MATHS

BOOKS - ARIHANT MATHS (HINGLISH)

THE STRAIGHT LINES

Examples

1. Find the inclination of the line whose slope is $-\frac{1}{\sqrt{3}}$

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2. Find the slope of the line through the points $(4, -6)(-2, -5)$

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3. Determine x so that 2 is the slope of the line through (2,5) and $(x, 3)$.

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4. Show that the line joining (2,-3) and (-5,1) is parallel to the line joining (7,-1) and (0,3).

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5. Find whether the points $(-a, -b), [-(s+1)a, -(s+1)b]$ and $[(t-1)a, (t-1)b]$ are collinear?

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

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7. Find the angle between the lines joining the point $(0, 0)$, $(2, 3)$ and the points $(2, -2)$, $(3, 5)$.

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8. If the angle between two lines is $\frac{\pi}{4}$ and slope of one of the lines is $\frac{1}{2}$, find the slope of the other line.

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9. Without using pythagoras theorem, show that the points $A(-1, 3)$, $B(0, 5)$ and $C(3, 1)$ are the vertices of a right angled triangle

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10. A line passes through the points $A(2, -3)$ and $B(6, 3)$. Find the slopes of the lines which are ,

(i) parallel to AB (ii) perpendicular to AB

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11. Show that the triangle which has one of the angles as 60° can not have all verticles with integral coordinates.

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12. Find the equation of the straight line parallel to Y - axis and at a distance (i) 3 units to the right (ii) 2 units to the left

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13. Write down the equation of a line parallel to the x-axis

(i) at a distance of 5 units above the x-axis.

(ii) at a distance of 4 units below the x-axis.

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14. Find the equation of the straight line which passes through the point $(2, -3)$ and is

(i) parallel to the X-axis ,

perpendicular to the X - axis

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15. Find the equation of a line which is equidistant from the lines $x = -\frac{7}{2}$ and $x = \frac{15}{2}$

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16. If the straight line y = $mx + c$ passes through the points (2,4) and $(-3, 6)$, find the values of m and c .

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17. What are the inclination to the X - axis and intercept on Y - axis of the line

$3y = \sqrt{3}x + 6?$

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18. The equation of line cutting of an intercept -3 from the y-axis and inclined at an angle $\tan^{-1}\left(\frac{3}{5}\right)$ to the x-axis is:

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19. Find the equation to the straight line cutting off an intercept of 5 units on negative direction of Y - axis and being equally inclined to the axes.

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20. Find the equation of the bisectors of the angles between the coordinate axes.

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21. Find the equation of a line which makes an angle of 135° with the x-axis and passes through the point (3,5).

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22. Find the equation of the straight line bisecting the segment joining the points $(5, 3)$ and $(4, 4)$ and making an angle of 45° with the positive direction of X-axis.

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

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24. Find the equation of the straight lines passing through the following pair of point: $(at_1, a/t_1)$ and $(at_2, a/t_2)$

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25. 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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26. The vertices of a triangle are $A(10, 4), B(-4, 9)$ and $C(-2, -1)$. Find the equation of the altitude through A.

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27. If A(-1, 6), B(-3, -9) and C(5, -8) are the vertices of a $\triangle ABC$, find the equations of its medians.

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28. In what ratio is the line joining the pints $(2, 3) and (4, -5)$ divided by the line passing through the points (6,8) and (-3,-2).

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29. Find the equation of the line through (2,3) so that the segment of the line intercepted between the axes is bisected at this point.

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30. Find the equation of the straight line passing through $(3, 4)$ and has intercepts on the axes (i) equal in magnitude but opposite in sign (ii) such that their sum is 14.

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31. Find the equation of the straight line through the point P(a,b) parallel to the line $\frac{x}{a} + \frac{y}{b} = 1$ also find the intercepts made by it on the axes .

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32. The length of perpendicular from the origin to a line is 9 and the line makes an angle of 120° witth the positive direction of Y - axes . Find the equation of the line .

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33. Find the equation of the straight line on which the perpendicular from origin makes an angle 30^{o} with positive x-axis and which foms a triangle of area $\frac{50}{\sqrt{3}}$sq, units with the co-ordinates axis.

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34. Reduce $x+\sqrt{3}y+4=0$ to the : Slope intercepts form and find its slope and y-intercept.

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35. Reduce $x + \sqrt{3}y + 4 = 0$ to the : Slope intercepts form and find its slope and y-intercept.

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36. Reduce $x + \sqrt{3y} + 4 = 0$ to the :

(iii) Normal form and find the values of p and α

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37. Find the measure of the angle of intersection of the lines whose equations are $3x + 4y + 7 = 0$ and $4x - 3y + 5 = 0$

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38. Find the angle between the lines , $(a^2 - ab)y = (ab + b^2)x + b^3$, and $(ab + b^2)y = (ab - a^2)x + a^3$ where $a < b < 0$

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39. 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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40. The slope of a straight line through $A(3, 2) is 3/4$ Find the coordinates of the points on the line that are $5 units$ away from A.

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41. 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 $x + y = 4$ may be at a distance $\frac{1}{3}\sqrt{6}$ from this point

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42. A line (2,3) makes an angle $\frac{3\pi}{4}$ with the negative direction of X- axis . Find the length of the line segment cut off between (2,3) and the line $x + y - 7 = 0$

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43. Find the distance of the point (2,3) from the line $2x - 3y + 9 = 0$ measured along the line $2x - 2y + 5 = 0$

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44. If the line $y - \sqrt{3}x + 3 = 0$ cuts the parabola $y^2 = x + 2$ at P and Q then $AP.\ AQ$ is equal to

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

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47. The experimities of the diagonal of a square are (1,1) ,$(-2, -1)$ .Obtain the other two vertices and the equation of the other diagonal .

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48. Are the points (2,1) and $(-3, 5)$ on the same or opposite side of the line $3x - 2y + 1 = 0$?

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49. Is the point $(2, -7)$ lies on origin side of the line $2x + y + 2 = 0$?

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50. A canal is $4\frac{1}{2}$ kms from a place and the shortest route from this place to the cenal is exactly north-east. A village is 3 kms north and 4 kms east from the place. Does it lie on canal?

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51. For what values of the parameter t does the point $P(t, t+1)$ lies inside the triangle ABC where

$A = (0, 3), B = (-2, 0)$ and $C = (6, 1)$.

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52. Find λ if $(\lambda, 2)$ is an interior point of ΔABC formed by $x + y = 4, 3x - 7y = 8$ and $4x - y = 31$

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53. 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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54. Find the general equation of the line which is parallel to $3x - 4y + 5 = 0$. Also find such line through the point $(-1, 2)$

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55. Find the general equation of the line which is perpendicular to $x + y + 4 = 0$. Also find such line through the point $(1, 2)$

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

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57. 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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58. If p and q are respectively the perpendiculars from the origin upon the striaght lines, whose equations are $x \sec \theta + y \cos ec\theta = a$ and $x \cos \theta - y \sin \theta a = \cos 2\theta, then 4p^2 + q^2$ is equal to

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59. 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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60. Number of lines that can be drawn through the point $(4, -5)$ so that its distance from $(-2, 3)$ will be equal to 12 is equal to

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61. The distance between two parallel lines $5x - 12y + 2 = 0$ and $5x - 12y - 3 = 0$ is given by

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62. The equation ns of the lines parallel to $5x - 12y + 26 = 0$ and at a distance of 4 units from it are: $5x - 12y - 26 = 0$ $5x - 12y + 26 = 0$ $5x - 12y - 78 = 0$ (d) $5x - 12y + 78 = 0$

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63. Show that the area of the parallelogram formed by the lines $x + 3y - a = 0, 3x - 2y + 3a = 0, x + 3y + 4a = 0$ and $3x + 2y + 7a =$ is $\frac{20}{11}a^2$ sq units/

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64. Prove that the area of the parallelogram formed by the lines

$x\cos\alpha + y\sin\alpha = p, x\cos\alpha + ys \in \alpha = q, x\cos\beta + y\sin\beta = randx\cos$

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65. Prove that the diagonals of the parallelogram formed by the lines

$\frac{x}{a} + \frac{y}{b} = 1, \frac{x}{b} + \frac{y}{a} = 1, \frac{x}{a} + \frac{y}{b} = 2 \text{ and } \frac{x}{b} + \frac{y}{a} = 2$ are at right angles . Also find its area $(a \neq b)$

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66. Area of the rhombus bounded by the four lines, $ax \pm by \pm c = 0$ is

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67. Show that the lines

$2x + 3y - 8 = 0, x - 5y + 9 = 0 \text{ and } 3x + 4y - 11 = 0$ are concurrent.

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68. 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 $\frac{1}{1-a}+\frac{1}{1-b}+\frac{1}{1-c}=1.$

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69. Show that the three straight lines $2x-3y+5=0, 3x+4y-7=0$ and $9x-5y+8=0$ meet in a point

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70. Find the equation of the straight line passing through the point (2,1) and through the point of intersection of the lines

$x + 2y = 3$ and $2x - 3y = 4$

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71. The fix point through which the line $x(a+2b)+y(a+3b)=a+b$ always passes for all values of a and b, is-

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72. If $3a+2b+6c=0$ the family of straight lines $ax+by=c=0$ passes through a fixed point . Find the coordinates of fixed point .

