCD are parallel to the lines y = x + 2 and y = 7x + 3 If the diagonals of the rhombus intersect at the point (1, 2) and the vertex A is on the y-axis, then vertex A can be

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Exercise 2 6

1. If $aandb$ are two arbitrary constants, then prove that the straight line $(a-2b)x+(a+3b)y+3a+4b=0$ will pass through a fixed point. Find that point.

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2. If a, b, c are in harmonic progression, then the straight line $\left(\left(\frac{x}{a}\right)\right)_{\frac{y}{b}}+\left(\frac{l}{c}\right)=0$ always passes through a fixed point. Find that point.

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3. A variable line passes through a fixed point P. The algebraic sum of the perpendiculars drawn from the points (2,0), (0,2) and (1,1) on the line is zero. Find the coordinate of the point P.

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4. Consider the family of lines $5x + 3y - 2 + \lambda_1(3x - y - 4) = 0$ and $x - y + 1 + \lambda_2(2x - y - 2) = 0$. Find the equation of a straight line that belongs to both the families.

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5. If the straight lines $x + y - 2 - 0, 2x - y + 1 = 0$ and $ax + by - c = 0$ are concurrent, then the family of lines $2ax + 3by + c = 0(a, b, c)$ are nonzero) is concurrent at $(2, 3)$ (b) $\left(\frac{1}{2}, \frac{1}{3}\right)$ $\left(-\frac{1}{6}, -\frac{5}{9}\right)$ (d) $\left(\frac{2}{3}, -\frac{7}{5}\right)$

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Exercise Single

1. Find the equations of the diagonals of the square formed by the lines $x=o, y=0, x=1andy=1.$

A. y=x,y+x=1

B. y=x,x+y=2

C. 2y = x,y+x = 1/3

D. y=2x,y+2x =1

Answer: A

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2. The coordinates of two consecutive vertices A and B of a regular hexagon ABCDEF are (1,0) and (2,0) respectively. The equation of the diagonal CE is:

A. $\sqrt{3}x + y = 4$

B. $x + \sqrt{3}y + 4 = 0$

C. $x + \sqrt{3}y = 4$

D. none of these

Answer: C

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3. If each of the points $(x - 1, 4), (-2, y_1)$ lies on the line joining the points $(2, -1) and (5, -3)$, then the point $P(x_1, y_1)$ lies on the line.

A. $6(x + y) - 25 = 0$

B. $2x + 6y + 1 = 0$

C. $2x + 3y - 6 = 0$

D. $6(x + y) + 25 = 0$

Answer: B

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4. The equation to the straight line passing through the point $\left(a\cos^3\theta, a\sin^3\theta\right)$ and perpendicular to the line $x\sec\theta + y\text{cosec}\theta = a$ is

A. $x\cos\quad\theta - y\sin\theta = a\cos2\theta$

B. $x\cos\quad\theta + y\sin\theta = a\cos2\theta$

C. $x\sin\theta + y\cos\theta = a\cos2\theta$

D. none of these

Answer: A

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5. The line PQ whose equation is $x - y = 2$ cuts the x-axis at $P, andQ$ is (4,2). The line PQ is rotated about P through 45^0 in the anticlockwise direction. The equation of the line PQ in the new position is $y = -\sqrt{2}$

(b) $y = 2\,x = 2$ (d) $x = -2$

A. $y = -\sqrt{2}$

B. y=2

C. x=2

D. x=-2

Answer: C

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6. A line moves in such a way that the sum of the intercepts made by it on the axes is always c. The locus of the mid- point of its intercept between the axes is

A. x+y=2c

B. x+y=c

C. 2(x+y)=c

D. 2x+y=c

Answer: C

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7. If the x intercept of the line $y = mx + 2$ is greater than $\frac{1}{2}$ then the gradient of the line lies in the interval

A. (-1,0)

B. $\left(\frac{-1}{4}, 0\right)$

C. $(-\infty, -4)$

D. $(-4, 0)$

Answer: D

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8. The equation of a straight line on which the length of perpendicular from the origin is four units and the line makes an angle of 120^0 with the x-axis is

A. $x\sqrt{3} + y + 8 = 0$

B. $x\sqrt{3} - y = 8$

C. $x\sqrt{3} - y = 8$

D. $x - \sqrt{3} + 8 = 0$

Answer: A

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9. $ABCD$ is a square $A \equiv (1, 2), B \equiv (3, -4)$. If line CD passes through $(3, 8)$, then the midpoint of CD is

A. (2,6)

B. (6,2)

C. (2,5)

D. (28/5,1/5)

Answer: D

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10. The equation of straight line which passes through the point (-4,3) such that the portion of the line between the axes is divided by the point in ratio 5:3 is -

A. 9x-20y+96=0

B. 9x+20y=24

C. 20x+9y+53=0

D. none of these

Answer: A

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11. A square of side 'a' lies above the x-axis and has one vertex at the origin. The side passing through the origin makes an angle α (0 < $\alpha' <$ pi`/4) with the positive direction of x-axis. Find the equation of diagonal not passing through the origin ?

A. $y(\cos\alpha+\sin\alpha)+x(\sin\alpha-\cos\alpha)=a$

B. $y(\cos\alpha+\sin\alpha)+x(\sin\alpha+\cos\alpha)=a$

C. $y(\cos\alpha+\sin\alpha)+x(\cos\alpha-\sin\alpha)=a$

D. $y(\cos\alpha-\sin\alpha)-x(\sin\alpha-\cos\alpha)=a$

Answer: C

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12. Let P = (-1, 0), Q = (0, 0) and R = (3, $3\sqrt{3}$) be three points. The equation of the bisector of the angle PQR

A. $\left(\sqrt{3}/2\right)x+y=0$

B. $x+\sqrt{3}y=0$

C. $\sqrt{3}x+y=0$

D. $x+(\sqrt{3}/2)y=0$

Answer: C

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13. The equation of a line through the point (1, 2) whose distance from the point $(3, 1)$ has the greatest value is $y=2x$ (b) $y=x+1$ $x+2y=5$ (d) $y=3x-1$

A. y=2x

B. y=x+1

C. x+2y=5

D. y=3x-1

Answer: A

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14. One diagonal of a square is along the line $8x - 15y = 0$ and one of its vertex is (1, 2). Then the equations of the sides of the square passing through this vertex are $23x + 7y = 9, 7x + 23y = 53$ $23x - 7y + 9 = 0, 7x + 23y + 53 = 0$ $23x - 7y - 9 = 0, 7x + 23y - 53 = 0$ none of these

A. 7x-8y+9=0, 8x+7y-22=0

B. 9x-8y+7=0.8x+9y-26=0

C. 23x-7y-9=0,7x+23y-53=0

D. none of these

Answer: C

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15. The angle between the diagonals of a quadrilateral formed by the lines $\frac{x}{a}+\frac{y}{b}=1, \frac{x}{b}+\frac{y}{a}=1, \frac{x}{a}+\frac{y}{b}=2$ and $\frac{x}{b}+\frac{y}{a}=2$ is (a) $\frac{\pi}{4}$ (b) $\frac{\pi}{6}$ (c) $\frac{\pi}{3}$ (d) $\frac{\pi}{2}$

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

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

C. $\frac{\pi}{3}$

D. $\frac{\pi}{6}$

Answer: B

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16. A line with positive rational slope, passes through the point A(6,0) and is at a distance of 5 units from B (1,3). The slope of line is

A. $\frac{15}{8}$

B. $\frac{8}{15}$

C. $\frac{5}{8}$

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

Answer: B

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17. The line 'x + 3y - 2 = 0' bisects the angle between a pair of straight lines of which one has equation 'x - 7y + 5 = 0' , then find equation of other line.

A. 3x+3y-1=0

B. x-3y+2=0

C. 5x+5y-3=0

D. none of these

Answer: C

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18. Given $A \equiv (1, 1)$ and AB is any line through it cutting the x-axis at B. If AC is perpendicular to AB and meets the y-axis in C , then the equation of the locus of midpoint P of BC is

A. x+y=1

B. x+y=2

C. x+y=2xy

D. 2x+2y=1

Answer: A

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19. The number of possible straight lines passing through point(2,3) and forming a triangle with coordiante axes whose area is 12 sq. unit is: a. one b. two c. three d. four

A. one

B. two

C. three

D. four

Answer: C

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20. Two parallel lines lying in the same quadrant make intercepts a and b on x and y axes, respectively, between them. The distance between the lines is (a) $\frac{ab}{\sqrt{a^2+b^2}}$ (b) $\sqrt{a^2+b^2}$ (c) $\frac{1}{\sqrt{a^2+b^2}}$ (d) $\frac{1}{a^2}+\frac{1}{b^2}$

A. $\sqrt{a^2+b^2}$

B. $\frac{ab}{\sqrt{a^2+b^2}}$

C. $\frac{1}{\sqrt{a^2+b^2}}$

D. $\frac{1}{a^2}+\frac{1}{b^2}$

Answer: B

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21. The line $L_1 \equiv 4x + 3y - 12 = 0$ intersects the x-and y-axies at $AandB,$ respectively. A variable line perpendicular to L_1 intersects the x-and the y-axis at P and Q , respectively. Then the locus of the circumcenter of triangle ABQ is $3x - 4y + 2 = 0$ $4x + 3y + 7 = 0$ $6x - 8y + 7 = 0$ (d) none of these

A. 3x-4y+2 = 0

B. 4x+3y+7 = 0

C. 6x-8y+7=0

D. none of these

Answer: C

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22. A beam of light is sent along the line $x - y = 1$, which after refracting from the x-axis enters the opposite side by turning through 30^0 towards the normal at the point of incidence on the x-axis. Then the equation of the refracted ray is $(2-\sqrt{3})x - y = 2+\sqrt{3}$ $(2+\sqrt{3})x - y = 2+\sqrt{3}$ $(2-\sqrt{3})x + y = (2+\sqrt{3})$ $y = (2-\sqrt{3})(x-1)$

A. $(2-\sqrt{3})x - y = 2+\sqrt{3}$

B. $(2+\sqrt{3})x - y = 2+\sqrt{3}$

C. $(2-\sqrt{3})x + y = (2+\sqrt{3})$

D. $y = (2+\sqrt{3})(x-1)$

Answer: D

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23. 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

A. 2

B. 0

C. 4

D. 1

Answer: A

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24. If the sum of the distances of a point from two perpendicular lines in a plane is 1, then its locus is a square (b) a circle a straight line (d) two intersecting lines

A. a square

B. a circle

C. a straight line

D. two intersecting lines

Answer: A

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25. The equation of set of lines which are at a constant distance 2 units from the origin is

A. x+y+2=0

B. x+y+4=0

C. $x\cos\alpha + y\sin\alpha = 2$

D. $x\cos\alpha + y\sin\alpha = \frac{1}{2}$

Answer: C

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26. The lines $y = m_1 x, y = m_2 x$, and $y = m_3 x$ make equal in- tercepts on the line $x + y = 1$. then

