MATHS

BOOKS - CENGAGE

STRAIGHT LINE

Examples

1. Find the equation of the line through $(2, 3)$ which is (i) parallel to the x-axis and (ii) parallel to the y-axis.

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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 $AB, BC, and CA$, respectively. If P lies inside the triangle and satisfies the condition $PL^2 = PM\dot{P}N,$ then find the locus of P.

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

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

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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, $a^2x + aby + 1 = 0, \forall a \in R$.

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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.

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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.

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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. $2x + 3y - 1 = 0$ $x + 2y - 3 = 0$ $5x - 6y - 1 = 0$

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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 perimeter.

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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 $3y = 4x$ and $y = 0$, 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 $3x - 4y = 0 and 12x - 5y = 0$. 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 lines $3x - 4y - 13 = 0, 8x - 11y - 33 = 0$ and $2x - 3y + \lambda = 0$ are concurrent.

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65. If the lines $a_1x + b_1y + 1 = 0,\ a_2x + b_2y + 1 = 0\ and\ a_3x + b_3y + 1 = 0$ 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 $x(a + 2b) + y(a + 3b) = a + b$ 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, where $a, bandc$ 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. 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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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 $(x + y - 1) + \lambda 1(2x + 3y - 2) = 0$and $(x - y + 2) + \lambda 2(2x - 3y + 5) = 0$ 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. Find the straight line passing through the point of intersection of lines 2x+3y+5=0 and 5x-2y-16=0 and through the point (-1,3) using the concept of family of lines.

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80. Find the normal to the curve $x = a(1 + \cos\theta), y = a\sin\theta a\mathrm{h}\eta$. Prove that it always passes through a fixed point and find that fixed 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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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 perpendicular from the origin to a straight line is at the point (3,-4). Then the equation of the line is

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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 points A and B. The equation of AB so that the triangle OAB is equilateral, where O is the origin.

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12. The equation of the straight line passing through the point (4, 3) and making intercepts on the coordinate 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 axis 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 $L\cdot$

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

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16. The point of intersection of the curves $y^2 = 4x$ and the line y = x is

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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. If $A(-6, -6)$ and $B(-6, 4)$ be two points that a point P on the line AB satisfies $AP = 2/9AB$. find the point P

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20. In the adjoining figure , ΔPQR is an equilateral triangle. QR = RN . Prove that $PN^2 = 3PR^2$

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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. Find the points on the line x + y = 1 that lie at a distance 3 units from the line 5x+12y = 3.

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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 q are the lengths of perpendiculars from the origin to the lines $x\cos\theta - y\sin\theta = k\cos 2\theta$ and $x\sec\theta + y\cos ec\theta = k$, respectively, prove that $p^2 + 4q^2 = k^2$.

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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

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5. Find the rectangular form of the complex numbers.

$$\left(\cos\frac{\pi}{6}+i\sin\frac{\pi}{6}\right)\left(\cos\frac{\pi}{12}+i\sin\frac{\pi}{12}\right)$$

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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?

$(i)(-3, -4) \text{ and } (1, 2)$ $(ii)(-1, -1) \text{ and } (3, 7)$

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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. $x - y \leq 2$

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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 $\left(\sqrt{3}x - y + 8 - 4\sqrt{3}\right)\left(-\sqrt{3}x - y + 12 + 4\sqrt{3}\right) = 0$ 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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Exercise 2.6

1. If $a and b$ 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 $\left(\left(\frac{x}{a}\right)\right)+\left(\frac{y}{b}\right)+\left(\frac{1}{c}\right)=0$ 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„ 4), (-2, y,) lie 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 of a straight line which passes through the point ($a\cos^3\theta, a\sin^3\theta$) and perpendicular to $x\sec\theta+y\cos ec\theta=a$

A. $x\cos\quad\theta - y\sin\theta = a\cos 2\theta$

B. $x\cos\quad\theta + y\sin\theta = a\cos 2\theta$

C. $x\sin\theta + y\cos\theta = a\cos 2\theta$

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. If P(a,b) is the mid point of a line segment between the axes, then:

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 $x\sqrt{3}+y+8=0$ $x\sqrt{3}-y=8$ $x\sqrt{3}-y=8$ (d) $x-\sqrt{3}y+8=0$

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. Find the equation of a line which passes through the point $(2, 3, 4)$ and which has equal intercepts on the axes.