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73. If $4a^2+9b^2-c^2+12ab=0$ then the family of straight lines $ax+by+c=0$ is concurrent at : (A) $(-3, 2)$ or $(2, 3)$ (B) $(-2, 3)$ or $(2, -3)$ (C) $(3, 2)$ or $(-3, -2)$ (D) $(2, 3)$ or $(-2, -3)$

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74. Find the equation of the line passing through the point of intersection of the lines $x+5y+7=0$ and $3x+2y-5=0$

(a) parallel to the line $7x+2y-5=0$

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75. Find the equation of the line passing through the point of intersection of the lines $x+5y+7=0$ and $3x+2y-5=0$

(b) perpendicular to the line $7x+2y-5=0$

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76. Find the equation of the line passing through the intersection of the lines 3x-4y+1=0 and 5x+y-1=0 and which cuts off equal intercepts from the axes.

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77. If t_1 and t_2 are roots of the equation $t^2 + \lambda t + 1 = 0$ where λ is an arbitrary constant. Then the line joining the points $\left((at_1)^2, 2at_1\right)$ and $\left(a(t_2)^2, 2at_2\right)$ always passes through a fixed point then find that point.

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78. A variable line through the point of intersection of the lines $\frac{x}{a} + \frac{y}{b} = 1$ and $\frac{x}{b} + \frac{y}{a} = 1$ meets the coordinate axes in A and B. Show that the locus of the midpoint of AB is the curve $2xy(a+b) = ab(x+y)$.

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

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80. The orthocentre of the triangle formed by the lines $xy = 0$ and $x + y = 1$, is

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81. Find the orthocentre of the triangle ABC whose abgular points are $A(1, 2), B(2, 3)$ and $C(4, 3)$

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

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83. If the otrhocentre of the triangle formed by the lines $2x + 3y - 1 = 0, x + 2y - 1 = 0, ax + by - 1 = 0$ is at the origin then (a,b) is given by.

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84. Find eq^{ns} of lines passing through the point $(2, 3)$ and inclined at an angle $\frac{\pi}{4}$ to the line $2x + 3y = 5$

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85. 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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86. The st. lines $3x + 4y = 5$ and $4x - 3y = 15$ interrect at a point $A(3, -1)$. On these linepoints B and C are chosen so that $AB = AC$. Find the possible eqns of the line BC pathrough the point $(1, 2)$

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87. Find the equation of a straight line passing through the point (4, 5) and equally inclined to the lines $3x = 4y + 7$ and $5y = 12x + 6$.

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88. 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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89. 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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90. Find the equations of angular bisector bisecting the angle containing the origin and not containing the origin of the lines $4x + 3y - 6 = 0 \text{ and } 5x + 12y + 9 = 0$

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91. The equations of the bisector of the agle between the line $2x + y - 6 = 0$ and $2x - 4y + 7 = 0$ which contains the point (1,2) is .

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92. 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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93. Find the bisector of acute angle between the lines $x + y - 3 = 0$ and $7x - y + 5 = 0$

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94. The vertices of ΔABC are $A(0, 6)$, $B(8, 12)$ and $C(8, 0)$. The cordinates of the incentre are:

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95. Find the coordinates of the foot of the perpendicular drawn from the point (2,3) to the line $y = 3x + 4$

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96. Find the image of the point $(4, -13)$ in the line $5x + y + 6 = 0$.

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97. Find the image of the $(-2, -7)$ under the transformations (x,y) to $(x - 2y, -3x + y)$.

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98. The image of the point A (1,2) by the line mirror y=x is the point B and the image of B by the line mirror y=0 is the point (α, β), then a. $\alpha = 1, \beta = -2$ b. $\alpha = , \beta = 0$ c. $\alpha = , \beta = -1$ d. none of these

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99. The point (4, 1) undergoes the following three transformations successively: (a) Reflection about the line y = x (b) Translation through a distance 2 units along the positive direction of the x-axis. (c) Rotation through an angle $\frac{\pi}{4}$ about the origin in the anti clockwise direction. The final position of the point is given by the co-ordinates.

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100. Find the equations of the sides of the triangle having $(3, \ -1)$ as a vertex, $x-4y+10=0$ and $6x+10y-59=0$ being the equations of an angle bisector and a median respectively drawn from different vertices.

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101. If $P=(1,1), Q=(3,2)$ and R is a point on x-axis then the value of $PR+RQ$ will be minimum at

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102. Find a point P on the line $3x+2y+10=0$ such that $|PA-PB|$is minimum where A is (4,2) and B is (2,4)

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

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105. A ray of light is sent along the line $x - 6y = 8$ After refracting across the line $x + y = 1$ it enters the opposite side after turning by 15° away from the line $x + y = 1$ .Find the equation of the line along which the refracted ray travels .

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

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107. A rectangle $ABCD$ has its side AB parallel to line $y = x,$ and vertices $A, BandD$ lie on $y = 1, x = 2,$ and $x = -2,$ respectively. The locus of vertex C is $x = 5$ (b) $x - y = 5$ $y = 5$ (d) $x + y = 5$

A. x=5

B. $x - y = 5$

C. y=5

D. $x + y = 5$

Answer:

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108. The line $(k+1)x + ky - 2k^2 - 2 = 0$ passes through a point regardless of the value k. Which of the following is the line with slope 2 passing through the point?

A. $y = 2x - 8$

B. $y = 2x - 5$

C. $y = 2x - 4$

D. $y = 2x + 8$

Answer:

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109. A man starts from the point $P(-3, 4)$ and reaches the point $Q(0, 1)$ touching the x-axis at $R(\alpha, 0)$ such that $PR + RQ$ is minimum. Then $5|\alpha| =$ ________

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

B. $\left(-\frac{3}{5}, 0\right)$

C. $\left(-\frac{2}{5}, 0\right)$

D. $(-2, 0)$

Answer:

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110. If the point $P(a, a^2)$ lies completely inside the triangle formed by the lines $x = 0, y = 0,$ and $x + y = 2,$ then find the exhaustive range of values of a.

A. (0,1)

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

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

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

Answer:

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111. If $5a + 4b + 20c$ = t then the value of t for which the line $ax + by + c - 1 = 0$ always passes through a fixed point is

A. ,0

B. 20

C. 30

D. None of these

Answer:

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112. If the straight lines. $ax + amy + 1 = 0, bx + (m+1)by + 1 = 0$ and $cx + (m+2)cy + 1 = 0, \ m \neq 0$ are concurrent then a,b.c are in: (A) A.P. only for m = 1 (B) A.P. for all m (C) G.P. for all m (D) H.P. for all m

A. AP only for m=1

B. AP for all m

C. GP for all m

D. HP for all m

Answer:

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113. If a ray travelling the line x = 1 gets reflected the line $x + y = 1$ then the equation of the line along which the reflected ray travels is

A. y=0

B. $x - y = 1$

C. $x = 0$

D. None of these

Answer:

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

A. $\alpha\beta$

B. $2\alpha\beta$

C. $4\alpha\beta$

D. $8\alpha\beta$

Answer:

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115. The coordinates of the point P on the line $2x+3y+1=0$ such that $|PA-PB|$ is maximum where A is (2,0) and B is (0,2) is

A. $(5, -3)$

B. $(7, -5)$

C. $(9, -7)$

D. $(11, -9)$

Answer:

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116. Equation of the straight line which belongs to the system of straight lines $a(2x + y - 3) + b(3x + 2y - 5) = 0$ and is farthest from the pint $(4, \ -3)$ is

A. $4x + 11y - 15 = 0$

B. $3x - 4y + 1 = 0$

C. $7x + y - 8 = 0$

D. None of these

Answer:

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

A. $\left(\frac{3}{2}, 0\right)$

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

C. $\left(\frac{9}{4}, \frac{3}{4}\right)$

D. $\left(\frac{9}{4}, 0\right)$

Answer:

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118. Line $\frac{x}{a} + \frac{y}{b} = 1$ cuts the coordinate axes at A(a,0) and B(0,0) and the line $\frac{x}{a} + \frac{y}{b} = -1$ at $A'(-a', 0)$ and $B'(0, -b')$. If the points A,B A' ,B' are concyclic , then the orthocentre of the triangle ABA' is

A. $(0, 0)$

B. $(0, b)$

C. $\left(0, \frac{-aa}{b}\right)$

D. $\left(0, \frac{\text{bb}'}{a}\right)$

Answer:

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

A. $y = 3x \text{ and } 3y = 2x$

B. $2y = 3x \text{ and } 3y = x$

C. $y + 3x = 0 \text{ and } 3y + 2x = 0$

D. $2y + 3x = 0 \text{ and } 3y + x = 0$

Answer:

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120. A and B are two fixed points whose coordinates $(3, 2)$ and $(5, 4)$ respectively. The coordinates of a poin if ABP is an equilateral triangle, are

A. $(4-\sqrt{3}, 3+\sqrt{3})$

B. $(4+\sqrt{3}, 3-\sqrt{3})$

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

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

Answer:

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121. P(x,y) is called a natural point if x,$y \in N$. The total number of points lying inside the quadrilateral formed by the lines $2x+y=2, x=0, y=0$ and $x+y=5$ is

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122. The distance of the point (x,y) from the origin is defined as d = max . $\{|x|, |y|\}$. Then the distance of the common point for the family of lines $x(1+\lambda)+\lambda y+2+\lambda=0(\lambda$ being parameter) from the origin is

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123. statement $1:$ incentre of the triangle formed by the lines whose $3x+4y=0, 5x-12y=0$ and $y-15=0$ is the point P whose co-ordinates are $(1, 8)$.Statement-$2:$ Point P is equidistant from the 3 lines forming the triangle.