A. $2(1 + m_1)(1 + m_3) = (1 + m_2)(2 + m_1 + m_3)$

B. $(1 + m_1)(1 + m_3) = (1 + m_2)(1 + m_1 + m_3)$

C. $(1 + m_1)(1 + m_2) = (1 + m_3)(2 + m_1 + m_3)$

D. $2(1 + m_1)(1 + m_3) = (1 + m_2)(1 + m_1 + m_3)$

Answer: A

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27. The condition on $aandb$, such that the portion of the line $ax + by - 1 = 0$ intercepted between the lines $ax + y = 0$ and $x + by = 0$ subtends a right angle at the origin, is $a = b$ (b) $a + b = 0$ $a = 2b$ (d) $2a = b$

A. a =b

B. a+b=0

C. a=2b

D. 2a=b

Answer: B

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28. The area of the triangle formed by the lines y= ax, x+y-a=0, and y-axis is equal to

A. $\frac{1}{2|1+a|}$

B. $\frac{a^2}{|1+a|}$

C. $\frac{1}{2}\frac{a}{|1+a|}$

D. $\frac{a^2}{2|1+a|}$

Answer: D

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29. The line $\frac{x}{a}+\frac{y}{b}=1$ meets the x-axis at A, the y-axis at B, and the line $y=x$ at C such, that the area of $\mathrm{Delta}AOC$ is twice the area of $\mathrm{Delta}BOC$. Then the coordinates of C are $\left(\frac{b}{3},\frac{b}{3}\right)$ (b) $\left(\frac{2a}{3},\frac{2a}{3}\right)$ $\left(\frac{2b}{3},\frac{2b}{3}\right)$ (d) none of these

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

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

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

D. none of these

Answer: C

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30. The lien $\frac{x}{3}+\frac{y}{4}=1$ meets the $y-$ and $x-axys$ at $AandB$, respectively. A square $ABCD$ is constructed on the line segment AB

away from the origin. The coordinates of the vertex of the square farthest from the origin are (7, 3) (b) (4, 7) (c) (6, 4) (d) (3, 8)

A. 7,3

B. 4,7

C. 6,4

D. 3,8

Answer: B

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31. The area of a parallelogram formed by the lines $ax \pm bx \pm c = 0$ is $\frac{c^2}{(ab)}$ (b) $\frac{sc^2}{(ab)}$ $\frac{c^2}{2ab}$ (d) none of these

A. $c^2/(ab)$

B. $2c^2/(ab)$

C. $c^2/2ab$

D. none of these

Answer: B

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32. One diagonal of a square is 3x-4y+8=0 and one vertex is (-1,1), then the area of square is

A. $\frac{1}{50}\text{sq.unit}$

B. $\frac{1}{25}\text{sq.unit}$

C. $\frac{3}{50}\text{sq.unit}$

D. $\frac{2}{25}\text{sq.unit}$

Answer: D

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33. In an isoceles triangle OAB , O is the origin and OA=OB=6 . The equation of the side AB is x-y+1=0 Then the area of the triangle is

A. $2\sqrt{21}$

B. $\sqrt{142}$

C. $\sqrt{\frac{142}{2}}$

D. $\sqrt{\frac{71}{2}}$

Answer: D

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34. A straight line through the origin 'O' meets the parallel lines $4x + 2y = 9$ and $2x + y = -6$ at points P and Q respectively. Then the point 'O' divides the segment PQ in the ratio

A. $1:2$

B. $3:4$

C. $2:01$

D. $4:3$

Answer: B

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35. The coordinates of the foot of the perpendicular from the point $(2, 3)$ on the line $-y+3x+4=0$ are given by $\left(\frac{37}{10}, -\frac{1}{10}\right)$ (b) $\left(-\frac{1}{10}, \frac{37}{10}\right)$ $\left(\frac{10}{37}, -10\right)$ (d) $\left(\frac{2}{3}, -\frac{1}{3}\right)$

A. (37,/10,-1/10)

B. (-1/10,37/10)

C. (10/37,-10)

D. (2/3,-1/3)

Answer: B

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36. The straight lines $7x - 2y + 10 = 0$ and $7x + 2y - 10 = 0$form an isosceles triangle with the line $y = 2$. The area of this triangle is equal to

A. 15/7 sq. units

B. 10/7 sq. units

C. 18/7 sq. units

D. none of these

Answer: C

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37. The equations of the sides of a triangle are x+y-5=0, x-y+1=0, and y-1=0. Then the coordinates of the circumcenter are

A. 2,1

B. 1,2

C. 2,-2

D. 1,-2

Answer: A

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38. The equations of the sided of a triangle are $x+y-5=0, x-y+1=0,$ and $x+y-\sqrt{2}=0$ is $\left(-\infty, -\frac{4}{3}\right)\cup\left(\frac{4}{3}, +\infty\right)$ $\left(-\frac{4}{3}, \frac{4}{3}\right)$ (c) $\left(-\frac{3}{4}, \frac{4}{3}\right)$ none of these

A. $(-\infty, -4/3)\cup(4/3, +\infty)$

B. (-4/3, 4/3)

C. (-3/4,4/3)

D. none of these

Answer: A

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39. The range of values of θ in the interval $(0, \pi)$ such that the points (3,5) and $(\sin\theta, \cos\theta)$ lie on the same side of the line $x + y - 1 = 0$, is

A. $0 < \theta < \dfrac{\pi}{4}$

B. $0 < \theta < \dfrac{\pi}{2}$

C. $0 < \theta < \pi$

D. $\dfrac{\pi}{4} < \theta < \dfrac{3\pi}{4}$

Answer: B

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40. Distance of origin from the line $(1 + \sqrt{3})y + (1 - \sqrt{3})x = 10$ along the line $y = \sqrt{3}x + k$ (1) $\dfrac{2}{\sqrt{5}}$ (2) $5\sqrt{2} + k$ (3) 10 (4) 5

A. $\dfrac{5}{\sqrt{2}}$

B. 5sqrt(2)+k

C. 10

D. 5

Answer: D

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41. Consider the points $A(0, 1) and B(2, 0), and P$ be a point on the line $4x + 3y + 9 = 0$. The coordinates of P such that $|PA - PB|$ is maximum are $\left(-\frac{12}{5}, \frac{17}{5}\right)$ (b) $\left(-\frac{84}{5}, \frac{13}{5}\right)$ $\left(\frac{31}{7}, \frac{31}{7}\right)$ (d) $(, 0)$

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42. Consider the point $A = (3, 4), B(7, 13)$. If 'P' be a point on the line $y = x$ such that $PA + PB$ is minimum then coordinates of P is (A) $\left(\frac{13}{7}, 13, 7\right)$ (B) $\left(\frac{23}{7}, \frac{23}{7}\right)$ (C) $\left(\frac{31}{7}, \frac{31}{7}\right)$ (D) $\left(\frac{33}{7}, \frac{33}{7}\right)$

A. (12/7,12/7)

B. (-24/5,17/5)

C. (31/7,31/7)

D. (0,0)

Answer: C

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43. The are enclosed by $2|x| + 3|y| \leq 6$ is

A. 3 sq. units

B. 4 sq. units

C. 12 sq. units

D. 24 sq. units

Answer: C

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44. ABC is a variable triangle such that A is (1, 2), and $B and C$ on the line $y = x + \lambda(\lambda$ is a variable). Then the locus of the orthocentre of $\mathrm{Delta}ABC$ is $x + y = 0$ (b) $x - y = 0$ $x^2 + y^2 = 4$ (d) $x + y = 3$

A. x+y=0

B. x-y=0

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

D. x+y=3

Answer: D

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45. In ABC , the coordinates of the vertex A are $(4, -1)$, and lines $x - y - 1 = 0$ and $2x - y = 3$ are the internal bisectors of angles $B and C$. Then, the radius of the encircle of triangle ABC is $\frac{4}{\sqrt{5}}$ (b) $\frac{3}{\sqrt{5}}$ (c) $\frac{6}{\sqrt{5}}$ (d) $\frac{7}{\sqrt{5}}$

A. $4/\sqrt{5}$

B. $3/\sqrt{5}$

C. $6/\sqrt{5}$

D. $7/\sqrt{5}$

Answer: C

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46. P is a point on the line $y+2x=1,$ and $QandR$ two points on the line $3y+6x=6$ such that triangle PQR is an equilateral triangle. The length of the side of the triangle is $\frac{2}{\sqrt{5}}$ (b) $\frac{3}{\sqrt{5}}$ (c) $\frac{4}{\sqrt{5}}$ (d) none of these

A. $2/\sqrt{15}$

B. $3/\sqrt{5}$

C. $4/\sqrt{5}$

D. none of these

Answer: A

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47. If the equation of base of an equilateral triangle is $2x - y = 1$ and the vertex is $(-1, 2)$, then the length of the sides of the triangle is

A. $\sqrt{20/3}$

B. $2/\sqrt{15}$

C. $\sqrt{8/15}$

D. $\sqrt{15/2}$

Answer: A

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48. The locus of a point that is equidistant from the lines $x + y - 2\sqrt{2} = 0$ and $x + y - \sqrt{2} = 0$ is (a) $x + y - 5\sqrt{2} = 0$ (b)

$x+y-3\sqrt{2}=0$ (c) $2x+2y-3\sqrt{2}=0$ (d) $2x+2y-5\sqrt{5}=0$

A. $x+y-5\sqrt{2}=0$

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

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

D. $2x+2y-5\sqrt{2}=0$

Answer: C

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49. If the quadrilateral formed by the lines $ax+by+c=0, a'x+b'y+c=0, ax+by+c'=0, a'x+b'y+c'=$ has perpendicular diagonals, then $b^2+c^2=b^{\prime 2}+c^{\prime 2}$ $c^2+a^2=c^{\prime 2}+a^{\prime 2}$ $a^2+b^2=a^{\prime 2}+b^{\prime 2}$ (d) none of these

A. $b^2+c^2=b^2+c^2$

B. $c^2+a^2=c^{\prime 2}+a^{\prime 2}$

C. $a^2+b^2=a^{\prime 2}+b^{\prime 2}$

D. none of these

Answer: C

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50. A line of fixed length 2 units moves so that its ends are on the positive x-axis and that part of the line $x + y = 0$ which lies in the second quadrant. Then the locus of the midpoint of the line has equation. $x^2 + 5y^2 + 4xy - 1 = 0$ $x^2 + 5y^2 + 4xy + 1 = 0$ $x^2 + 5y^2 - 4xy - 1 = 0$ $4x^2 + 5y^2 + 4xy + 1 = 0$

A. $x^2 + 5y^2 + 4xy - 1 = 0$

B. $x^2 + 5y^2 + 4xy + 1 = 0$

C. $x^2 + 5y^2 - 4xy - 1 = 0$

D. $x^2 + 5y^2 - 4xy - 1 = 0$

Answer: A

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51. If the extremities of the base of an isosceles triangle are the points $(2a, 0)$ and (0, a), and the equation of one of the side is $x = 2a$, then the area of the triangle is $5a^2 s\dot{q}units$ (b) $\frac{5a^2}{2} s\dot{q}units$ $\frac{25a^2}{2} s\dot{q}units$ (d) none of these

A. $5a^2$sq. units

B. $5a^2 / 2$sq. units

C. $25a^2 / 2$sq. units

D. none of these

Answer: B

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52. $A \equiv (-4, 0), B \equiv (4, 0)\dot{M}andN$ are the variable points of the y-axis such that M lies below $NandMN = 4$. Lines $AMandBN$ intersect at P. The locus of P is $2xy - 16 - x^2 = 0$ $2xy + 16 - x^2 = 0$ $2xy + 16 + x^2 = 0$ $2xy - 16 + x^2 = 0$