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 and angle α $\left(0 < \alpha < \frac{\pi}{4}\right)$ with the positive direction of x-axis. The equation of its diagonal not passing through the origin is

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 is

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

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

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

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

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

A. y=2x

B. y=x+1

C. x+2y=5

D. y=3x-1

Answer: A

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14. 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.

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 locus of the centers of the circles $(x-1)^2+y^2=10 and x^2+(y-2)^2=5$ intersect is $\frac{\pi}{6}$ (b) $\frac{\pi}{4}$ (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 2x - y = 1 bisects angle between two lines. If equation of one line is y = x, then the equation of the other line is

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. If R is any point on the x-axis and Q is any point on they y-axis and P is a variable point on RQ with RP=b, PQ=a, then find the equation of locus of P.

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

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 (a) square (b) a circle (c) 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. From the differential equation of family of lines situated at a constant distance p from the origin.

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 intercepts on the line $x + y = 1.$ Then

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

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

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

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

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 a and b , 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)$a = b$ (b) $a + b = 0$

(c)$a = 2b$ (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. $\dfrac{a^2}{2|1+a|}$

Answer: D

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

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

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

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

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 (a) $\frac{c^2}{(ab)}$ (b) $\frac{sc^2}{(ab)}$ (c) $\frac{c^2}{2ab}$ (d) none of these

A. $c^2 / (ab)$

B. $sc^2 / (ab)$

C. $c^2 / 2ab$

D. none of these

Answer: D

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

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

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

D. $\frac{2}{25}$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) $\frac{15}{7} sq\dot{u}nits$ (b) $\frac{10}{7} sq\dot{u}nits$ (c) $\frac{18}{7} sq\dot{u}nits$ (d) none of these

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. If the intercepts made by the line $y = mx$ by lines $x = 2$ and $x = 5$ is less than 5, then the range of values of m is a. $\left(-\infty, -\frac{4}{3}\right) \cup \left(\frac{4}{3}, \infty\right)$ b. $\left(-\frac{4}{3}, \frac{4}{3}\right)$ c. $\left(-\frac{3}{4}, \frac{4}{3}\right)$ d. 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 (3,2) and $(\sin\theta, \cos\theta)$ lie on the same side of the line $x + y - 1 = 0$, is

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

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

C. $0 < \theta < \pi$

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

Answer: B

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

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 area enclosed by $2|x| + 3|y| \leq 6$ is 3 sq. units (b) 4 sq. units 12 sq. units (d) 24 sq. units

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 lie on line $y = x + \lambda$ (where λ is a variable). Then the locus of the orthocentre of triangle ABC is $(x-1)^2 + y^2 = 4$ $x + y = 3$ $2x - y = 0$ (d) none of these

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

$BandC$. 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 Q and R 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 (a)$\frac{2}{\sqrt{5}}$ (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 side 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 $b^2+c^2=b'^2+c'^2$ $c^2+a^2=c'^2+a'^2$ $a^2+b^2=a'^2+b'^2$ (d) none of these

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

B. $c^2 + a^2 = c'^2 + a'^2$

C. $a^2 + b^2 = a'^2 + b'^2$

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

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 (a)$5a^2 s\dot{q}units$ (b) $\frac{5a^2}{2} s\dot{q}units$ (c)$\frac{25a^2}{2} s\dot{q}units$ (d) none of these

A. $5a^2\text{sq. units}$

B. $5a^2/2\text{sq. units}$

C. $25a^2/2\text{sq. units}$

D. none of these

Answer: B

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52. $A \equiv (-4, 0), B \equiv (4, 0) \dot{M} and N$ are the variable points of the y-axis such that M lies below $N and MN = 4$. Lines $AM and BN$ intersect at P. The locus of P is a. $2xy - 16 - x^2 = 0$ b. $2xy + 16 - x^2 = 0$ c. $2xy + 16 + x^2 = 0$ d. $2xy - 16 + x^2 = 0$