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124. x coordinates of two points B and C are the roots of equation $x^2+4x+3=0$ and their y coordinates are the roots of equation $x^2-x-6=0$. If x coordinate of B is less than the x coordinate of C and y coordinate of B is greater than the y coordinate of C and coordinates of a third point A be $(3, -5)$, find the length of the bisector of the interior angle at A.

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125. The vertices $B and C$ 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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126. The ends A and B of a straight line segment of constant length c slide upon the fixed rectangular axes OX and OY, respectively. If the rectangle OAPB be completed, then the locus of the foot of the perpendicular drawn from P to AB is

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127. A square lies above the X - axis and has one vertex at the origin . The side passing through the origin makes an angle $\alpha(o < \alpha < \pi/4)$ with the positive direction of the X - axis . Prove that the equation of its diagonals are ,

$y(\cos\alpha - \sin\alpha) = x(\sin\alpha + \cos\alpha)$,

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

where , is the length of each side of the square

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128. In a $\Delta ABC, A \equiv (\alpha, \beta), B \equiv (1, 2), C \equiv (2, 3)$ and point A lies on the line y = 2 x + 3 where $\alpha, \beta \in l$. If the area of ΔABC be such that $[\Delta] = 2$, where [.] denotes the greatest integer function, find all possible coordinates of A.

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129. Find the values of non-negative real number $h_1, h_2, h_3, k_1, k_2, k_3$ such that the algebraic sum of the perpendiculars drawn from the points $(2, k_1), (3, k_2), \cdot 7, k_3), (h_1, 4), (h_2, 5), (h_3, -3)$ on a variable line passing through (2, 1) is zero.

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

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

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132. 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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133. 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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134. For points $P=(x_1, y_1)$ and $Q=(x_2, y_2)$ of the coordinate plane, a new distance $d(P, Q)$ is defined by $d(P, Q)=|x_1-x_2|+|y_1-y_2|$.

Let $O(0,0)$ and $A=(3,2)$. Prove that the set of points in the first quadrant which are equidistant (wrt new distance) from O and A consists of the union of a line segment of finite length and an infinite ray. Sketch this set in a labelled diagram.

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

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Exercise For Session 1

1. Find the distance of the point $(3,5)$ from the line $2x+3y=14$ measured parallel to the line $x-2y=1$.

A. $\frac{7}{\sqrt{5}}$

B. $\frac{7}{\sqrt{13}}$

C. $\sqrt{5}$

D. $\sqrt{13}$

Answer: C

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2. The lines $x\cos\alpha + y\sin\alpha = P_1$ and $x\cos\beta + y\sin\beta = P_2$ will be perpendicular, if :

A. $\alpha = \beta$

B. $|\alpha - \beta| = \pi/2$

C. $\alpha = \pi/2$

D. $\alpha \pm \beta = \pi/2$

Answer: B

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3. If each of the points $(x-1, 4), (-2, y_1)$ lies on the line joining the points $(2, -1) and (5, -3)$, then the point $P(x_1, y_1)$ lies on the line. $6(x+y)-25=0$ $2x+6y+1=0$ $2x+3y-6=0$ (d) $6(x+y)+25=0$

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 the straight line passing through the point (4.3) and making intercepts on the co ordinate axes whose sum is -1, is

A. $\frac{x}{2}+\frac{y}{3}=-1$ and $\frac{x}{-2}+\frac{y}{1}=-1$

B. $\frac{x}{2}-\frac{y}{3}=-1$ and $\frac{x}{-2}+\frac{y}{1}=-1$

C. $\frac{x}{2}+\frac{y}{3}=1$ and $\frac{x}{-2}+\frac{y}{1}=1$

D. $\frac{x}{2}-\frac{y}{3}=1$ and $\frac{x}{-2}+\frac{y}{1}=1$

Answer: D

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5. If the straight lines $ax+by+c=0$ and $x\cos\alpha+y\sin\alpha=c$ enclose an angle $\pi/4$ between them and meet the straight line $x\sin\alpha-y\cos\alpha=0$ in the same point , then

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

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

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

D. $a^2+b^2=4$

Answer: B

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6. The angle between the straight lines $2x - y + 3 = 0$ and $x + 2y + 3 = 0$ is-

A. 30°

B. 45°

C. 60°

D. 90°

Answer: D

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7. (i) Find the gradient of a straight line which is passes through the point (-3. 6) and the mid point of (4,-5) and (-2, 9)

A. $\pi/4$

B. $\pi/2$

C. $3\pi/4$

D. π

Answer: C

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8. A square of side a lies above the X- axis and has one vertex at the origin . The side passing through the origin makes an angle $\pi/6$ with the positive direction of X-axis .The equation of its diagonal not passing through the origin is

A. $y(\sqrt{3}-1)-x(1-\sqrt{3})=2a$

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

C. $y(\sqrt{3}+1)+x(1+\sqrt{3})=2a$

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

Answer: D

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

A. $x + 2y - 7 = 0$

B. $x - 2y + 5 = 0$

C. $2x + y - 5 = 0$

D. $2x - y + 1 = 0$

Answer: A::D

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10. 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 $x + y - 1 = 0$.

A. $x - 2y + 13 = 0$

B. $2x - y + 14 = 0$

C. $x - y + 9 = 0$

D. $x - y + 10 = 0$

Answer: C

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11. Equation to the straight line cutting off an intercept 2 from negative direction of the axis of y and inclined at 30° to the positive direction of axis of x is :

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

B. $y - x + 2 = 0$

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

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

Answer: D

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12. What is the value of y so that the line through $(3, y) and (2, 7)$ is parallel to the line through $(-1, 4) and (0, 6)$?

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13. A straight line drawn through the point $P(2, 3)$ and is incline at an angle of 30^0 with the x-axis. Find the coordinates of two points on it a distance 4 from P on either side of P.

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14. If the straight line through the point (3,4) makes an angle $\frac{\pi}{6}$ with x-axis and meets the line 12 x + 5 y + 10 = 0 at Q, Then the length of PQ is :

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15. The distance of a point (2,3) from the line 2x -3y + 9 = 0 measured along a line x-y +1 =0 is :

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16. A line is such that its segment between the lines $5xy + 4 = 0$and $3x + 4y4 = 0$is bisected at the point (1, 5). Obtain its equation.

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17. The sides AB and AC of a triangle ABC are respectively $2x + 3y = 29$ and $x + 2y = 16$ respectively. If the mid-point of $BC$is

$(5, 6)$ then find the equation of BC

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18. A straight line through $A(-15-10)$ meets the lines $x-y-1=0$, $x+2y=5$ and $x+3y=7$ respectively at A, B and C. If $\frac{12}{AB}+\frac{40}{AC}=\frac{52}{AD}$ prove that the line passes through the origin.

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Exercise For Session 2

1. The number of lines that are parallel to $2x+6y-7=0$ and have an intercept 10 between the coordinate axes is

A. 1

B. 2

C. 4

D. infinitely many

Answer: B

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2. The distance between the lines $4x + 3y = 11$ and $8x + 6y = 15$ is

A. $\frac{7}{2}$

B. $\frac{7}{5}$

C. $\frac{7}{10}$

D. $\frac{9}{10}$

Answer: C

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3. Let the algebraic sum of the perpendicular distances from the points $(2, 0), (0, 2) and (1, 1)$ to a variable straight line be zero. Then the line pass through a fixed point whose coordinates are $(1, 1)$ b. $(2, 2)$ c. $(3, 3)$ d. $(4, 4)$

A. $(1, 1)$

B. $(-1, 1)$

C. $(-1, -1)$

D. $(1, -1)$

Answer: A

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4. 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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5. The area of the parallelogram formed by the lines $3x - 4y + 1 = 0, 3x - 4y + 3 = 0, 4x - 3y - 1 = 0$ and $4x - 3y - 2 = 0$, is (A) $\frac{1}{7} squnits$ (B) $\frac{2}{7} squnits$ (C) $\frac{3}{7} squnits$ (D) $\frac{4}{7} squnits$

A. $\frac{1}{7}$ squints

B. $\frac{2}{7}$sq units

C. $\frac{3}{7}$ sq units

D. $\frac{4}{7}$ sq units

Answer: B

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6. Area of the parallelogram formed by the lines y = mx, y = mx + 1,y = nx and y =nx+1 equals to

A. $\frac{|m+n|}{(m+n)^2}$

B. $\frac{2}{|m+n|}$

C. $\frac{1}{|m+n|}$

D. $\frac{1}{|m-n|}$

Answer: D

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7. The co-ordinates of a point on the line $y = x$ where perpendicular distance from the line $3x + 4y = 12$ is 4 units, are :