A. $2xy - 16 - x^2 = 0$

B. $2xy + 16 - x^2 = 0$

C. $2xy + 16 + x^2 = 0$

D. $2xy - 16 + x^2 = 0$

Answer: D

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53. The number of triangles that the four lines $y = x + 3, y = 2x + 3, y = 3x + 2,$ and $y + x = 3$ form is (a) 4 (b) 2 (c) 3 (d) 1

A. 4

B. 2

C. 3

D. 1

Answer: C

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54. A variable line $\frac{x}{a}+\frac{y}{b}=1$ moves in such a way that the harmonic mean of a and b is 8. Then the least area of triangle made by the line with the coordinate axes is

A. 8 sq. unit

B. 16 sq. unit

C. 32 sq. unit

D. 64 sq. unit

Answer: C

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55. Given $A(0,0)$ and $B(x, y)$ with $x \in (0,1)$ and $y > 0$. Let the slope of the line AB equals m_1 Point C lies on the line $x = 1$ such that the slope of BC equals m_2 where $0 < m_2 < m_1$ If the area of the triangle ABC can expressed as $(m_1 - m_2) f(x)$, then largest possible value of $f(x)$ is:

A. 1

B. $1/2$

C. $1/4$

D. $1/8$

Answer: D

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56. A triangle is formed by the lines $x + y = 0, x - y = 0,$ and $lx + my = 1.$ If $l and m$ vary subject to the condition $l^2 + m^2 = 1,$ then the locus of its circumcenter is $\left(x^2 - y^2\right)^2 = x^2 + y^2$ $\left(x^2 + y^2\right)^2 = \left(x^2 - y^2\right)$ $\left(x^2 + y^2\right)^2 = 4x^2y^2$ $\left(x^2 - y^2\right)^2 = \left(x^2 + y^2\right)^2$

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

B. $(x^2 - y^2)^2 = (x^2 - y^2)$

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

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

Answer: A

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57. Let P be (5, 3) and a point R on $y = x$ and Q on the x-axis be such that $PQ + QR + RP$ is minimum. Then the coordinates of Q are $\left(\frac{17}{4}, 0\right)$ (b) $(17, 0)$ $\left(\frac{17}{2}, 0\right)$ (d) none of these

A. (17/4,0)

B. (17,0)

C. (17/2,0)

D. none of these

Answer: A

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58. If a pair of perpendicular straight lines drawn through the origin forms an isosceles triangle with the line $2x + 3y = 6$, then area of the triangle so formed is 36/13 (b) 12/17 (c) 13/5 (d) 17/14

A. $\frac{36}{13}$ sq. unit

B. $\frac{12}{17}$ sq. unit

C. $\frac{13}{5}$ sq. unit

D. $\frac{17}{13}$ sq. unit

Answer: A

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59. A point $P(x, y)$ moves that the sum of its distance from the lines $2x - y - 3 = 0$ and $x + 3y + 4 = 0$ is 7. The area bounded by locus P is (in sq. unit)

A. 70

B. $70\sqrt{2}$

C. $35\sqrt{2}$

D. 140

Answer: B

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60. If AD, BE and CF are the altitudes of ΔABC whose vertex A is (-4,5). The coordinates of points E and F are (4,1) and (-1,-4), respectively. Equation of BC is

A. 3x-4y+28=0

B. 4x+3y+28=0

C. 3x-4y-28=0

D. x+2y+7=0

Answer: C

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61. The vertex A of ΔABC is (3,-1). The equation of median BE and angle bisector CF are x-4y+10=0 and 6x+10y-59=0, respectively. Equation of AC is

A. 5x+18y=37

B. 15x+8y=37

C. 15x-8y=37

D. 15x+8y+37=0

Answer: B

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62. Suppose A, B are two points on $2x - y + 3 = 0$ and $P(1, 2)$ is such that PA=PB. Then the mid point of AB is

A. $\left(\frac{-1}{5}, \frac{13}{5}\right)$

B. $\left(\frac{-7}{5}, \frac{9}{5}\right)$

C. $\left(\frac{7}{5}, \frac{-9}{5}\right)$

D. $\left(\frac{-7}{5}, \frac{-9}{5}\right)$

Answer: A

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63. Triangle formed by variable lines (a+b)x+(a-b)y-2ab=0 and (a-b)x+(a+b)y-2ab=0 and x+y=0 is (where a, $b \in R$)

A. equilateral

B. right angled

C. scalene

D. none of these

Answer: D

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64. A light ray coming along the line $3x+4y=5$ gets reflected from the line $ax+by=1$ and goes along the line $5x-12y=10$. Then, $a=\frac{64}{115}, b=\frac{112}{15}$ $a=\frac{14}{15}, b=-\frac{8}{115}$ $a=\frac{64}{115}, b=-\frac{8}{115}$ $a=\frac{64}{15}, b=\frac{14}{15}$

A. $a=\frac{64}{115}, b=\frac{112}{15}$

B. $a=\frac{14}{15}, b=-\frac{18}{115}$

C. $a=\frac{64}{115}, b=-\frac{8}{115}$

D. $a=\frac{64}{15}, b=\frac{14}{15}$

Answer: C

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65. The point (2,1) , translated parallel to the line $x - y = 3$ by the distance of 4 units. If this new position A' is in the third quadrant, then the coordinates of A' are-

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

B. $(-2 + \sqrt{2}, -1 - 2\sqrt{2})$

C. $(2 - 2\sqrt{2}, 1 - 2\sqrt{2})$

D. none of these

Answer: C

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66. One of the diagonals of a square is the portion of the line x/2+y/3=2 intercepted between the axes. Then the extremitites of the other diagonal are

A. (5,5), (-1,1)

B. (0,0), (4,6)

C. (0,0),(-1,1)

D. (5,5),(4,6)

Answer: A

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67. The point P(2,1) is shifted through a distance $3\sqrt{2}$ units measured parallel to the line x+y=1 in the direction of decreasing ordinates, to reach at Q. The image of Q with respect to given line is

A. (3,-4)

B. (-3,2)

C. (0,-1)

D. none of these

Answer: A

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68. Let O be the origin. If $A(1, 0) and B(0, 1) and P(x, y)$ are points such that $xy > 0 and x + y < 1$, then P lies either inside the triangle OAB or in the third quadrant. P cannot lie inside the triangle OAB P lies inside the triangle OAB P lies in the first quadrant only

A. P lies either inside the triangle OAB or in the third quadrant

B. P cannot lie inside the triangle OAB

C. P lies inside the triangle OAB

D. P lies in the first quadrant only

Answer: A

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69. In a triangle ABC, the bisectors of angles $BandC$ lies along the lines $x = yandy = 0$. If A is $(1, 2)$, then the equation of line BC is $2x + y = 1$ (b) $3x - y = 5$ $x - 2y = 3$ (d) $x + 3y = 1$

A. 2x+y=1

B. 3x-y=5

C. x-2y=3

D. x+3y=1

Answer: B

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70. Line $ax + by + p = 0$ makes angle $\frac{\pi}{4}$ with $\cos\alpha + y\cos\alpha + y\sin\alpha = p, p \in R^+$. If these lines and the line $x\sin\alpha - y\cos\alpha = 0$ are concurrent, then $a^2 + b^2 = 1$ (b) $a^2 + b^2 = 2$ $2(a^2 + b^2) = 1$ (d) none of these

A. $a^2 + b^2 = 1$

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

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

D. none of these

Answer: B

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71. The equation of the line AB is $y = x$. If A and B lie on the same side of the line mirror $2x - y = 1$, then the equation of the image of AB is (a) $x + y - 2 = 0$ (b) $8x + y - 9 = 0$ (c) $7x - y - 6 = 0$ (d) `None of these

A. x+y=2

B. 8x+y=9

C. 7x-y=6

D. none of these

Answer: C

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72. The equation of the bisector of the acute angle between the lines $2x - y + 4 = 0$ and $x - 2y = 1$ is $x - y + 5 = 0$ $x - y + 1 = 0$ $x - y = 5$ (d) none of these

A. x+y+5=0

B. x-y+1=0

C. x-y=5

D. none of these

Answer: B

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73. The straight lines $4ax + 3by + c = 0$, where $a + b + c$ $(4, 3)$ (b) $\left(\frac{1}{4}, \frac{1}{3}\right)$ $\left(\frac{1}{2}, \frac{1}{3}\right)$ (d) none of these

A. (4,3)

B. (1/4,1/3)

C. (1/2,1/3)

D. none of these

Answer: B

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74. If the lines $ax + y + 1 = 0, x + by + 1 = 0 and x + y + c = 0 (a, b, c$ being distinct and different from $1)$ are concurrent, then prove that $\frac{1}{1-a} + \frac{1}{1-b} + \frac{1}{1-c} = 1.$

A. 0

B. 1

C. 1/(a+b+c)

D. none of these

Answer: B

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75. If lines $x+2y-1=0, ax+y+3=0,$ and $bx-y+2=0$ are concurrent, and S is the curve denoting the locus of (a, b), then the least distance of S from the origin is $\frac{5}{\sqrt{57}}$ (b) $5/\sqrt{51}$ $5/\sqrt{58}$ (d) $5/\sqrt{59}$

A. $5/\sqrt{57}$

B. $5/\sqrt{51}$

C. $5/\sqrt{58}$

D. $5/\sqrt{59}$

Answer: C

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76. The straight lines $x+2y-9=0, 3x+5y-5=0$, and $ax+by-1=0$ are concurrent, if the straight line $35x-22y+1=0$ passes through the point (a, b) (b) (b, a) $(-a, -b)$ (d) none of these

A. (a,b)

B. (b,a)

C. (-a,-b)

D. none of these

Answer: A

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77. If the straight lines $2x+3y-1=0, x+2y-1=0,$ and $ax+by-1=0$form a triangle with the origin as orthocentre, then $(a, b)$is given by

A. $(6, 4)$

B. $(-3, 3)$

C. $(-8, 8)$

D. $(0, 7)$

Answer: C

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78. If $\frac{a}{bc}-2=\sqrt{\frac{b}{c}}+\sqrt{\frac{c}{b}},$ where $a, b, c>0,$ then the family of lines $\sqrt{a}x+\sqrt{b}y+\sqrt{c}=0$ passes though the fixed point given by $(1, 1)$ (b) $(1, -2)$ $(-1, 2)$ (d) $(-1, 1)$

A. (1,1)

B. (1,-2)

C. (-1,2)

D. (-1,1)

Answer: D

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79. Distance possible to draw a line which belongs to all the given family of lines $y-2x+1+\lambda_1(2y-x-1)=0, 3y-x-6+\lambda_2(y-3x+6)=0, ax+$

, then $a=4$ (b) $a=3$ $a=-2$ (d) $a=2$

A. a=4

B. a=3

C. a=-2

D. a=2

Answer: A

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80. If two members of family $(2+\lambda)x+(1+2\lambda)y-3(1+\lambda)=0$ and line x+y=0 make an equilateral triangle, the the incentre of triangle so formed is