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 (1) 8 sq. unit (2) 16 sq. unit (3) 32 sq. unit (4) 64 sq. unit

A. 8 sq. unit

B. 16 sq. unit

C. 32 sq. unit

D. 64 sq. unit

Answer: C

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55. Two $A(0, 0)$ and $B(x, y)$ with $x \in (0, 1)$ and $y > 0$. Let the slope of line AB be m_1 Point C lies on line $x = 1$ such that the slope of BC is equal to m_2, where `0

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 $landm$ 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. $\left(x^2 - y^2\right)^2 = x^2 + y^2$

B. $\left(x^2 - y^2\right)^2 = \left(x^2 - y^2\right)$

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

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

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. about to only mathematics

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 $A(2, 1)$ is translated parallel to the line $x - y = 3$ by a distance of 4 units. If the 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

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 $\frac{x}{2} + \frac{y}{3} = 2$ intercepted between the axes. Then the extremities of the other diagonal are: (a) $(5, 5), (-1, 1)$ (b) $(0, 0), (4, 6)$ (c) $(0, 0), (-1, 1)$ (d) $(5, 5), 4, 6)$

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 $x\cos\alpha+y\sin\alpha=p, p\in R^{+}$. If these lines and the line $x\sin\alpha-y\cos\alpha=0$ are concurrent, then (a)$a^2+b^2=1$ (b) $a^2+b^2=2$ (c)$2(a^2+b^2)=1$ (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)(a, b) (b) (b, a) (c)$(-a, -b)$ (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 $\frac{a}{\sqrt{bc}}-2=\sqrt{\frac{b}{c}}+\sqrt{\frac{c}{b}},$ 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 (a) $(1, 1)$ (b) $(1, -2)$ (c)$(-1, 2)$ (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

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

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 $\left(\frac{a^3}{(a-1)}\right), \left(\frac{(a^2-3)}{(a-1)}\right), \left(\frac{b^3}{b-1}\right), \left(\left(\frac{b^2-3}{(b-1)}\right),\right.$ and $\left(\frac{(c^2-3)}{(c-1)}\right)$, where a, b, c are different from 1, lie on the $lx+my+n=0$, then $a+b+c= -\frac{m}{l}$ $ab+bc+ca=\frac{n}{l}$ $abc=\frac{(m+n)}{l}$ $abc-(bc+ca+ab)+3(a+b+c)=0$

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 the ellipse $\frac{x^2}{4}+y^2=1$ meets the ellipse $x^2+\frac{y^2}{a^2}=1$ at four distinct points and $a=b^2-5b+7$, then b does not lie in (a)$[4, 5]$ (b) $(-\infty, 2)\cup(3, \infty)$ (c)$(-\infty, 0)$ (d) $[2, 3]$

A. (1,1)

B. (1,-1)

C. (2,-2)

D. (3,3)

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

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11. $\frac{d}{dx}\left[\tan^{-1}\left(\frac{\sqrt{x}(3-x)}{1-3x}\right)\right] = \frac{1}{2(1+x)\sqrt{x}}$ (b) $\frac{3}{(1+x)\sqrt{x}}$ $\frac{2}{(1+x)\sqrt{x}}$ (d) $\frac{3}{2(1+x)\sqrt{x}}$

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

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 $mandx_1$ are fixed and different lines are drawn for different values of y_1, then (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 $y = x_1$

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) (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)$x-\sqrt{3}y-5\sqrt{3}=0$

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 $x+y-1=0, (m-1)x+(m^2-7)y-5=0,$ 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 (a)$3x - y - 9$ (b) $5y + x = 10$ (c)$5y + x = \; - 10$ (d) $x - 4y = 10$

A. 12

B. -12

C. 10

D. -10

Answer: A::B

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21. If $x - 2y + 4 = 0and2x + y - 5 = 0$ are the sides of an isosceles triangle having area $10squnits$, 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. The number of values of a for which the lines $2x+y-1=0$, $ax+3y-3=0,$ and $3x+2y-2=0$ are concurrent is 0 (b) 1 (c) 2 (d) infinite

A. -3

B. -1

C. 1

D. 4

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

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23. Three lines px + qy+r=0, qx + ry+ p = 0 and rx + py + q = 0 are concurrent of

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. The equation of bisector of two lines L_1 and L_2 are 2x-16y-5=0 and 64x+8y+35=0. If the line L_1 passes through (-11,4), then identify the equation of acute angle bisector of L_1 and L_2.