A. $\left(\frac{3}{7}, \frac{5}{7}\right)$

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

C. $\left(-\frac{8}{7}, -\frac{8}{7}\right)$

D. $\left(\frac{32}{7}, -\frac{32}{7}\right)$

Answer: C::D

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8. A line passes through the point $(2, 2)$ and is perpendicular to the line $3x + y = 3$, then its y-intercept is

A. $-\frac{2}{3}$

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

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

D. $\frac{4}{3}$

Answer: D

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9. If the point (1,2) and (34) were to be on the same side of the line $3x - 5y + a = 0$ then

A. $7 < a < 11$

B. a=7

C. a=11

D. $a < 7 \text{ or } a > 11$

Answer: D

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10. The lines y = mx , $y + 2x = 0, y = 2x + k$ and $y + mx = k$ form a rhombus if m equals

A. -1

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

C. 1

D. 2

Answer: D

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11. What are the points on the x-axis whose perpendicular distance from the line $\frac{x}{a} + \frac{y}{b} = 1$ is a

A. $\frac{b}{a}\left(a \pm \sqrt{(a^2 + b^2)}, 0\right)$

B. $\frac{a}{b}\left(b \pm \sqrt{(a^2 + b^2)}, 0\right)$

C. $\frac{b}{a}(a + b, 0)$

D. $\frac{a}{b}\left(a \pm \sqrt{(a^2 + b^2)}, 0\right)$

Answer: B

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12. The three sides of a triangle are given by $(x^2 - y^2)(2x + 3y - 6) = 0$. If the points (-2,a) lies inside and (b,1) lies outside the triangle, then

A. $a \in \left(2, \frac{10}{3}\right), b \in (-1, 1)$

B. $a \in \left(-2, \frac{10}{3}\right), b \in \left(-1, \frac{9}{2}\right)$

C. $a \in \left(1, \frac{10}{3}\right), b \in (-3, 5)$

D. None of these

Answer: D

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

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14. If the point as $(4, 7)$ and $(\cos\theta, \sin\theta)$, where `0

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

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16. If the area of the parallelogram formed by the lines 2x - 3y + a = 0 , 3x - 2y - a = 0 , 2x - 3y + 3a = 0 and 3x - 2y - 2a = 0 is 10 square units , then a =

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17. 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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18. The vertices of a $\triangle OBC$ are $O(0, 0), B(-3, -1), C(-1, -3)$. Find the equation of the line parallel to BC and intersecting the sides OB and OC and whose perpendicular distance from the origin is $\frac{1}{2}$.

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Exercise For Session 3

1. Locus of the point of intersection of lines $x \cos \alpha + y \sin \alpha = a$ and $x \sin \alpha - y \cos \alpha = a (\alpha \in R)$ is

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

B. $x^2 - y^2 = a^{2-b^2}$

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

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

Answer: C

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2. If a, c, b are in AP the family of line $ax + by + c = 0$ passes through the point.

A. a straight line

B. a family of concurrent lines

C. a family of parallel lines

D. None of these

Answer: D

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3. if the lines $x + 2ay + a = 0$, $x + 3by + b = 0$ and $x + 4cy + c = 0$ are concurrent, then a, b, c are in: (1) A.P.(2) G.P.(3) H.P.(4) A.G.P.

A. AP

B. GP

C. HP

D. AGP

Answer: B

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4. The set of lines ax + by+ c= 0, where 3a+ 2b+ 4c =0, is concurrent at the point:

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

B. $\left(\frac{1}{2}, \frac{3}{4}\right)$

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

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

Answer: B

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5. If the lines ax+y+1=0, x+by+1=0 and x+y+c=0 (a,b and c being distinct and different from 1) are concurrent the value of $\frac{a}{a-1}+\frac{b}{b-1}+\frac{c}{c-1}$ is

A. -2

B. -1

C. 1

D. 2

Answer: C

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6. If $u = a_1x + b_1y + c_1 = 0, v = a_2x + b_2y + c_2 = 0,$ and $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2},$ then the curve $u + kv = 0$ is the same straight line u different straight line not a straight line none of these

A. u = 0

B. a family of concurrent lines

C. a family of parallel lines

D. None of these

Answer: B

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

A. (a, b)

B. (b, a)

C. $(a, \ -b)$

D. $(-a, b)$

Answer: C

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8. 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) $\left(\frac{2}{3}, -\frac{7}{5}\right)$

A. $\left(-\frac{1}{6}, -\frac{5}{9}\right)$

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

C. $\left(-\frac{1}{6}, -\frac{5}{9}\right)$

D. $\left(\frac{2}{3}, -\frac{7}{5}\right)$

Answer: A

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9. The straight line through the point of intersection of $ax+by+c=0$ and $a'x+b'y+c'=0$ are parallel to the y-axis has the equation

A. $x(ab'-a'b)+(cb'-c'b)=0$

B. $x(ab'+a'b)+(cb'+c'b)=0$

C. $y(ab'-a'b)+(c'a-ca')=0$

D. $y(b'+a'b)+(c'a+ca')=0$

Answer: A

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10. If the equations of three sides of a triangle are $x+y=1, 3x+5y=2$ and $x-y=0$ then the orthocentre of the triangle lies on the line/lines

A. $5x - 3y = 1$

B. $5y - 3x = 1$

C. $2x - 3y = 1$

D. $5x - 3y = 2$

Answer: A::B

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11. Find the equations of the line through the intersection of $2x - 3y + 4 = 0$ and $3x + 4y - 5 = 0$and perpendicular to $6x - 7y + c = 0$

A. $119y + 20x = 125$

B. $199y - 120x = 125$

C. $119x + 102y = 125$

D. $119x - 102y = 125$

Answer: C

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12. The locus of point of intersection of the lines $\frac{x}{a} - \frac{y}{b} = m$ and $\frac{x}{a} + \frac{y}{b} = \frac{1}{m}$ (i) a circle (ii) an ellipse (iii) a hyperbola (iv) a parabola

A. a circle

B. an ellipse

C. a hyperbola

D. a parabola

Answer: C

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13. 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

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14. If the lines $(a-b-c)x+2ay+2a=0, 2bx+(b-c-a)y+2b=0$ and $(2c+1)x$ are concurrent , then the prove that either $a+b+c=0$ or $(a+b+c)^2+2a=0$

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15. Find the equation of the straight line which passes through the intersection of the lines $x-y-1=0and2x-3y+1=0$ and parallel (i) $x-a\xi s(ii)y-a\xi s(iii)3x+4y=14.$

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16. Let a, b, c be parameters. Then the equation $ax + by + c = 0$ will represent a family of straight lines passikng through a fixed point iff there exists a linear relation between $a, b,\ and\ \cdot$

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17. Prove that the family of lines represented by $x(1+\lambda) + y(2-\lambda) + 5 = 0, \lambda$ being arbitrary, pass through a fixed point. Also find the fixed point.

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Exercise For Session 4

1. Three straight lines $2x + 11y - 5 = 0, 24x + 7y - 20 = 0$ and $4x - 3y - 2 = 0$

A. form a triangle

B. are only concurrent

C. are concurrent with one line bisecting the angle between the other two

D. None of the above

Answer: C

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2. the line $x + 3y - 2 = 0$ bisects the angle between a pair of straight lines of which one has equation $x - 7y + 5 = 0$. 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

A. $3x + 3y - 1 = 0$

B. $x - 3y + 2 = 0$

C. $5x + 5y + 3 = 0$

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

Answer: D

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3. P is a point on either of the two lines $y - \sqrt{3}|x| = 2$ at a distance 5 units from their point of intersection The coordinates of the foot of the perpendicular from P on the bisector of the angle between them are

A. $\left(0, \frac{4+5\sqrt{3}}{2}\right)$ or $\left(0, \frac{4-5\sqrt{3}}{2}\right)$ depending on which the point P is taken

B. $\left(0, \frac{4+5\sqrt{3}}{2}\right)$

C. $\left(0, \frac{4-5\sqrt{3}}{2}\right)$

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

Answer: B

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4. In a ΔABC the bisector of angles B and C lie along the lines $x = y$ and $y = 0$. If A is $(1, 2)$, then $\sqrt{10}d(A, BC)$ where d (A, BC)represents distance of point A from side BC

A. $2x + y = 1$

B. $3x - y = 5$

C. $x - 2y = 3$

D. $x + 3y = 1$

Answer: B

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5. In $\triangle ABC,$ the coordinates of the vertex A are , $(4, -1)$ and lines $x - y - 1 = 0$ and $2x - y = 3$ are the internal bisectors of angles B and C . Then the radius of the circles of triangle AbC is

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

B. $\dfrac{3}{\sqrt{5}}$

C. $\frac{6}{\sqrt{5}}$

D. $\frac{7}{\sqrt{5}}$

Answer: C

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6. The equation of the straight line which bisects the intercepts between the axes of the lines $x + y = 2$and $2x + 3y = 6$ is

A. $2x = 3$

B. $y = 1$

C. $2y = 3$

D. $x = 1$

Answer: B

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7. 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. $x - y + 5 = 0$

Answer: C

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8. The equation of the bisector of that angle between the lines x + y = 3 and 2x - y = 2 which contains the point (1,1) is

A. $(\sqrt{5} - 2\sqrt{2})x + (\sqrt{5} + \sqrt{2})y = 3\sqrt{5} - 2\sqrt{2}$

B. $(\sqrt{5} + 2\sqrt{2})x + (\sqrt{5} - \sqrt{2})y = 3\sqrt{5} + 2\sqrt{2}$

C. $3x = 10$

D. $3x - 5y + 2 = 0$

Answer: A

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9. The equation of two straight lines through $(7, 9)$ and making an angle of 60° with the line $x - \sqrt{3}y - 2\sqrt{3} = 0$ is

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10. Equation of the base of an equilateral triangle is $3x + 4y = 9$ and its vertex is at point (1,2) .Find the equations of the other sides and the length of each side of the triangle .