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

B. $\left(\frac{7}{6}, -\frac{5}{6}\right)$

C. $\left(\frac{5}{6}, \frac{5}{6}\right)$

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

Answer: A

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81. The set of lines $x\tan^{-1}a + y\sin^{-1}\left(\frac{1}{\sqrt{1+a^2}}\right) + 2 = 0$ where $a \in (0, 1)$ are concurrent at

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82. If

$\sin(\alpha+\beta)\sin(\alpha-\beta) = \sin\gamma(2\sin\beta + \sin\gamma)$ where $0 < \alpha, \beta, < \pi,$

then the straight line whose equation is $x\sin\alpha + y\sin\beta - \sin\gamma = 0$ passes through the point

A. (1,1)

B. (-1,1)

C. (1,-1)

D. none of these

Answer: C

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Exercise Multiple

1. If P is a point (x, y) on the line $y = -3x$ such that P and the point (3, 4) are on the opposite sides of the line $3x - 4y = 8$, then $x > \frac{8}{15}$ (b) $x > \frac{8}{5}$ $y < -\frac{8}{5}$ (d) $y < -\frac{8}{15}$

A. $x > 8/15$

B. $x > 8/5$

C. $x < -8/5$

D. $y < -8/15$

Answer: A::C

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2. If (x, y) is a variable point on the line $y = 2x$ lying between the lines $2(x+1)+y=0$ and $x+3(y-1)=0$, then $x \in \left(-\frac{1}{2}, \frac{6}{7}\right)$ (b) $x \in \left(-\frac{1}{2}, \frac{3}{7}\right)$ $y \in \left(-1, \frac{3}{7}\right)$ (d) $y \in \left(-1, \frac{6}{7}\right)$

A. $x \in (-1/2, 6/7)$

B. $x \in (-1/2, 3/7)$

C. $y \in (-1, 3/7)$

D. $y \in (-1, 6/7)$

Answer: B::D

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3. Let $P(\sin\theta, \cos\theta)$ $(0 \leq \theta \leq 2\pi)$ be a point and let OAB be a triangle with vertices $(0, 0)$, $\left(\sqrt{\frac{3}{2}}, 0\right)$ and $\left(0, \sqrt{\frac{3}{2}}\right)$ Find θ if P lies inside $\triangle OAB$

A. $0 < 0 < \pi/12$

B. $5\pi/2 < \theta < \pi/2$

C. $0 < \theta < 5\pi/2$

D. $5\pi/2 < \theta < \pi$

Answer: A::B

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4. The lines $x + 2y + 3 = 0, x + 2y - 7 = 0, and 2x - y - 4 = 0$ are the sides of a square. The equation of the remaining side of the square can be $2x-y+6=0$ (b) $2x-y+8=0$ $2x-y-10=0$ (b) $2x-y-14=0$

A. 2x-y+6=0

B. 2x-y+8=0

C. 2x-y-10=0

D. 2x-y-14=0

Answer: A::D

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5. Angle made with the x-axis by a straight line drawn through (1, 2) so that it intersects $x+y=4$ at a distance $\frac{\sqrt{6}}{3}$ from (1, 2) is 105^0 (b) 75^0 (c) 60^0 (d) 15^0

A. 105°

B. 75°

C. 60°

D. 15°

Answer: B::D

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6. Given three straight lines $2x+11y-5=0, 24x+7y-20=0,$ and $4x-3y-2=0$. Then, they form a triangle one line bisects the angle between the other two two of them are parallel

A. they from a triangle

B. they are concurrent

C. one line bisects the angle between the other two

D. two of them are parallel

Answer: C

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7. A triangle is formed by the lines whose equations are AB: x+y-5=0, BC: x+7y-7=0 and CA: 7x+y+14=0.

Then

A. angle at A is acute

B. angle at C is acute

C. internal angle bisector at angle B is 3x+6y-16=0

D. external angle bisector at angle C is 8x+8y+7 = 0

Answer: A::C::D

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8. If the points $\left(\frac{a^3}{a-1}, \frac{a^2-3}{a-1}\right), \left(\frac{b^3}{b-1}, \frac{b^3-3}{b-1}\right) and \left(\frac{c^3}{c-1}, \frac{c^3-3}{c-1}\right)$ where a, b, c are different from 1 lie on the line $lx+my+n=0$

$a+b+c=-\frac{m}{l}$ $\quad ab+bc+ca+\frac{n}{l}=0$ $\quad abc=\frac{(3m+n)}{l}$

$abc-(bc+ca+ab)+3(a+b+c)=0$

A. $a+b+c= \ -\frac{m}{l}$

B. $ab+bc+ca \ =\frac{n}{l}$

C. $abc=\frac{(m+n)}{l}$

D. abc-(bc+ca+ab) +3(a+b+c)=0

Answer: A::B::D

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9. Two sides of a rhombus OABC (lying entirely in first quadrant or fourth quadrant) of area equal to 2 sq. units, are $y=\frac{x}{\sqrt{3}}, y=\sqrt{3}x$ Then possible coordinates of B is / are ('O' being the origin)

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

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

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

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

Answer: A::B

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10. If $\left(\frac{x}{a}\right) + \left(\frac{y}{b}\right) = 1$ and $\left(\frac{x}{c}\right) + \left(\frac{y}{d}\right) = 1$ intersect the axes at four concylic points and $a^2 + c^2 = b^2 + d^2$, then these lines can intersect at, $(a, b, c, d > 0)$ $(1, 1)$ (b) $(1, -1)$ $(2, -2)$ (d) $(3, 3)$

A. (1,1)

B. (1,-1)

C. (2,-2)

D. (3,3)

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

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11. The straight line $3x+4y-12=0$ meets the coordinate axes at $AandB$. An equilateral triangle ABC is constructed. The possible coordinates of vertex C $\left(2\left(1-\frac{3\sqrt{3}}{4}\right),\frac{3}{2}\left(1-\frac{4}{\sqrt{3}}\right)\right)$ $\left(-2(1+\sqrt{3}),\frac{3}{2}(1-\sqrt{3})\right)$ $\left(2(1+\sqrt{3}),\frac{3}{2}(1+\sqrt{3})\right)$ $\left(2\left(1+\frac{3\sqrt{3}}{4}\right),\frac{3}{2}\left(1+\frac{4}{\sqrt{3}}\right)\right)$

A. $\left(2\left(1-\frac{3\sqrt{3}}{4}\right),\frac{3}{2}\left(1-\frac{4}{\sqrt{3}}\right)\right)$

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

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

D. $\left(2\left(1+\frac{3\sqrt{3}}{4}\right),\frac{3}{2}\left(1+\frac{4}{\sqrt{3}}\right)\right)$

Answer: A::D

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12. The equation of the lines passing through the point $(1,0)$ and at a distance $\frac{\sqrt{3}}{2}$ from the origin is $\sqrt{3}+y-\sqrt{3}$ =0 $x+\sqrt{3}y-\sqrt{3}=0$

$\sqrt{3}x - y - \sqrt{3} = 0\ x - \sqrt{3}y - \sqrt{3} = 0$

A. $\sqrt{3}x + y - \sqrt{3} = 0$

B. $x + \sqrt{3}y - \sqrt{3} = 0$

C. $\sqrt{3}x - y - \sqrt{3} = 0$

D. $x - \sqrt{3}y - \sqrt{3} = 0$

Answer: A::C

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13. The sides of a triangle are the straight lines $x + y = 1, 7y = x,$ and $\sqrt{3}y + x = 0$. Then which of the following is an interior point of the triangle? Circumcenter (b) Centroid Incenter (d) Orthocenter

A. Circumcenter

B. Centroid

C. Incenter

D. Orthocenter

Answer: B::C

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14. If the straight line $ax + cy = 2b$, where $a, b, c > 0$, makes a triangle of area 2 sq. units with the coordinate axes, then a, b, c are in GP a, -b; c are in GP $a, 2b, c$ are in GP (d) $a, \ -2b, c$ are in GP

A. a,b,c are in GP

B. a,-b, c are in GP

C. a,2b,c are in GP

D. a,-2b, c are in GP

Answer: A::B

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15. Consider the equation $y - y_1 = m(x - x_1)$. If $m and x_1$ are fixed and different lines are drawn for different values of y_1, then the lines will pass through a fixed point there will be a set of parallel lines all the lines intersect the line $x = x_1$ all the lines will be parallel to the line $y = x_1$

A. the lines will pass through a fixed point

B. there will be a set of parallel lines

C. all the lines intersect the line $x = x_1$

D. all the lines will be parallel to the line $y = x_1$

Answer: B::C

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16. Equation(s) of the straight line(s), inclined at 30^0 to the x-axis such that the length of its (each of their) line segment(s) between the coordinate axes is 10 units, is (are) $x + \sqrt{3}y + 5\sqrt{3} = 0$ $x - \sqrt{3}y + 5\sqrt{3} = 0$ $x + \sqrt{3}y - 5\sqrt{3} = 0$ $x - \sqrt{3}y - 5\sqrt{3} = 0$

A. $x+\sqrt{3}y+5\sqrt{3}=0$

B. $x-\sqrt{3}y+5\sqrt{3}=0$

C. $x+\sqrt{3}y-5\sqrt{3}=0$

D. $x-\sqrt{3}y-5\sqrt{3}=0$

Answer: B::D

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17. The lines $x+y-1=0, (m-1)x+\left(m^2-7\right)y-5=0,$ and $(m-2)x+(2m-5)y=0$ are concurrent for three values of m concurrent for no value of m parallel for one value of m parallel for two value of m

A. concurrent for three values of m

B. concurrent for one value of m

C. concurrent for no value of m

D. parallel for m-3

Answer: C::D

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18. The equation of a straight line passing through the point (2, 3) and inclined at an angle of $\tan^{-1}\left(\frac{1}{2}\right)$ with the line $y+2x=5$ $y=3$ (b) $x=2$ $3x+4y-18=0$ (d) $4x+3y-17=0$

A. y=3

B. x=2

C. 3x+4y-18=0

D. 4x+3y-17=0

Answer: B::C

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19. The equation of the line on which the perpendicular from the origin makes an angle of 30° with x - axis and which forms a triangle of area $\frac{50}{\sqrt{3}}$ with the axes is

A. $\sqrt{3}x+y-10=0$

B. $\sqrt{3}x+y+10=0$

C. $x+\sqrt{3}y-10=0$

D. $x-\sqrt{3}y-10=0$

Answer: A::B

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20. A line is drawn perpendicular to line $y=5x,$ meeting the coordinate axes at $AandB$. If the area of triangle OAB is 10 sq. units, where O is the origin, then the equation of drawn line is $3x-y-9$ (b) $x-5y=10$ $x+4y=10$ (d) $x-4y=10$

A. 12

B. -12

C. 10

D. -10

Answer: A::B

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21. If $x-2y+4=0 and 2x+y-5=0$ are the sides of an isosceles triangle having area $10 sq units$, the equation of the third side is $3x-y=-9$ (b) $3x-y+11=0$ $x-3y=19$ (d) $3x-y+15=0$

A. x+3y=-1

B. x+3y=19

C. 3x-y=-9

D. 3x-y=11

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

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22. Find the value of a for which the lines $2x + y - 1 = 0$ $2x + y - 1 = 0$ $ax + 3y - 3 = 0$ $3x + 2y - 2 = 0$ are concurrent.