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. The system of equations x +2y+3z=1, x-y+4z=0, 2x+y+7z=1 has

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 $k_1u - k_2v = 0$ and $k_1u + k_2v = 0$, for nonzero and real k_1 and k_2 are $u = 0$ (b) $k_2u + k_1v = 0$ $k_2u - k_1v = 0$ (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. about to only mathematics

A. $PR = 3\sec\theta$

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

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 the farthest from the point (2, 2).

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 perimeter of an equilateral triangle is 30 cm. The area is

A. 1

B. 2

C. 3

D. 4

Answer: B

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5. The perimeter of an equilateral triangle is 30 cm. The area 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 perimeter of an equilateral triangle is 30 cm. The area 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.

Slope of Line L 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. $\left(10+5\sqrt{6}\right)/10$

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

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.

Slope of Line L is

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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 $x + y = 2$.

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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 parallelogram whose equations for the diagonals AC and BD are x+2y=3 and 2x+y=3, respectively. If length of diagonal AC=4 units and area of parallologram ABCD=8 sq. units then

(i)the length of other diagonal BD is

(a) $\frac{10}{3}$ (b) $\frac{20}{3}$ (c) 2 (d) 5

(ii) length of side AB equals to

(a) $\frac{2\sqrt{58}}{3}$ (b) $\frac{2\sqrt{58}}{9}$ (c) $\frac{3\sqrt{58}}{9}$ (d) $\frac{4\sqrt{58}}{9}$

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

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21. Evaluate $\int_2^5 (x - [x])dx$, where [.] denotes the greatest integer function.

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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. $\frac{3 + \tan\theta}{1 + \tan\theta}$

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

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

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

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 length of portion of straight line inside the triangle may lie in the range

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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. $(\sqrt{2}, 2)$

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

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

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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

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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:

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. A straight line with negative slope passing the point (1, 4) meets the coordinate axes at A and B. The minimum value of OA + OB =

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4. 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

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5. The point $A(1, 2), B(2, -3), C(-1, -5)$ and $D(-2, 4)$ in order are the vertices of

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6. Differentiate $y = \sin(x^2 + 3)$.

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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. straight line L with negative slope passes through the point (9,4) cuts the positive coordinate axes at the point P and W As L. Varies, find the minimum value of |OP|+|OQ| , where O is 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_____

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8. The line $3x + 2y = 24$ meets the y-axis at A and the x-axis at $B \cdot$ The perpendicular bisector of AB meets the line through $(0, -1)$ parallel to the x-axis at $C \cdot$ 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 line $L_1 : y - x = 0$ 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. Statement-1 is true, Statement-2 is true ; Statement-2 is correct explanation for Statement-1 Statement-1 is true, Statement-2 is true ; Statement-2 is not a correct explanation for Statement-1 Statement-1 is true, Statement-2 is false Statement-1 is false, Statement-2 is true

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 where the midpoints of the sides are (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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1. about to only mathematics

A. a hyperbola

B. a parabola

C. an ellipse

D. a straight line

Answer: D

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2. about to only mathematics

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. about to only mathematics

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 $(4, 3)$?

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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

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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

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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

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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

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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,

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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

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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

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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. 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?

$(a) 4x^2 - 9y^2 + 30 = 0 (b) 4x^2 - 9y^2 - 30 = 0 (c) 9x^2 - 4y^2 - 30 = 0 (d)$ 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: (a) $\frac{\pi}{3}$ (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: (a) $(p - 2q)x + (q - 2p)y + 1 = 0$ (b) $(p + q)(x + y) - 2 = 0$ (c) $(2pq - 1)(px + qy - 1) = (p^2 + q^2 - 1)(qx + py - 1)$ (d)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 $\Delta ABC, A=(2,3)$ 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

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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

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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

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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

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

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

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

Answer: A::B

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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

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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 $8 squnits$ 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

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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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