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11. Find the coordinates the those point on the line $3x + 2y = 5$ which are equisdistant from the lines $4x + 3y - 7 = 0$ and $2y - 5 = 0$

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

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13. The bisector of two lines L and L are given by $3x^2 - 8xy - 3y^2 + 10x + 20y - 25 = 0$. If the line L_1 passes through origin, find the equation of line L_2.

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14. The equation of the bisector of that angle between the lines $x + 2y - 11 = 0, 3x - 6y - 5 = 0$ which contains the point $(1, \ -3)$ is $(3x = 19$ (b) $3y = 7$ $3x = 19and3y = 7$ (d) None of these

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15. Find the equation of thebisector of the angle between the lines $2x - 3y - 5 = 0$ and $6x - 4y + 7 = 0$ which is the supplement of the angle containing the point $(2, \ -1)$

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Exercise For Session 5

1. The coordinates of the foot of the perpendicular from (2,3) to the line $3x + 4y - 6 = 0$ are

A. $\left(-\frac{14}{25}, -\frac{27}{25}\right)$

B. $\left(\frac{14}{15}, -\frac{17}{25}\right)$

C. $\left(-\frac{14}{25}, \frac{17}{25}\right)$

D. $\left(\frac{14}{25}, \frac{27}{25}\right)$

Answer: D

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

A. $3x - 4y = 25$

B. $3x - 4y + 25 = 0$

C. $4x + 3y - 25 = 0$

D. $4x - 3y + 25 = 0$

Answer: A

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3. The coordinates of the foot of the perpendicular from (a,0) on the line $y = mx + \frac{a}{m}$ are

A. $\left(0, -\frac{1}{a}\right)$

B. $\left(0, \frac{a}{m}\right)$

C. $\left(0, -\frac{a}{m}\right)$

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

Answer: B

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

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

B. $\sqrt{\left(a_1^2 + b_1^2 - a_2^2 - b_2^2\right)}$

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

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

Answer: D

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5. Write the coordinates of the image of the point $(3, 8)$ in the lines $x + 3y - 7 = 0.$

A. $(1, 4)$

B. $(3, 4)$

C. $(- 1, 4)$

D. $(- 4, - 1)$

Answer: C

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6. The image of the point $(4, -3)$ with respect to the line $x - y = 0$ is,

A. $(-4, -3)$

B. $(3, 4)$

C. $(-4, 3)$

D. $(-3, 4)$

Answer: D

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7. The coordinates of the image of the origin O with respect to the line $x + y + 1 = 0$ are

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

B. $(-2, -2)$

C. $(1, 1)$

D. $(-1, 1)$

Answer: D

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

A. $6x - 4y - 7 = 0$

B. $2x - 3y - 5 = 0$

C. $3x - 2y + 5 = 0$

D. $3x - 2y + 10 = 0$

Answer: C

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9. The image of $P(a, b)$ on the line $y = -x$ is Q and the image of Q on the line $y = x$

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

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

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

D. $(0, 0)$

Answer: D

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10. The nearest point on the line $3x - 4y = 25$ from the origin is

A. $(3, 4)$

B. $(3, -4)$

C. $(3, 5)$

D. $(-3, 5)$

Answer: B

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11. 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

A. $\left(-\frac{12}{5}, \frac{17}{5}\right)$

B. $(-\frac{84}{5}, \frac{13}{5}\Big)$

C. $\left(-\frac{6}{5}, \frac{17}{5}\right)$

D. $(0, -3)$

Answer: B

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12. 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. $\left(\frac{12}{7}, \frac{12}{7}\right)$

B. $\left(\frac{13}{7}, \frac{13}{7}\right)$

C. $\left(\frac{31}{7}, \frac{31}{7}\right)$

D. $(0, 0)$

Answer: C

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13. the image of the point $A(2, 3)$ by the line mirror y=x is the point B and the image of B by the line mirror y=0 is the point (α, β), find α and β

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14. The equations of the perpendicular bisectors of the sides $AB and AC$ 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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15. In a triangle, ABC, the equation of the perpendicular bisector of AC is $3x - 2y + 8 = 0$. If the coordinates of the points A and B are $(1, \ -1)\&(3, 1)$ respectively, then the equation of the line BC & the centre of the circum-circle of the triangle ABC will be

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16. Is there a real value of λ for which the image of the point $(\lambda, \lambda - 1)$ by the line mirror $3x + y = 6\lambda$ is the point $\left(\lambda^2 + 1, \lambda\right)$ If so find λ. ,

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Exercise For Session 6

1. A ray of light passing through the point (1, 2) reflects on the xaxis at point A and the reflected ray passes through the point (5, 3). Find the coordinates of A.

A. 3

B. $\frac{13}{3}$

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

D. $\frac{13}{4}$

Answer: C

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

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

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

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

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

Answer: A::B

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4. All of the points lying inside thr triangle formed by the points (0,4) (2,5) and (6,2) satisfy

A. $3x + 2y + 8 \geq 0$

B. $2x + y - 10 \geq 0$

C. $2x - 3y - 11 \geq 0$

D. $-2x + y - 3 \geq 0$

Answer: A

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5. 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 in ΔOAB or in third quadrant

B. P cannot be inside in ΔOAB

C. P lies inside the ΔOAB

D. None of these

Answer: A

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

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

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

Answer: C

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7. Two sides of a triangle have the joint equation $x^2 - 2xy - 3y^2 + 8y - 4 = 0$ The third side , which is variable always passes through the point $(-5, -1)$ .Find the range of values of the slope of the third side , so that the origin is an interior point of the triangle .

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8. Determine the range of values of $0 \in [0, 2\pi]$ for which $(\cos\theta, \sin\theta)$ lies inside the triangle formed by the lines $x + y - 2 = 0, x - y - 1 = 0$ and $6x + 2y - \sqrt{10 = 0}$

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9. Let P(sinθ,cosθ) (θ belongs to 0 to 2π) be apoint and OAB be a triangle with vertices (0,0), ($\sqrt{\frac{3}{2}}$, 0) and (0, $\sqrt{\frac{3}{2}}$, 0) . Find θ if P lies inside the AQAB.

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10. Find all the values of θ for which the point $(\sin^2\theta, \sin\theta)$ lies inside the square formed by the line $xy = 0$ and $4xy - 2x - 2y + 1 = 0$.

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11. ermine whether the point (-3, 2) lies inside or outside the triangle whose sides are given by the equations x + y-4x+8-0,4x-y-31-0.

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12. A ray of light is sent along the line $x - 2y + 5 = 0$ upon reaching the line $3x - 2y + 7 = 0$ the ray is reflected from it . Find the equation of the containing the reflected ray .

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Exercise Single Option Correct Type Questions

1. 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. $ax + by + 2a = 0$

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

C. $ax + by + 2b = 0$

D. None of these

Answer: B

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2. If $\frac{2}{1!9!}+\frac{2}{3!7!}+\frac{1}{5!5!}=\frac{2}{a!}$, then orthocentre of the triangle having sides $x-y+1=0, x+y+3=0$ and $2x+5y-2=0$ is

A. $(2m-2n, m-n)$

B. $(2m-2n, n-m)$

C. $(2m-n, m+n)$

D. $(2m-n, m-n)$

Answer: A

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3. If $f(x+y)=f(x).\,f(y)$ for all x and y. $f(1)=2$, then area enclosed by $3|x|+2|y|\leq 8$ is (A) $f(5)$ sq. units (B) $f(6)$ sq. units (C) $\frac{1}{3}f(6)$ sq. units (D) $f(4)$ sq. units

A. f(4)sq units

B. $\frac{1}{2}$f(6) sq units

C. $\frac{1}{3}$f(6) sq units

D. $\frac{1}{3}$ f(5) sq units

Answer: C

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4. The graph of the function, $\cos x \cos(x+2) - \cos^2(x+1)$ is

A. a straight line passing through $\left(0 - \sin^2 1\right)$ with slope 2

B. a straight line passing through (0,0)

C. a parabola with vertex $\left(1 - \sin^2 1\right)$

D. a straight line passing through the point $\left(\frac{\pi}{2}, -\sin^2 1\right)$ are parallel to the X-axis

Answer: D

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

(A) $x^2 - 2|\lambda|x + |\lambda| = 0$ (B) $x^2 + |\lambda|x + 2|\lambda| = 0$

(C) $x^2 - |\lambda|x + |2\lambda| = 0$ (D) None of these

A. $x^2 - 2|\lambda|x + |\lambda| = 0$

B. $x^2 + |\lambda|x + 2|\lambda| = 0$

C. $x^2 - |\lambda|x + 2|\lambda| = 0$

D. None of these

Answer: C

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6. The set of values of b for which the origin and the point (1, 1) lie on the same side of the straight line, $a^2x + aby + 1 = 0 \forall a \in R, b > 0$ are(A)