A. -3

B. -1

C. 1

D. 4

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

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23. The lines $px + qy + r = 0, qx + ry + p = 0, rx + py + q = 0,$ are concurrant then

A. p+p+r=0

B. $p^2+q^2+r^2=pr+rp+pq$

C. $p^3+q^3+r^3=3pqr$

D. none of these

Answer: A::B::C

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24. θ_1 and θ_2 are the inclination of lines L_1 and L_2 with the x-axis. If L_1 and L_2 pass through $P(x,y)$, then the equation of one of the angle bisector of these lines is

A. $\dfrac{x-x_1}{\cos\left(\frac{\theta_1+\theta_2}{2}\right)}=\dfrac{y-y_1}{\sin\left(\frac{\theta_1+\theta_2}{2}\right)}$

B. $\dfrac{x-x_1}{-\sin\left(\frac{\theta_1-\theta_2}{2}\right)}=\dfrac{y-y_1}{\cos\left(\frac{\theta_1-\theta_2}{2}\right)}$

C. $\dfrac{x-x_1}{\sin\left(\frac{\theta_1+\theta_2}{2}\right)}=\dfrac{y-y_1}{\cos\left(\frac{\theta_1+\theta_2}{2}\right)}$

D. $\dfrac{x-x_1}{-\sin\left(\frac{\theta_1+\theta_2}{2}\right)}=\dfrac{y-y_1}{\cos\left(\frac{\theta_1+\theta_2}{2}\right)}$

Answer: A::D

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25. Consider the lines $L_1 \equiv 3x - 4y + 2 = 0$ and $L_2 \equiv 3y - 4x - 5 = 0$. Now, choose the correct statement(s).

A. The line x+y=0 bisects the acute angle between L_1 and L_2 containing the origin.

B. The line x-y+1=0 bisects the obtuse angle between L_1 and L_2 not containing the origin.

C. The line x+y+3=0 bisects the obtuse angle between L_1 and L_2 containing the origin.

D. The line x-y+1=0 bisects the acute angle between L_1 and L_2 not containing the origin.

Answer: A::B

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26. The sides of a rhombus are parallel to the lines $x+y-1=0$ and $7x-y-5=0$. It is given that the diagonals of the rhombus intersect at (1, 3) and one vertex, A of the rhombus lies on the line $y=2x$. Then the coordinates of vertex A are $\left(\frac{8}{5}, \frac{16}{5}\right)$ (b) $\left(\frac{7}{15}, \frac{14}{15}\right)$ $\left(\frac{6}{5}, \frac{12}{5}\right)$ (d) $\left(\frac{4}{15}, \frac{8}{15}\right)$

A. (8/5, 16/5)

B. (7/15, 14/15)

C. (6/5,12/5)

D. (4/15, 8/15)

Answer: A::C

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27. Two straight lines $u = 0 and v = 0$ pass through the origin and the angle between them is $\tan^{-1}\left(\frac{7}{9}\right)$. If the ratio of the slope of $v = 0$ and $u = 0$ is $\frac{9}{2}$, then their equations are $y + 3x = 0 and 3y + 2x = 0$ $2y + 3x = 0 and 3y + 2x = 0$ $2y = 3x and 3y = x$ $y = 3x and 3y = 2x$

A. y+3x=0 and 3y+2x=0

B. 2y+3x=0 and 3y+x=0

C. 2y=3x and 3y=0

D. y=3x and 3y=2x

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

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28. Let $u \equiv ax + by + ab3 = 0, v \equiv bx - ay + ba3 = 0, a, b \in R,$ be two straight lines. The equations of the bisectors of the angle formed by $k_1 u - k_2 v = 0$ and $k_1 u + k_2 v = 0$, for nonzero and real k_1 and k_2 are $u = 0$ (b) $k_2 u + k_1 v = 0$ $k_2 u - k_1 v = 0$ (d) $v = 0$

A. u=0

B. $k_2u + k_1v = 0$

C. $k_2u - k_1v = 0$

D. v=0

Answer: A::D

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29. Two sides of a triangle are parallel to the coordinate axes. If the slopes of the medians through the acute angles of the triangle are 2 and m, the $m = \frac{1}{2}$ (b) 2 (c) 4 (d) 8

A. $1/2$

B. 2

C. 4

D. 8

Answer: A::D

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30. A line which makes an acute angle θ with the positive direction of the x-axis is drawn through the point $P(3, 4)$ to meet the line $x = 6$ at R and $y = 8$ at S. Then, $PR = 3\sec\theta$ $PS = 4\cos ec\theta$ $PR = + PS = \left(2\frac{3\sin\theta + 4\cos\theta \square}{\sin 2\theta}\right.$ $\frac{9}{(PR)^2} + \frac{16}{(PS)^2} = 1$

A. $PR = 3\sec\theta$

B. $PS = 4 \ \ \operatorname{cosec}\theta$

C. $PR + PS = \dfrac{2(3\sin\theta + 4\cos\theta)}{\sin 2\theta}$

D. $\dfrac{9}{(PR)^2} + \dfrac{16}{(PS)^2} = 1$

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

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Exercise Comprehension

1. Let l be the line belonging to the family of straight lines $(a+2b)x+(a-3b)y+a-8b=0, a, b \in R,$ which is farthest from the point $(2, 2)$, then area enclosed by the line L and the coordinate axes is

A. x+4y+7=0

B. 2x+3y+4=0

C. 4x-y-6=0

D. none of these

Answer: A

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2. Let l be the line belonging to the family of straight lines $(a+2b)x+(a-3b)y+a-8b=0, a, b \in R,$ which is farthest from the point $(2, 2)$, then area enclosed by the line L and the coordinate axes is

A. 4/3 sq. units

B. 9/2 sq. units

C. 49/8 sq. units

D. none of these

Answer: C

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3. Let L be the line belonging to the family of straight lines (a+2b) x+(a-3b)y+a-8b =0, a, b $\in$ R, which is the farthest from the point (2, 2). If L is concurrent with the lines x-2y+1=0 and $3x-4y+\lambda=0$, then the value of λ is

A. 2

B. 1

C. -4

D. 5

Answer: D

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4. The equation of an altitude of an equilateral triangle is $\sqrt{3}x + y = 2\sqrt{3}$ and one of its vertices is $(3, \sqrt{3})$ then the possible number of triangles is

A. 1

B. 2

C. 3

D. 4

Answer: B

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5. The equation of an altitude of an equilateral triangle is $\sqrt{3}x + y = 2\sqrt{3}$ and one of its vertices is $(3, \sqrt{3})$ then the possible number of triangles is

A. 0,0

B. $0, 2\sqrt{3}$

C. $3, \ -\sqrt{3}$

D. none of these

Answer: D

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6. The equation of an altitude of an equilateral triangle is $\sqrt{3}x + y = 2\sqrt{3}$ and one of its vertices is $(3, \sqrt{3})$ then the possible number of triangles is

A. $1, \sqrt{3}$

B. $0, \sqrt{3}$

C. 0, 2

D. none of these

Answer: A

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7. a variable line L is drawn trough $O(0, 0)$ to meet the lines $L_1: y - x - 10 = 0$ and $L_2: y - x - 20 = 0$ at point $A \& B$ respectively .A point P is taken on line L the (1) if $\frac{2}{OP} = \frac{1}{OA} + \frac{1}{OB}$ then locus of P is (2) if $(OP)^2 = (OA) \cdot (OB)$ then locus of P is (3) if $\frac{1}{(OP)^2} = \frac{1}{(OA)^2} + \frac{1}{(OB)^2}$ then locus of point P is:

A. 3x+3y=40

B. 3x+3y+40 =0

C. 3x-3y=40

D. 3y-3x=40

Answer: D

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8. A variable line L is drawn through O(0,0) to meet the line L_1 and L_2 given by y-x-10 =0 and y-x-20=0 at Points A and B, respectively. Locus of P, if $OP^2 = OA \times OB$, is

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

B. $(y+x)^2 = 50$

C. $(y-x)^2 = 200$

D. none of these

Answer: C

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9. a variable line L is drawn trough $O(0, 0)$ to meet the lines $L_1 : y - x - 10 = 0$ and $L_2 : y - x - 20 = 0$ at point $A \& B$ respectively .A point P is taken on line L the (1) if $\frac{2}{OP} = \frac{1}{OA} + \frac{1}{OB}$ then locus of P is (2) if $(OP)^2 = (OA) \cdot (OB)$ then locus of P is (3) if $\frac{1}{(OP)^2} = \frac{1}{(OA)^2} + \frac{1}{(OB)^2}$ then locus of point P is:

A. $(y - x)^2 = 80$

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

C. $(y - x)^2 = 64$

D. none of these

Answer: A

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10. The line 6x+8y=48 intersects the coordinates axes at A and B, respecively. A line L bisects the area and the perimeter of triangle OAB, where O is the origin.

The number of such lines possible is

A. 1

B. 2

C. 3

D. more than 3

Answer: A

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11. The line 6x+8y=48 intersects the coordinates axes at A and B, respecively. A line L bisects the area and the perimeter of triangle OAB, where O is the origin.

The slope of line L can be

A. $(10 + 5\sqrt{6}) / 10$

B. $(10 - 5\sqrt{6}) / 10$

C. $\left(8+3\sqrt{6}\right)/10$

D. none of these

Answer: B

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12. The line 6x+8y=48 intersects the coordinates axes at A and B, respecively. A line L bisects the area and the perimeter of triangle OAB, where O is the origin.

Line L

A. does not intersect AB

B. does not intersect OB

C. does not intersect OA

D. can intersect all the sides

Answer: C

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13. $A(1, 3)$ and $c\left(-\frac{2}{5}, -\frac{2}{5}\right)$ are the vertices of a ΔABC and the equation of the angle bisector of $\angle ABC$ is $x + y = 2$.

A. 7x+3y-4=0

B. 7x+3y+4=0

C. 7x-3y+4=0

D. 7x-3y-4=0

Answer: B

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14. $A(1, 3)$ and $c\left(-\frac{2}{5}, -\frac{2}{5}\right)$ are the vertices of a ΔABC and the equation of the angle bisector of $\angle ABC$ is $x + y = 2$.

A. (3/10, 17/10)

B. (17/10, 3/10)

C. (-5/2, 9/2)

D. (1,1)

Answer: C

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15. $A(1, 3)$ and $c\left(-\frac{2}{5}, -\frac{2}{5}\right)$ are the vertices of a ΔABC and the equation of the angle bisector of $\angle ABC$ is $x + y = 2$.

A. 3x+7y=24

B. 3x+7y+24=0

C. 13x+7y+8=0

D. 13x-7y+8=0

Answer: A

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16. Let ABCD be a parallelogram the equation of whose diagonals are $AC: x + 2y = 3$; BD: 2x + y = 3. If length of diagonal $AC = 4$ units and area of $ABCD = 8$ sq. units. (i) The length of the other diagonal is (ii) the length of side AB is equal to

A. $10/3$

B. 2

C. $20/3$

D. none of these

Answer: C

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17. Let ABCD be a parallelogram whose equations for the diagonals AC and BD are x+2y=3 and 2x+y=3, respectively.