$b \in (2, 4)$ (B)$b \in (0, 2)$ (C) $b \in [0, 2]$(D) $(2, \infty)$

A. $b \in (2, 4)$

B. $b \in (0, 2)$

C. $b \in [0, 2]$

D. None of these

Answer: B

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7. Line L has intercepts a and b on the coordinate axes. When, the axes area rotated through a given angle, keeping the origin fixed, the same line L has intercepts p and q, then

A. $a^2 + b^2 = p^2 + q^2$

B. $\frac{1}{a^2} + \frac{1}{b^2} = \frac{1}{p^2} + \frac{1}{q^2}$

C. $a^2 + p^2 = b^2 + q^2$

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

Answer: B

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8. If the distance of any point (x, y) from origin is defined as $d(x, y) = \max\{|x|, |y|\}$, then the locus of the point (x, y) where $d(x, y) = 1$ is

A. a circle

B. a straight line

C. a square

D. a triangle

Answer: B

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9. If p_1, p_2, p_3 be the length of perpendiculars from the points $(m^2, 2m), (mm', m + m')$ and $(m'^2, 2m')$ respectively on the line $x \cos\alpha + y \sin\alpha + \frac{\sin^2\alpha}{\cos\alpha} = 0$ then p_1, p_2, p_3 are in:

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10. $ABCD$ 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.

A. $\sqrt{3}x + (1 - \sqrt{3}) = y = \sqrt{3}, x^2 + y^2 = 4$

B. $(1 + \sqrt{3})x - (1 - \sqrt{2})y = 2, x^2 + y^2 = 9$

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

D. None of the above

Answer: C

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11. The point (4,1) undergoes the following three successive transformations ,

reflection about the line $y = x - 1$

translation through a distance 1 unit along the positive direction

rotation thrpough an angle $\frac{\pi}{4}$ about the origin in the anti - clockwise direction

Then the coordinates of the final point are ,

A. $(4, 3)$

B. $\left(\frac{7}{2}, \frac{7}{2}\right)$

C. $(0, 3\sqrt{2})$

D. $(3, 4)$

Answer: C

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12. If the square ABCD, where $A(0, 0)$, $B(2, 0) C(2, 2)$ and $D(0, 2)$ undergoes the following three transformations successively

(i) $f_1(x, y) \rightarrow (y, x)$

(ii) $f_2(x, y) \rightarrow (x + 3y, y)$

(iii) $f_3(x, y) \rightarrow \left(\frac{x - y}{2}, \frac{x + y}{2}\right)$

then the final figure is a

A. square

B. parallelogram

C. rhombus

D. None of these

Answer: B

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13. The line $x + y = a$ meets the axes of x and y at A and B respectively. A triangle AMN is inscribed in the triangle OAB, O being the origin, with right angle at N, M and N lie respectively on OB and AB. If the area of the triangle AMN is $\frac{3}{8}$ of the area of the triangle OAB, then $\frac{AN}{BM}$ is equal to:

A. 1

B. 2

C. 3

D. 4

Answer: C

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14. If P(1,0), Q(-1,0) and R (2,0) are three given points, then the locus of the point S satisfying the relation $(SQ)^2 + (SR)^2 = 2(SP)^2$

A. a straight line parallel to X -axis

B. a circle through the origin

C. a circle with centre at the origin

D. a straight line parallel to Y-axis

Answer: D

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15. If $A\left(\frac{\sin\alpha}{3}-1, \frac{\cos\alpha}{2}-1\right)$ and B(1,1) $\alpha \in [-\pi, \pi]$ are two points on the same side of the line $3x-2y+1=0$ then α belongs to the interval

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

B. $[-\pi, \pi]$

C. ϕ

D. None of these

Answer: A

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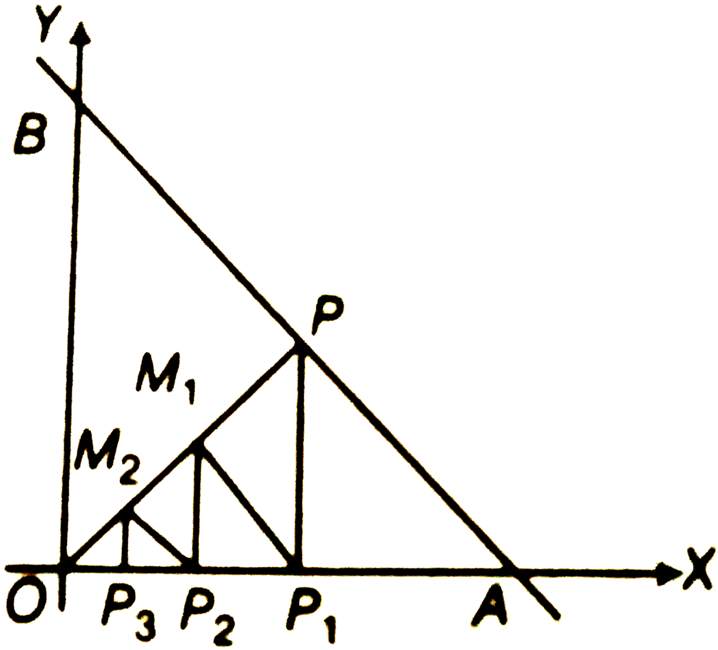
16. The line $x+y=1$ meets X-axis at A and Y-axis at B,P is the mid-point of AB, P_1 is the foot of perpendicular from P to OA, M_1 is that of P_1 from OP, P_2 is that of M_1 from OA, M_2 is that of P_2 from OP, P_3 is that of M_2 from OA and so on. If P_n denotes theb nth foot of the perpendicular on OA, then find OP_n



A. $\frac{1}{2n}$

B. $\frac{1}{2^n}$

C. 2^n-1

D. $2^n + 3$

Answer: B

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17. The line x = c cuts the triangle with corners (0,0) , (1,1) and (9,1) into two regions .For the area of the two regions to the same , then c must be equal to

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

B. 3

C. $\frac{7}{2}$

D. 3 or 15

Answer: B

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18. If the straight lines $x + 2y = 9, 3x - 5y = 5$ and $ax + by = 1$ are concurrent , then the straight line $5x + 2y = 1$ passes through the point

A. $(a, \ - b)$

B. $(- a, b)$

C. (a, b)

D. $(- a, \ - b)$

Answer: C

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19. If the ends of the base of an isosceles triangle are at (2, 0) and (0, 1), and the equation of one side is $x = 2$, then the orthocenter of the triangle is

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

B. $\left(\frac{5}{4}, 1\right)$

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

D. $\left(\frac{4}{3}, \frac{7}{12}\right)$

Answer: B

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20. Let m, n are integers with `0

A. $2m(m+n)$

B. $m(m+3n)$

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

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

Answer: B

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

A. 10

B. 18

C. 16

D. 12

Answer: B

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22. Drawn from origin are two mutually perpendicular lines forming an isosceles triangle together with the straight line $2x+y=a$ then the area of this triangle is

A. $\frac{a^2}{2}$ sq units

B. $\frac{a^2}{3}$ sq units

C. $\frac{a^2}{5}$ sq units

D. None of these

Answer: C

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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 2 (b) 0 (c) 4 (d) 1

A. 2

B. 0

C. 4

D. 1

Answer: A

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24. A ray of light coming fromthe point (1, 2) is reflected at a point A on the x-axis and then passes through the point (5,3). The coordinates of the point A is :

A. $\left(\frac{13}{5}, 0\right)$

B. $\left(\frac{5}{13}, 0\right)$

C. $(-7, 0)$

D. None of these

Answer: A

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25. Consider the family of lines $5x + 3y - 2 + \lambda(3x - y - 4) = 0$ and $x - y + 1 + \mu(2x - y - 2) = 0$ Equation of straight line that belong to both families is $ax + by - 7 = 0$ then $a + b$ is

A. 1

B. 3

C. 5

D. 7

Answer: B

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26. In ΔABC equation of the right bisectors of the sides Ab and AC are $x+y=0$ and $x-y=0$ respectively .If A = (5,7) then equation of side BC is

A. $7y=5x$

B. $5x=y$

C. $5y=7x$

D. $5y=x$

Answer: A

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

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

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

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

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

Answer: A

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28. 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

A. $\left(\frac{17}{8}, 0\right)$

B. $\left(\frac{17}{4}, 0\right)$

C. $\left(\frac{17}{2}, 0\right)$

D. $(17, 0)$

Answer: B

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Exercise More Than One Correct Option Type Questions

1. The point of intersection of the lines $\frac{x}{a}+\frac{y}{b}=1$ and $\frac{x}{b}+\frac{y}{a}=1$ lies on

A. $x-y=0$

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

C. $(lx + my)(a + b) = 2ab$

D. $(lx - my)(a + b) = (l - m)ab$

Answer: A::B::D

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

A. $b = c$

B. $c = a$

C. $a = b$

D. $a + b + c = 0$

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

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

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

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

C. $\left(\frac{7}{2}, \frac{13}{2}\right)$

D. $\left(\frac{-1}{4}, \frac{11}{4}\right)$

Answer: A::C

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4. If the lines $x - 2y - 6 = 0, 3x + y - 4$ and $\lambda x + 4y + \lambda^2 = 0$ are concurrent , then

A. $\lambda = 2$

B. $\lambda = 2$

C. $\lambda = 4$

D. $\lambda = -4$

Answer: A::D

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5. Equation of a straight line passing through the point of intersection of $x - y + 1 = 0$ and $3x + y - 5 = 0$ are perpendicular to one of them is

A. $x + y + 3 = 0$

B. $x + y - 3 = 0$

C. $x - 3y - 5 = 0$

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

Answer: B::D

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6. If one vertex of an equilateral triangle of side 'a' lie at the origin and the other lies on the line $x - \sqrt{3}y = 0$, the co-ordinates of the third vertex are:

A. $(0, a)$

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

C. $(0, -a)$

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

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

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7. If the lines $ax + by + c = 0, bx + cy + a = 0$ and $cx + ay + b = 0(a, b, c$ being distinct) are concurrent, then (A) $a+b+c=0$ (B) $a+b+c=0$ (C) $ab+bc+ca=1$ (D) $ab+bc+ca=0$

A. $a^3+b^3+c^3-3abc=0$

B. $a=b$

C. $a=b=c$

D. $a^2+b^2+c^2-bc-ca-ab=0$

Answer: A::C::D

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

A. $x+2y-7=0$

B. $x-2y+5=0$

C. $2x+y-5=0$

D. $2x - y + 1 = 0$

Answer: A::D

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9. 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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10. Consider the straight lines $x+2y+4=0$ and $4x+2y-1=0$.

The line $6x+6y+7=0$ is

A. bisector of the angle including origin

B. bisector of acute angle

C. bisector of obtuse angle

D. None of these

Answer: A::B

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11. Two roads are represented by the equations $y-x=6$ and $x+y=8$ An inspection bungalow has to be so constructed that it is at a distance of 100 from each of the roads. Possible location of the bungalow is given by

A. $(100\sqrt{2}+1, 7)$

B. $(1-100\sqrt{2}, 7)$

C. $(1, 7 + 100\sqrt{2})$

D. $(1, 7 - 100\sqrt{2})$

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

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

A. the lines will pass through a fixed point

B. there will be a set of parallel lines

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

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

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

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14. Let $L_1 \equiv ax + by + a\sqrt[3]{b} = 0$ and $L_2 \equiv bx - ay + b\sqrt[3]{a} = 0$ be two straight lines . The equatins of the bisectors of the angle formed by the foci whose equations are

$\lambda_1 L_1 - \lambda_2 L_2 = 0$ and $\lambda_1 l_1 + \lambda_2 = 0, \lambda_1$ and λ_2 being non - zero real numbers ,are given by

A. $L_1 = 0$

B. $L_2 = 0$

C. $\lambda_1 L_1 + \lambda_2 L_2 = 0$

D. $\lambda_2 L_1 - \lambda_1 L_2 = 0$

Answer: A::B

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15. The equation of the bisectors of the angles between the two intersecting lines $\frac{x-3}{\cos\theta} = \frac{y+5}{\sin\theta}$ and $\frac{x-3}{\cos\theta} = \frac{y+5}{\sin\theta}$ are $\frac{x-3}{\cos\alpha} = \frac{y+5}{\sin\alpha}$ and $\frac{x-3}{\beta} = \frac{y+5}{\gamma}$, then

A. $\alpha = \frac{\theta + \phi}{2}$

B. $\beta = -\sin\alpha$

C. $\gamma = \cos\alpha$

D. $\beta = \sin \alpha$

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

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Exercise Passage Based Questions

1. For points $P \equiv (x_1, y_1)$ and $Q = (x_2, y_2)$ of the coordinate plane , a new distance d (P,Q) is defined by d(P,Q) $= |x_1 - x_2| + |y_1 - y_2|$ Let $O \equiv (0, 0), A \equiv (1, 2) B \equiv (2, 3)$ and $C \equiv (4, 3)$ are four fixed points on x-y plane

Let R(x,y) such that R is equisdistant from tthe point O and A with respect to new distance and if $0 \le x < 1$ and $0 \le y < 2$, then R lie on a line segment whose equation is

A. $x + y = 3$

B. $x + 2y = 3$

C. $2x + y = 3$

D. $2x + 2y = 3$

Answer: D

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2. For points $P \equiv (x_1, y_1)$ and $Q = (x_2, y_2)$ of the coordinate plane , a new distance d (P,Q) is defined by d(P,Q) $= |x_1 - x_2| + |y_1 - y_2|$ Let $O \equiv (0, 0), A \equiv (1, 2) B \equiv (2, 3)$ and $C \equiv (4, 3)$ are four fixed points on x-y plane

Let S(x,y) such that S is equisdistant from points O and B with respect to new and if $x \geq 2$ and $0 \leq y < 3$ then locus of S is

A. a line segment of infinite length

B. a line of infinite length

C. a ray of finite length

D. a ray of infinite length

Answer: D

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3. For points $P \equiv (x_1, y_1)$ and $Q = (x_2, y_2)$ of the coordinate plane , a new distance d (P,Q) is defined by d(P,Q) $= |x_1 - x_2| + |y_1 - y_2|$ Let $O \equiv (0, 0)$, $A \equiv (1, 2) B \equiv (2, 3)$ and $C \equiv (4, 3)$ are four fixed points on x-y plane

Le T(x,y) such that T is equisdistant from point O and C with respect to new distance and if T lie in first quadrant , then T consists of the union of a line segment of finite length and an infinite ray whose labelled diagram is

A.

B.

C.

D.

Answer: A

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4. In a triangle AbC , if the equation of sides AB,BC and CA are $2x - y + 4 = 0, x - 2y - 1 = 0$ and $x + 3y - 3 = 0$ respectively ,

Tangent of internal angle A is equal to

A. -7

B. -3

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

D. 7

Answer: A

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5. In a triangle ABC , if the equation of sides AB,BC and CA are $2x - y + 4 = 0, x - 2y - 1 = 0$ and $x + 3y - 3 = 0$ respectively ,

The equation of external bisector of angle B is

A. $x - y - 1 = 0$

B. $x - y + 1 = 0$

C. $x + y - 5 = 0$

D. $x + y + 5 = 0$

Answer: D

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6. In a triangle ABC , if the equation of sides Ab,BC and CA are $2x - y + 4 = 0, x - 2y - 1 = 0$ and $x + 3y - 3 = 0$ respectively ,

The image of point b w.r.t the side cA is

A. $\left(-\frac{3}{5}, \frac{26}{5}\right)$

B. $\left(-\frac{3}{5}, -\frac{26}{5}\right)$

C. $\left(\frac{3}{5}, -\frac{26}{5}\right)$

D. $\left(\frac{3}{5}, \frac{26}{5}\right)$

Answer: A

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7. $A(1, 3)$ 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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8. $A(1, 3)$ 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. $\left(\frac{3}{10}, \frac{17}{10}\right)$

B. $\left(\frac{17}{10}, \frac{3}{10}\right)$

C. $\left(-\frac{5}{2}, \frac{9}{2}\right)$

D. $\left(\frac{9}{2}, -\frac{5}{2}\right)$

Answer: C

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

A. $3x + 7y = 24$

B. $3x + 7y + 24 = 0$

C. $13x + 7y + 8 = 0$

D. $13x - 7y + 8 = 0$

Answer: A

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10. In a ΔABC the equation of the side BC is $2x - y = 3$ and its circumcentre and orthocentre are $(2, 4)$ and $(1, 2)$ respetively.

Circumradius of ΔABC is

A. $\sqrt{\frac{61}{5}}$

B. $\sqrt{\frac{51}{5}}$

C. $\sqrt{\frac{41}{5}}$

D. $\sqrt{\frac{43}{5}}$

Answer: A

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11. In a ΔABC the equation of the side BC is $2x - y = 3$ and its circumcentre and orthocentre are $(2, 4)$ and $(1, 2)$ respetively.

$\sin B. \sin C =$

A. $\frac{9}{2\sqrt{61}}$

B. $\frac{9}{4\sqrt{61}}$

C. $\frac{9}{\sqrt{61}}$

D. $\frac{9}{5\sqrt{61}}$

Answer: A

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12. In a ΔABC the equation of the side BC is $2x - y = 3$ and its circumcentre and orthocentre are $(2, 4)$ and $(1, 2)$ respetively .

The distnce of orthocentre from vertex A is

A. $\frac{1}{\sqrt{5}}$

B. $\frac{6}{\sqrt{5}}$

C. $\frac{3}{\sqrt{5}}$

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

Answer: B

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Exercise Single Integer Answer Type Questions

1. The number of possible straight lines passing through $(2, 3)$ and forming a triangle with the coordinate axes, whose area is 12 sq. units, is one (b) two (c) three (d) four

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2. The portion of the line $x + 3y - 1 = 0$ intersepted between the lines $ax + y + 1 = 0$ and $x + 3y = 0$ subtend a right angle at origin , then the value of |a| is

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3. Let ABC be a triangle and $A \equiv (1, 2), y = x$ be the perpendicular bisector of AB and $x - 2y + 1 = 0$ be the perpendicular bisector of $\angle C$. If the equation of BC is given by $ax + by - 5 = 0$ then the value of $a - 2b$ is

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4. A lattice point in a plane is a point for which both coordinates are integers. If n be the number of lattice points inside the triangle whose sides are $x = 0, y = 0$ and $9x + 22 \quad 3y = 2007$ then tens place digit in n is:

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5. 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

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6. 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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7. 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

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8. Find λ if $(\lambda, \lambda + 1)$ is an interior point of ΔABC where, $A \equiv (0, 3), B \equiv (-2, 0)$ and $C \equiv (5, 1)$.