The length of side AB is equal to

A. $2\sqrt{58}/3$

B. $4\sqrt{58}/9$

C. $3\sqrt{58}/9$

D. $4\sqrt{58}/9$

Answer: A

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18. Let ABCD be a parallelogram the equation of whose diagonals are $AC: x+2y=3$; BD: 2x + y = 3. If length of diagonal $AC=4$ units and area of $ABCD=8$ sq. units. (i) The length of the other diagonal is (ii) the length of side AB is equal to

A. $2\sqrt{10}/3$

B. $4\sqrt{10}/3$

C. $8\sqrt{10}/3$

D. none of these

Answer: A

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19. Consider a triangle PQR with coordinates of its vertices as P(-8,5), Q(-15, -19), and R (1, -7). The bisector of the interior angle of P has the equation which can be written in the form ax+2y+c=0.

The distance between the orthocenter and the circumcenter of triangle PQR is

A. $25/2$

B. $29/2$

C. $37/2$

D. $51/2$

Answer: A

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20. Consider a triangle PQR with coordinates of its vertices as $P(-8, 5), Q(-15, -19)$, and $R(1, -7)$. The bisector of the interior angle of P has the equation which can be written in the form $ax + 2y + c = 0$.

The radius of the in circle of triangle PQR is

A. 4

B. 5

C. 6

D. 8

Answer: B

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21. Consider a triangle PQR with coordinates of its vertices as P(-8,5), Q(-15, -19), and R (1, -7). The bisector of the interior angle of P has the equation which can be written in the form ax+2y+c=0.

The radius of the in circle of triangle PQR is

The sum a + c is

A. 129

B. 78

C. 89

D. none of these

Answer: C

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22. The base of an isosceles triangle measures 4 units base angle is equal to 45°. A straight line cuts the extension of the base at a point M at the angle θ and bisects the lateral side of the triangle which is nearest to M. The area of quadrilateral which the straight line cuts off from the given triangle is

A. $\dfrac{3+\tan\theta}{1+\tan\theta}$

B. $\dfrac{3+5\tan\theta}{1+\tan\theta}$

C. $\dfrac{3+\tan\theta}{1-\tan\theta}$

D. $\dfrac{3+2\tan\theta}{1+\tan\theta}$

Answer: B

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23. The base of an isosceles triangle measures 4 units base angle is equal to 45°. A straight line cuts the extension of the base at a point M at the angle θ and bisects the lateral side of the triangle which is nearest to M. The possible range of values in which area of quadrilateral which straight line cuts off from the given triangle lie in

A. $\left(\dfrac{5}{2}, \dfrac{7}{2}\right)$

B. (4,3)

C. (4,5)

D. (3,4)

Answer: D

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24. The base of an isosceles triangle measures 4 units base angle is equal to 45°. A straight line cuts the extension of the base at a point M at the angle θ and bisects the lateral side of the triangle which is nearest to M. The length of portion of straight line inside the triangle may lie in the range

A. (2,4)

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

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

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

Answer: C

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25. Consider point A(6, 30), point B(24, 6) and line AB: 4x+3y = 114.

Point $P(0, \lambda)$ is a point on y-axis such that $0 < \lambda < 38$ and point $Q(0, \lambda)$ is a point on y-axis such that $\lambda > 38$.

For all positions of pont P, angle APB is maximum when point P is

A. (0, 12)

B. (0, 15)

C. (0, 18)

D. (0, 21)

Answer: C

View Text Solution

26. Consider point A(6, 30), point B(24, 6) and line AB: 4x+3y = 114.

Point $P(0, \lambda)$ is a point on y-axis such that $0 < \lambda < 38$ and point $Q(0, \lambda)$ is a point on y-axis such that $\lambda > 38$.

The maximum value of angle APB is

A. $\frac{\pi}{3}$

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

C. $\frac{2\pi}{3}$

D. $\frac{3\pi}{3}$

Answer: B

View Text Solution

27. Consider point A(6, 30), point B(24, 6) and line AB: 4x+3y = 114.

Point $P(0, \lambda)$ is a point on y-axis such that $0 < \lambda < 38$ and point $Q(0, \lambda)$ is a point on y-axis such that $\lambda > 38$.

For all positions of pont Q, and AQB is maximum when point Q is

A. (0, 54)

B. (0, 58)

C. (0, 60)

D. (0, 1)

Answer: B

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Exercise Matrix

1. Consider the lines represented by equation $(x^2 + xy - x) \times (x - y) = 0$ forming a triangle. Then match the following lists:

List I	List II
a. Orthocenter of triangle	**p.** $(1/6, 1/2)$
b. Circumcenter	**q.** $(1/(2+2\sqrt{2}), 1/2)$
c. Centroid	**r.** $(0, 1/2)$
d. Incenter	**s.** $(1/2, 1/2)$

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2. Consider the triangle formed by the lines

y+3x+2=0, 3y-2x-5=0, 4y+x-14=0

Match the following lists:

Match the following lists:

List I	List II
a. Values of α if $(0, \alpha)$ lies inside the triangle	**p.** $(-\infty, 7/3) \cup (13/4, \infty)$
b. Values of α if $(\alpha, 0)$ lies inside the triangle	**q.** $-4/3 < \alpha < 1/2$
c. Values of α if $(\alpha, 2)$ lies inside the triangle	**r.** No value of α
d. Value of α if $(1, \alpha)$ lies outside the triangle	**s.** $5/3 < \alpha < 7/2$

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3. Match the following lists:

List I	List II
a. A straight line with negative slope passing through (1, 4) meets the coordinate axes at A and B. The minimum length of $OA + OB$, O being the origin, is	**p.** $5\sqrt{2}$
b. If the point P is symmetric to the point $Q(4, -1)$ with respect to the bisector of the first quadrant, then the length of PQ is	**q.** $3\sqrt{2}$
c. On the portion of the straight line $x + y = 2$ between the axis a square is constructed away from the origin, with this portion as one of its sides. If d denotes the perpendicular distance of a side of this square from the origin then the maximum value of d is	**r.** 9/2
d. If the parametric equation of a line is given by $x = 4 + \lambda/\sqrt{2}$ and $y = -1 + \sqrt{2}\lambda$, where λ is a parameter, then the intercept made by the line on the x-axis is	**s.** 9

Match the following lists:

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4. Match the following lists:

List I	List II
a. If lines $3x + y - 4 = 0$, $x - 2y - 6 = 0$, and $\lambda x + 4y + \lambda^2 = 0$ are concurrent, then the value of λ is	**p.** -4
b. If the points $(\lambda + 1, 1)$, $(2\lambda + 1, 3)$, and $(2\lambda + 2, 2\lambda)$ are collinear, then the value of λ is	**q.** $-1/2$
c. If the line $x + y - 1 - \lvert \lambda/2 \rvert = 0$, passing through the intersection of $x - y + 1 = 0$ and $3x + y - 5 = 0$, is perpendicular to one of them, then the value of λ is	**r.** 4
d. If the line $y - x - 1 + \lambda = 0$ is equidistant from the points $(1, -2)$ and $(3, 4)$, then λ is	**s.** 2

5. Match the followi g lists:

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5. Match the following lists:

List I	List II
a. Four lines $x + 3y - 10 = 0$, $x + 3y - 20 = 0$, $3x - y + 5 = 0$, and $3x - y - 5 = 0$ form a figure which is	**p.** a quadrilateral which is neither a parallelogram nor a trapezium
b. The points $A(1, 2)$, $B(2, -3)$, $C(-1, -5)$, and $D(-2, 4)$ in order are the vertices of	**q.** a parallelogram
c. The lines $7x + 3y - 33 = 0$, $3x - 7y + 19 = 0$, $3x - 7y - 10$, and $7x + 3y - 4 = 0$ form a figure which is	**r.** a rectangle of area 10 sq. units
d. Four lines $4y - 3x - 7 = 0$, $3y - 4x + 7 = 0$, $4y - 3x - 21 = 0$, $3y - 4x + 14 = 0$ form a figure which is	**s.** a square

6. Match the following lists:

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6. Match the following lists:

List I	List II
a. The lines $y = 0$; $y = 1$; $x - 6y + 4 = 0$, and $x + 6y - 9 = 0$ constitute a figure which is	**p.** a cyclic quadrilateral
b. The points $A(a, 0)$, $B(0, b)$, $C(c, 0)$, and $D(0, d)$ are such that $ac = bd$ and a, b, c, d are all positive. The points A, B, C, and D always constitute	**q.** a rhombus
c. The figure formed by the four lines $ax \pm by \pm c = 0$, $a \neq b$, is	**r.** a square
d. The line pairs $x^2 - 8x + 12 = 0$ and $y^2 - 14y + 45 = 0$ constitue a figure which is	**s.** a trapezium

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7. Consider the lines given by

$L_1 : x + 3y - 5 = 0$

$L_2 : 3x - ky - 1 = 0$

$L_3 : 5x + 2y - 12 = 0$

Match the following lists.

List I	List II
a. L_1, L_2, L_3 are concurrent if	**p.** $k = -9$
b. One of L_1, L_2, L_3 is parallel to at least one of the other two if	**q.** $k = -6/5$
c. L_1, L_2, L_3 form a triangle if	**r.** $k = 5/6$
d. L_1, L_2, L_3 do not form a triangle if	**s.** $k = 5$

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8. Consider a ΔABC in which sides AB and AC are perpendicular to x-y-4=0 and 2x-y-5=0, repectively. Vertex A is (-2, 3) and the circumcenter of ΔABC is (3/2, 5/2).

The equation of the line in List I is of the form ax+by+c=0, where

$a, b, c \in I$. Match it with the corresponding value of c in list II and then choose the correct code.

List I	List II
a. Equation of the perpendicular bisector of side AB	**p.** -1
b. Equation of the perpendicular bisector of side AC.	**q.** 1
c. Equation of side AC	**r.** -16
d. Equation of the median through A	**s.** -4

Codes :

a	b	c	d
r	s	p	q
s	r	q	p
q	p	s	r
r	p	s	q

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Exercise Numerical

1. A straight line l with negative slope passes through (8,2) and cuts the coordinate axes at P and Q. Find absolute minimum value of "OP+OQ where O is the origin-

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2. The number of values of k for which the lines $(k+1)x + 8y = 4kandkx + (k+3)y = 3k - 1$ are coincident is ________

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3. The sides of a triangle ABC lie on the lines $3x + 4y = 0, 4x + 3y = 0$ and $x = 3$. Let (h, k) be the centre of the circle inscribed in $\triangle ABC$. The value of $(h + k)$ equals

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4. The absolute value of the sum of the abscissas of all the points on the line $x + y = 4$ that lie at a unit distance from the line $4x + 3y - 10 = 0$ is________

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5. Two sides of a rectangle are 3x+4y+5=0, 4x-3y+15=0 and one of its vertices is (0, 0). The area of rectangle is ___.

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6. The line $x = c$ cuts the triangle with corners $(0, 0)$, $(1, 1)$ and $(9, 1)$ into two region. two regions to be the same c must be equal to (A) $\frac{5}{2}$ (B) 3 (C) $\frac{7}{2}$ (D) 5 or 15

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7. For all real values of a and b lines $(2a + b)x + (a + 3b)y + (b - 3a) = 0$and $mx + 2y + 6 = 0$are concurrent, then m is equal to (A) -2 (B) -3(C)-4 (D) -5

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8. The line $3x + 2y = 24$ meets the y-axis at A and the x-axis at B. The perpendicular bisector of AB meets the line through $(0, -1)$ parallel to the x-axis at C. If the area of triangle ABC is A , then the value of $\frac{A}{13}$ is_______

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9. Consider a ΔABC whose sides AB, BC and CA are represented by the straight lines $2x + y = 0, x + py = q$ and $x - y = 3$ respectively. The point P is $(2, 3)$. If P is orthocentre,then find the value of (p+q) is

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10. Triangle ABC with $AB = 13, BC = 5,$ and $AC = 12$ slides on the coordinates axes with $AandB$ on the positive x-axis and positive y-axis respectively. The locus of vertex C is a line $12x - ky = 0.$ Then the value of k is__________

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11. The line $y = \frac{3x}{4}$ meets the lines $x - y = 0$ and $2x - y = 0$ at points $AandB$, respectively. If P on the line $y = \frac{3x}{4}$ satisfies the condition $PA\dot{P}B = 25,$ then the number of possible coordinates of P is____

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12. In a plane there are two families of lines $y = x + r, y = \ -x + r,$ where $r \in \{0, 1, 2, 3, 4\}$. The number of squares of diagonals of length 2 formed by the lines is:

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13. If $5a + 5b + 20c = t,$ then find the value of t for which the line $ax + by + c - 1 = 0$ always passes through a fixed point.

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1. The line L given by $\frac{x}{5}+\frac{y}{b}=1$ passes through the point (13,32).the line K is parallel to L and has the equation $\frac{x}{c}+\frac{y}{3}=1$ then the distance between L and K is

A. $\frac{23}{\sqrt{17}}$

B. $\frac{23}{\sqrt{15}}$

C. $\sqrt{17}$

D. $\frac{17}{\sqrt{15}}$

Answer: A

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2. The lines $L_1 : y-x=0$ and $L_2 : 2x+y=0$ intersect the line $L_3 : y+2=0$ at P and Q, respectively. The bisector of the acute angle between L_1 and L_2 intersects L_3 at R.

Statement 1 : The ratio PR : RQ equals $2\sqrt{2}: \sqrt{5}$.

Statement 2: In any triangle, bisector of an angle divides the triangle into two similar triangles.1

A. Statement 1 is true, statement 2 is false.

B. Statement 1 is true, statement 2 is true, statement 2 is the correct explanation of statement1.

C. Statement 1 is true, statement 2 is true, statement 2 is not the correct explanation of statement 1.

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

Answer: A

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3. A line is drawn through the point (1, 2) to meet the coordinate axes at P and Q such that it forms a triangle OPQ, where O is the origin. If the area of the triangle OPQ is least, then the slope of the line PQ is

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

B. -4

C. -2

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

Answer: C

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4. 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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5. A ray of light along $x + \sqrt{3}y = \sqrt{3}$ gets reflected upon reaching x-axis, the equation of the reflected ray is

A. $y = x + \sqrt{3}$

B. $\sqrt{3}y = x - \sqrt{3}$

C. $y = \sqrt{3}x - \sqrt{3}$

D. $\sqrt{3}y = x - 1$

Answer: B

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6. Let a,b, c and d be non-zero numbers. If the point of intersection of the lines $4ax + 2ay + c = 0$ and $5bx + 2by + d = 0$ lies in the fourth quadrant and is equidistant from the two axes, then

A. 2bc-3ad = 0

B. 2bc+3ad=0

C. 3bc-2ad=0

D. 3bc+2ad=0

Answer: C

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7. Let PS be the median of the triangle with vertices $P(2, 2), Q(6, -1) and R(7, 3)$. The equation of the line passing through $(1, -1)$ and parallel to PS is (1) $4x-7y-11=0$ (2) $2x+9y+7=0$ (3) $4x+7y+3=0$ (4) $2x-9y-11=0$

A. 4x-7y-1=0

B. 2x+9y+7=0

C. 4x+7y+3=0

D. 2x-9y-11=0

Answer: B

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8. Locus of the image of the point (2, 3) in the line $(2x-3y+4)+k(x-2y+3)=0, k\varepsilon R$, is a : (1) straight line parallel to x-axis. (2) straight line parallel to y-axis (3) circle of radius $\sqrt{2}$ (4) circle of radius $\sqrt{3}$

A. Straight line parallel to x-axis

B. straight line parallel to y-axis

C. circle of radius $\sqrt{2}$

D. circle of radius 3

Answer: C

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9. Two sides of a rhombus are along the lines,$x - y + 1 = 0$ and $7x - y - 5 = 0$. If its diagonals intersect at $(-1, -2)$, then which one of the following is a vertex of this rhombus ? (1) $(-3, -9)$ (2) $(-3, -8)$ (3) $\left(\frac{1}{3}, -\frac{8}{3}\right)$ (4) $\left(-\frac{10}{3}, -\frac{7}{3}\right)$

A. (-3, -8)

B. $\left(\frac{1}{3}, -\frac{8}{3}\right)$

C. $\left(\left(-\frac{10}{3}, -\frac{7}{3}\right)\right.$

D. (-3, -9)

Answer: B

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Jee Advanced Previous Year

1. The locus of the orthocentre of the triangle formed by the lines $(1+p)x - py + p(1+p) = 0, (1+q)x - qy + q(1+q) = 0$ and y = 0, where $p \neq \cdot q$, is (A) a hyperbola (B) a parabola (C) an ellipse (D) a straight line

A. a hyperbola

B. a parabola

C. an ellipse

D. a straight line

Answer: D

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2. A straight line L through the point (3,-2) is inclined at an angle 60° to the line $\sqrt{3}x + y = 1$ If L also intersects the x-axis then the equation of L is

A. $y + \sqrt{3}x + 2 - 3\sqrt{3} = 0$

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

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

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

Answer: B

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3. For $a>b>c>0$, if the distance between $(1,1)$ and the point of intersection of the line $ax+by-c=0$ and $bx+ay+c=0$ is less than $2\sqrt{2}$ then, (A) $a+b-c>0$ (B) $a-b+c<0$ (C) $a-b+c>0$ (D) $a+b-c<0$

A. $a+b-c>0$

B. $a-b+c<0$

C. $a-b+c>0$

D. $a+b-c<0$

Answer: A

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4. For a point P in the plane, let $d_1(P) and d_2(P)$ be the distances of the point P from the lines $x - y = 0 and x + y = 0$ respectively. The area of the region R consisting of all points P lying in the first quadrant of the plane and satisfying $2 \leq d_1(P) + d_2(P) \leq 4,$ is

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Single Correct Answer Type

1. In the xy-plane, how many straight lines whose x-intercept is a prime number and whose y-intercept is a positive integer pass through the point $(4, 3)$?

A. 1

B. 2

C. 3

D. 4

Answer: B

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2. The condition that the equation $lx+my+n=0$ represents the equatio of a straight line in the normal form is

A. $l^2+m^2\pm0, n>0$

B. $l^2+m^2\pm0, n<0$

C. $l^2+m^2=1, n<0$

D. $l^2+m^2=1, n>0$

Answer: C

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3. In an isosceles triangle ABC, the coordinates of the points $B$and C on the base BC are respectively $(1, 2)$ and $(2. 1)$. If the equation of the line AB is $y = 2x,$ then the equation of the line AC is

A. $y = \frac{1}{2}(x - 1)$

B. $y = \frac{x}{2}$

C. $y = x - 1$

D. $2y = x + 3$

Answer: B

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4. If the coordinates of the points A, B, C be $(-1, 5), (0, 0)$ and $(2, 2)$ respectively, and D be the middle point of BC, then the equation of the perpendicular drawn from B to the line AD is

A. $x + 2y = 0$

B. $2x + y = 0$

C. $x - 2y = 0$

D. $2x - y = 0$

Answer: C

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5. Two lines are drawn through (3,4), each of which makes angle of 45° with the line $x - y = 2$. Then area of the triangle formed by these lines is

A. 9

B. $9/2$

C. 2

D. $2/9$

Answer: B

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6. The line $y = 2x + 4$ is shifted 2 units along $+y$ axis, keeping parallel to itself and then 1 unit along $+x$ axis direction in the same manner, then equation of the line in its new position is,

A. $y = 2x + 6$

B. $y = 2x + 5$

C. $y = 2x + 4$

D. none of these

Answer: C

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7. A ray of light passing through the point A(2, 3) reflected at a point B on line $x + y = 0$ and then passes through (5, 3). Then the coordinates of B are

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

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

C. $\left(\frac{1}{13}, -\frac{1}{13}\right)$

D. none of these

Answer: C

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8. If the transversal $y = m_r x : r = 1, 2, 3$ cut off equal intercepts on the transversal $x + y = 1$ then $1 + m_1, 1 + m_2, 1 + m_3$ are in

A. A.P.

B. G.P.

C. H.P.

D. None of these

Answer: C

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9. The straight line $y = x - 2$ rotates about a point where it cuts x-axis and become perpendicular on the straight line $ax + by + c = 0$ then its equation is

A. $ax + by + 20 = 0$

B. $ax - by - 2a = 0$

C. $bx + ay - 2b = 0$

D. $ay - bx + 2b = 0$

Answer: D

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10. The two adjacent sides of parallelogram are y = 0 and $y = \sqrt{3}(x - 1)$. If equation of one diagonal is $\sqrt{3}y = (x + 1)$, then equation of other diagonal is

A. $\sqrt{3}y = (x - 1)$

B. $y = \sqrt{3}(x + 1)$

C. $y = -\sqrt{3}(x - 1)$

D. $\sqrt{3}y = -(x + 1)$

Answer: C

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11. A(3,0) and B(6,0) are two fixed points and U(x_1, y_1) is a variable point of the plane .AU and BU meets the y axis at C and D respectively and AD meets OU at V. Then for any position of U in the plane CV passes through fixed point (p,q) whose distance from origin is____units

A. 1units

B. 2 units

C. 3 units

D. 4 units

Answer: B

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12. If h denotes the A.M. and k denote G.M. of t e intercept made on axes by the lines passing through $(1, 1)$ then (h, k) lies on

A. $y^2 = 2x$

B. $y^2 = 4x$

C. $y = 2x$

D. $x + y = 2xy$

Answer: A

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13. Let $A(a, 0)$ and $B(b, 0)$ be fixed distinct points on the x-axis, none of which coincides with the $O(0, 0)$, and let C be a point on the y-axis. Let L be a line through the $O(0, 0)$ and perpendicular to the line AC. The locus of the point of intersection of the lines L and BC if C varies along is (provided $c^2 + ab \neq 0$)

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

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

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

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

Answer: C

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14. If AD,BE and CF are the altitudes of a triangle ABC whose vertex A is the point $(-4, 5)$. The coordinates of the points E and F are (4,1) and $(-1, -4)$ respectively, then equation of BC is

A. $3x - 4y - 28 = 0$

B. $4x + 3y - 28 = 0$

C. $3x - 4y + 28 = 0$

D. $x + 2y + 7 = 0$

Answer: A

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15. 92. Let P and Q be any two points on the lines represented by 2x-3y = 0 and 2x + 3y = 0 respectively. If the area of triangle OPQ (where O is origin) is 5, then which of the following is not the possible equation of the locus of mid-point of PO? (a) 4x2-9y2 +30 = 0 (b) 4x2-9y2-30 = 0 c) 9x2-4)/2-30=0 (d) none of these