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9. 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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10. If from point $P(4, 4)$ perpendiculars to the straight lines $3x+4y+5=0$ and $y=mx+7$ meet at Q and R area of triangle PQR is maximum, then m is equal to

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Exercise Statement I And Ii Type Questions

1. Statement I : The lines $x(a+2b)+y(a+3b)=a+b$ are concurrent at the point $(2, -1)$

Statement II : The lines $x+y-1=0$ and $2x+3y-1=0$ intersect at the point $(2, -1)$

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

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

C. Statement I is true ,statement II is false

D. Statement I is false ,statement II is true

Answer: A

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2. Statement I The points (3,2) and (1,4) lie on opposite side of the line $3x - 2y - 1 = 0$

Statement II The algebraic perpendicular distance from the given the point to the line have opposite sign

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

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

C. Statement I is true ,statement II is false

D. Statement I is false ,statement II is true

Answer: A

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3. Statement I If sum of algebraic distances from points A(1,2),B(2,3),C(6,1) is zero on the line $ax + by + c = 0$ then $2a + 3b + c = 0$,

Statement II The centroid of the triangle is (3,2)

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

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

C. Statement I is true ,statement II is false

D. Statement I is false ,statement II is true

Answer: D

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4. Statement I Let $A \equiv (0, 1)$ and $B \equiv (2, 0)$ and P be a point on the line $4x + 3y + 9 = 0$ then the co - ordinates of P such that $|PA - PB|$is maximum is $\left(-\frac{12}{5}, \frac{17}{5}\right)$

Statement II $|PA - PB| \leq |AB|$

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

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

C. Statement I is true ,statement II is false

D. Statement I is false ,statement II is true

Answer: D

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5. Statement I The incentre of a triangle formed by the line $x\cos\left(\frac{\pi}{9}\right)+y\sin\left(\frac{\pi}{9}\right)=\pi$ $x\cos\left(\frac{8\pi}{9}\right)+y\sin\left(\frac{8\pi}{9}\right)=\pi$ and $x\cos\left(\frac{13\pi}{9}\right)+y\sin\left(\frac{13\pi}{9}\right)=\pi$ is (0,0)

Statement if Any point equisdistant from the given three non - concurrent straight lines in the plane is the incentre of the triangle .

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

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

C. Statement I is true ,statement II is false

D. Statement I is false ,statement II is true

Answer: C

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6. Statement I Reflection of the point (5,1) in the line $x + y = 0 is(- 1, - 5)$

Statement II Reflection of a point $P(\alpha, \beta)$ in the line $ax + by + c = 0$ is $Q(\alpha'\beta')$ if $\left(\frac{\alpha + \alpha'}{2}, \frac{\beta + \beta'}{2}\right)$ lies on the line .

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

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

C. Statement I is true ,statement II is false

D. Statement I is false ,statement II is true

Answer: B

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7. Statement 1: The internal angle bisector of angle C of a triangle ABC with sides $AB, AC,$ and BC as $y=0, 3x+2y=0,$ and $2x+3y+6=0$, respectively, is $5x+5y+6=0$ Statement 2: The image of point A with respect to 5x+5y+6=0 lies on the side BC of the triangle.

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

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

C. Statement I is true ,statement II is false

D. Statement I is false ,statement II is true

Answer: B

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8. Statement 1:If the point $\left(2a-5, a^2\right)$ is on the same side of the line $x+y-3=0$ as that of the origin, then $a \in (2, 4)$ Statement 2: The points $(x_1, y_1) and (x_2, y_2)$ lie on the same or opposite sides of the line $ax+by+c=0,$ as ax_1+by_1+c and ax_2+by_2+c have the same or opposite signs.

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

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

C. Statement I is true ,statement II is false

D. Statement I is false ,statement II is true

Answer: D

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Exercise Subjective Type Questions

1. If $A(x_1, y_1), B(x_2, y_2), C(x_3, y_3)$ are the vertices of the triangle then show that:`

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2. Find the coordinates of the point at unit distance from the lines

$3x - 4y + 1 = 0, 8x + 6y + 1 = 0$

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3. A variable line makes intercepts on the coordinate axes the sum of whose squares is constant and is equal to a . Find the locus of the foot of the perpendicular from the origin to this line.

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

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5. P is any point on the $x - a = 0$. If $A = (a, 0)$and PQ , the bisector of $\angle OCA$ meets the x-axis in Q prove that the locus of the foot of prependicular from Q on Op is $(x - a)^2 (x^2 + y^2) = a^2 y^2$

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6. Having given the bases and the sum of the areas of a number of triangles which have a common vertex, show that the locus of the vertex is a straight line.

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7. A variable line is drawn through O to cut two fixed straight lines L_1 and L_2 in R and S. A point P is chosen the variable line such $\frac{m+n}{OP} = \frac{m}{OR} + \frac{n}{OS}$ Find the locus of P which is a straight ine passing through the point of intersection of L_1 and L_2

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8. 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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9. Two fixed straight lines X - axis and y = mx are cut by a variable line in the points A(a,0) and B(b,mb) respectively .P and Q are the feet of the perpendiculars drawn from A and B upon the lines y = mx and X - axis

,Show that ,if AB passes through a fixed point (h,k) then PQ will also pass through a fixed point .Find the fixed point

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10. Find the equation of straight lines passing through point (2,3) and having intersept of length 2 units between (2,3) and having an intercept of length 2 units between the straight lines $2x + y = 3, 2x + y = 5$

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

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Exercise Questions Asked In Previous 13 Years Exam

1. The lines parallel ot the x-axis and passing through the intersection of the lines $ax + 2by + 3b = 0$ and $bx - 2ay - 3a = 0$ [where $(a, b) \neq (0, 0)]$ is-

A. below the X - axis at a distance of $\frac{3}{2}$ from it

B. below the X-axis at a distance of $\frac{2}{3}$ from it

C. above the X-axis at a distance of $\frac{3}{2}$ from it

D. above the X - axis at a distance of $\frac{2}{3}$ from it

Answer: A

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

A. $x + y = 7$

B. $3x - 4y + 7 = 0$

C. $4x + 3y = 24$

D. $3x + 4y = 25$

Answer: C

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3. If (a, a^2) falls inside the angle made by the lines $y = \frac{x}{2}, x > 0$ and $y = 3x, x > 0$, then a belongs to the interval

A. $\left(0, \frac{1}{2}\right)$

B. $(2, \infty)$

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

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

Answer: C

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

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

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

C. Statement I is true ,statement II is false

D. Statement I is false ,statement II is true

Answer: C

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

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

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

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

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

Answer: C

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6. The perpendicular bisector of the line segment joining P (1, 4) and Q (k, 3) has yintercept -4. Then a possible value of k is (1) 1 (2) 2 (3) -2 (4) -4

A. 1

B. 2

C. -2

D. -4

Answer: A

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

A. exactly one values of p

B. exactly two values of p

C. more than two values of p

D. no values of p

Answer: A

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8. 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 (1) $\sqrt{17}$ (2) $\frac{17}{\sqrt{15}}$ (3) $\frac{23}{\sqrt{17}}$ (4) $\frac{23}{\sqrt{15}}$

A. $\sqrt{17}$

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

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

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

Answer: C

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

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

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

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

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

Answer: B

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

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

B. Statement I is true , statement II is false .

C. Statement I is false ,statement II is true

D. Statement I is true ,statement II is true , statement II is a correct explanation for statement I

Answer: B

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

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

B. 5

C. 6

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

Answer: C

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12. 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. $y=x+\sqrt{5}$

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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13. For $a>b>c>0$ if the distance between (1,1) and the point of intersection of the lines ax + by +c=0 and bx + ay+c=0 is less than $2\sqrt{2}$ then

A. $a+b-c>0$

B. $a-b+c<0$

C. $a - b + c > 0$

D. $a + b - c < 0$

Answer: A

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14. Let PS be the median of the triangle with vertices $P(2, 2)$, $Q(6, -1)$ and $R(7, 3)$ Then equation of the line passing through $(1, -1)$ and parallel to PS is

A. $4x + 7y + 3 = 0$

B. $2x - 9y - 11 = 0$

C. $4x - 7y - 11 = 0$

D. $2x + 9y + 7 = 0$

Answer: D

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15. 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. $3bc - 2ad = 0$

B. $3bc + 2ad = 0$

C. $2bc - 3ad = 0$

D. $2bc + 3ad = 0$

Answer: A

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

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

A. 820

B. 780

C. 901

D. 861

Answer: B

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18. 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 ?

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

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

C. $(-3, -9)$

D. $(-3, -8)$

Answer: A

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