A. $4x^2 - 9y^2 + 30 = 0$

B. $4x^2 - 9y^2 - 30 = 0$

C. $9x^2 - 4y^2 - 30 = 0$

D. none of these

Answer: C

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16. The acute angle between two straight lines passing through the point $M(-6, -8)$ and the points in which the line segment $2x + y + 10 = 0$ enclosed between the co-ordinate axes is divided in the ratio 1:2:2 in the direction from the point of its intersection with the x-axis to the point of intersection with the y-axis is: $\frac{\pi}{3}$ (b) $\frac{\pi}{4}$ (c) $\frac{\pi}{6}$ (d) $\frac{\pi}{12}$

A. $\pi/3$

B. $\pi/4$

C. $\pi/6$

D. $\pi/12$

Answer: B

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17. A variable line L is drawn through O(0, 0) to meet lines L1: 2x + 3y = 5 and L2: 2x + 3y = 10 at point P and Q, respectively. A point R is taken on L such that 2OP.OQ = OR.OP + OR.OQ. Locus of R is

A. $9x+6y=20$

B. $6x-9y=20$

C. $6x+9y=20$

D. none of these

Answer: C

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18. The complete set of values of the parameter α so that the point $P\left(\alpha, \left(1+\alpha^2\right)^{-1}\right)$ does not lie outside the triangle formed by the lines $L_1 : 15y = x+1$, $L_2 : 78y = 118-23x$ and $L_3 : y+2=0$ is

A. $(0, 5)$

B. $[2, 5]$

C. $[1, 5]$

D. $[0, 2]$

Answer: C

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19. if P, Q are two points on the line $3x + 4y + 15 = 0$ such that $OP = OQ = 9$ then the area of triangle OPQ is

A. 18 sq. units

B. $18\sqrt{2}$ sq. units

C. 27 sq. units

D. none of these

Answer: B

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20. The number of points on the line $3x + 4y = 5$, which are at a distance of $\sec^2\theta + 2\cos\sec^2\theta, \theta \in R$, from the point (1,3) is

A. 1

B. 2

C. 3

D. infinite

Answer: B

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21. ABC is an equilateral triangle whose centroid is origin and base BC is along the line $11x + 60y = 122$. Then

A. Area of the triangle is numerically equal to the perimeter

B. Area of triangle is numerically double the perimeter

C. Area of triangle is numerically three times the perimeter

D. Area of triangle is numerically half of the perimeter

Answer: A

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22. If the distance of a given point (α, β) from each of two straight lines $y = mx$ through the origin is d, then $(\alpha\gamma - \beta x)^2$ is equal to

A. $x^2 + y^2$

B. $d^2(x^2 + y^2)$

C. d^2

D. none of these

Answer: B

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23. The values of k for which lines $kx+2y+2=0, 2x+ky+3=0, 3x+3y+k=0$ are concurrent are

A. $\{2, 3, 5\}$

B. $\{2, 3, -5\}$

C. $\{3, -5\}$

D. $\{-5\}$

Answer: C

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24. The set of real values of k for which the lines $x+3y+1=0, kx+2y-2=0$ and $2x-y+3=0$ form a triangle is

A. $R-\left\{-4, \frac{2}{3}\right\}$

B. $R-\left\{-4, \frac{-6}{5}, \frac{2}{3}\right\}$

C. $R-\left\{\frac{-2}{3}, 4\right\}$

D. R

Answer: B

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25. Locus of the points which are at equal distance from $3x+4y-11=0$ and $12x+5y+2=0$ and which is near the origin is:

A. $21x-77y+153=0$

B. $99x+77y-133=0$

C. $7x-11y=19$

D. None of these

Answer: B

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26. Pair of lines through $(1, 1)$ and making equal angle with $3x - 4y = 1$ and $12x + 9y = 1$ intersect x-axis at P_1 and P_2 , then P_1, P_2 may be

A. $\left(\frac{8}{7}, 0\right)$ and $\left(\frac{9}{7}, 0\right)$

B. $\left(\frac{6}{7}, 0\right)$ and $(8, 0)$

C. $\left(\frac{8}{7}, 0\right)$ and $\left(\frac{1}{8}, 0\right)$

D. $(8, 0)$ and $\left(\frac{1}{8}, 0\right)$

Answer: B

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27. The algebraic sum of distances of the line $ax + by + 2 = 0$ from $(1, 2), (2, 1)$ and $(3, 5)$ is zero and the lines $bx - ay + 4 = 0$ and $3x + 4y + 5 = 0$ cut the coordinate axes at concyclic points. Then (a) $a + b = -\frac{2}{7}$ (b) area of triangle formed by the line $ax + by + 2 = 0$ with coordinate axes is $\frac{14}{5}$ (c) line $ax + by + 3 = 0$ always passes through the point $(-1, 1)$ (d) max $\{a, b\} = \frac{5}{7}$

A. $a+b=-\frac{2}{7}$

B. area of the triangle formed by the line $ax+by+2=0$ with coordinate axes is $\frac{14}{5}$

C. line $ax+by+3=0$ always passes through the point $(-1, 1)$

D. max $\{a, b\}=\frac{5}{7}$

Answer: C

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28. Equation of line which is equally inclined to the axis and passes through a common points of family of lines $4acx+y(ab+bc+ca-abc)+abc=0$ (where $a, b, c>0$ are in $H.P.$) is

A. $y-x=\frac{7}{4}$

B. $y-x=-\frac{7}{4}$

C. $y-x=\frac{1}{4}$

D. $y - x = -\frac{1}{4}$

Answer: A

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29. The base BC of a ABC is bisected at the point (p, q) & the equation to the side $AB \& AC$ are $px + qy = 1$ & $qx + py = 1$. The equation of the median through A is: $(p - 2q)x + (q - 2p)y + 1 = 0$ $(p + q)(x + y) - 2 = 0$ $(2pq - 1)(px + qy - 1) = (p^2 + q^2 - 1)(qx + py - 1)$ none of these

A. $qx - py = 0$

B. $\frac{x}{p} + \frac{y}{q} = 2$

C. $(2pq - 1)(px + qy - 1) = (p^2 + q^2 - 1)(qx + py - 1)$

D. $(p - 2q)x + (q - 2p)y = p^2 + r^2$

Answer: C

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30. $A(x_1, y_1), B(x_2, y_2), C(x_3, y_3)$ are three vertices of a triangle ABC. $lx + my + n = 0$ is an equation of the line L. If the centroid of the triangle ABC is at the origin and algebraic sum of the lengths of the perpendicular from O the vertices of triangle ABC on the line L is equal to, then sum of the squares of reciprocals of the intercepts made by L on the coordinate axes is equal to

A. 0

B. 4

C. 9

D. 16

Answer: C

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31. A straight line passes through the point of Intersection of the lines $x - 2y - 2 = 0$ and $2x - by - 6 = 0$ and the origin, then the set of values of 'b' for which the acute angle between this line and $y = 0$ is less than 45° is

A. $(-\infty, 4) \cup (7, \infty)$

B. $(-\infty, 5) \cup (7, \infty)$

C. $(-\infty, 4) \cup (5, 7) \cup (7, \infty)$

D. $(-\infty, 4) \cup (4, 5) \cup (7, \infty)$

Answer: D

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32. The locus of the foot of the perpendicular from the origin on each member of the family $(4a + 3)x - (a + 1)y - (2a + 1) = 0$

A. $(2x - 1)^2 + 4(y + 1)^2 = 5$

B. $(2x-1)^2+(y+1)^2=5$

C. $(2x+1)^2+4(y-1)^2=5$

D. $(2x-1)^2+4(y-1)^2=5$

Answer: C

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Comprehension Type

1. In a ΔABC, $A=(2,3)$ and medians through B and C have equations $x+y-1=0$ and $2y-1=0$

Equation of median through A is

A. $x+y=4$

B. $5x-3y=1$

C. $5x+3y=1$

D. $5x=3y$

Answer: B

View Text Solution

2. In a ΔABC, $A=(2,3)$ and medians through B and C have equations

$x+y-1=0$ and $2y-1=0$

Equation of side BC is

A. $5x+13y+11=0$

B. $5x-3y=1$

C. $5x=3y$

D. $5x+13y-11=0$

Answer: A

View Text Solution

3. Let A,B,C be angles of triangles with vertex $A \equiv (4, \ -1)$ and internal angular bisectors of angles B and C be $x - 1 = 0$ and $x - y - 1 = 0$ respectively.

Slope of BC is

A. $1/2$

B. 2

C. 3

D. 12

Answer: B

View Text Solution

Multiple Correct Answers Type

1. The point $P(\alpha, \alpha + 1)$ will lie inside the triangle whose vertices are $A(0, 3), B(-2, 0)$ and $C(6, 1)$ if

A. $\alpha = -1$

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

C. $\alpha = \frac{1}{2}$

D. $-\frac{6}{7} < \alpha < \frac{3}{2}$

Answer: B::C::D

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2. A straight line passing through the point $A(-2, -3)$ cuts lines $x + 3y = 9$ and $x + y + 1 = 0$ at B and C, respectively. If $AB. AC = 20$, then equation of the possible line is

A. $x - y = 1$

B. $x - y + 1 = 0$

C. $3x - y + 3 = 0$

D. $3x - y = 3$

Answer: A::C

View Text Solution

3. If $A(3, 4)$ and $B(-5, -2)$ are the extremities of the base of an isosceles triangle ABC with tan $C = 2$, then point C can be

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

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

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

D. $\left(-\frac{\left(3\sqrt{5}-5\right)}{2}, -(1-2\sqrt{5})\right)$

Answer: A::B

View Text Solution

4. If (a, b) be an end of a diagonal of a square and the other diagonal has the equation $x - y = a$, then another vertex of the square can be

A. $(a - b, a)$

B. $(a, 0)$

C. $(0, -a)$

D. $(a + b, b)$

Answer: B::D

Watch Video Solution

5. The equation 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 find the sides of the rectangle

A. $x = 1$

B. $x + y = 1$

C. $y = 9$

D. $x - 2y = 3$

Answer: A::C

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6. If $6a^2 - 3b^2 - c^2 + 7ab - ac + 4bc = 0$ then the family of lines $ax + by + c = 0, |a| + |b| \neq 0$ can be concurrent at concurrent (A) (-2,3) (B) (3,-1) (C) (2,3) (D) (-3,1)

A. $(-2, -3)$

B. $(3, -1)$

C. $(2, 3)$

D. $(-3, 1)$

Answer: A::B

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7. If graph of $xy = 1$ is reflected in $y = 2x$ to give the graph $12x^2 + rxy + sy^2 + t = 0$, then

A. $r = 7$

B. $s = -12$

C. $t = 25$

D. $r + s = -19$

Answer: B::C::D

View Text Solution

8. Let A,B,C be angles of triangles with vertex $A \equiv (4, -1)$ and internal angular bisectors of angles B and C be $x - 1 = 0$ and $x - y - 1 = 0$ respectively.

If A,B,C are angles of triangle at vertices A,B,C respectively then $\cot\left(\frac{B}{2}\right)\cot.\left(\frac{C}{2}\right) =$

A. 2

B. 3

C. 4

D. 6

Answer: D

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