EXERCISE-01 CHECK YOUR GRASP

SELECT THE CORRECT ALTERNATIVE (ONLY ONE CORRECT ANSWER)

1. If (3, –4) and (–6, 5) are the extremities of a diagonal of a parallelogram and (2, 1) is its third vertex, then its fourth vertex is -

(A) (–1, 0) (B) (–1, 1) (C) (0, –1) (D) (–5, 0)

2. The ratio in which the line joining the points (3, –4) and (–5, 6) is divided by x-axis -

(A) 2 : 3 (B) 6 : 4 (C) 3 : 2 (D) none of these

3. The circumcentre of the triangle with vertices (0, 0), (3, 0) and (0, 4) is -

(A) (1, 1) (B) (2, 3/2) (C) (3/2, 2) (D) none of these

4. The mid points of the sides of a triangle are (5, 0), (5, 12) and (0, 12), then orthocentre of this triangle is -

(A) (0, 0) (B) (0, 24) (C) (10, 0) (D) $\left(\frac{13}{3}, 8\right)$

5. Area of a triangle whose vertices are (a cos θ, b sinθ), (–a sin θ, b cos θ) and (–a cos θ, – b sin θ) is -

(A) a b sin θ cos θ (B) a cos θ sin θ (C) $\frac{1}{2}$ ab (D) ab

6. The point A divides the join of the points (–5,1) and (3,5) in the ratio k : 1 and coordinates of points B and C are (1,5) and (7,–2) respectively. If the area of ΔABC be 2 units, then k equals -

(A) 7,9 (B) 6,7 (C) 7,31/9 (D) 9,31/9

7. If A(cos α, sinα), B (sinα, – cosα), C (1,2) are the vertices of a ΔABC, then as α varies, the locus of its centroid is -

(A) $x^2 + y^2 - 2x - 4y + 3 = 0$ (B) $x^2 + y^2 - 2x - 4y + 1 = 0$

(C) $3(x^2 + y^2) - 2x - 4y + 1 = 0$ (D) none of these

8. The points with the co-ordinates (2a, 3a), (3b, 2b) & (c, c) are collinear-

(A) for no value of a, b, c (B) for all values of a, b, c

(C) if a, $\frac{c}{5}$, b are in H.P. (D) if a, $\frac{2}{5}$ c, b are in H.P.

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

(A) $x^2 + y^2 = 2.5$ (B) $x^2 + y^2 = 25$ (C) $x^2 + y^2 = 100$ (D) none

10. The equation of the line cutting an intercept of 3 units on negative y-axis and inclined at an angle $\tan^{-1}\frac{3}{5}$ to the x-axis is -

(A) 5y – 3x + 15 = 0 (B) 5y – 3x = 15 (C) 3y – 5x + 15 = 0 (D) none of these

11. The equation of a straight line which passes through the point (–3, 5) such that the portion of it between the axes is divided by the point in the ratio 5 : 3, internally (reckoning from x-axis) will be -

(A) x + y – 2 = 0 (B) 2x + y + 1 = 0 (C) x + 2y – 7 = 0 (D) x – y + 8 = 0

12. The points $\left(0, \frac{8}{3}\right)$, (1, 3) and (82, 30) are vertices of- **[IIT-JEE 1986]**

(A) an obtuse angled triangle (B) an acute angled triangle

(C) a right angled triangle (D) an isosceles triangle

13. The straight lines x + y = 0, 3x + y – 4 = 0, x + 3y – 4 = 0 form a triangle which is- **[IIT-JEE 1983]**

(A) isosceles (B) equilateral (C) right angled (D) none of these

14. The co-ordinates of the vertices P, Q, R & S of square PQRS inscribed in the triangle ABC with vertices A ≡ (0, 0), B (3, 0) & C ≡ (2, 1) given that two of its vertices P, Q are on the side AB are respectively :

(A) $\left(\frac{1}{4}, 0\right), \left(\frac{3}{8}, 0\right), \left(\frac{3}{8}, \frac{1}{8}\right)$ & $\left(\frac{1}{4}, \frac{1}{8}\right)$ (B) $\left(\frac{1}{2}, 0\right), \left(\frac{3}{4}, 0\right), \left(\frac{3}{4}, \frac{1}{4}\right)$ & $\left(\frac{1}{2}, \frac{1}{4}\right)$

(C) (1, 0), $\left(\frac{3}{2}, 0\right), \left(\frac{3}{2}, \frac{1}{2}\right)$ & $\left(1, \frac{1}{2}\right)$ (D) $\left(\frac{3}{2}, 0\right), \left(\frac{9}{4}, 0\right), \left(\frac{9}{4}, \frac{3}{4}\right)$ & $\left(\frac{3}{2}, \frac{3}{4}\right)$

15. The equation of perpendicular bisector of the line segment joining the points (1, 2) and (–2, 0) is -

(A) $5x + 2y = 1$ (B) $4x + 6y = 1$ (C) $6x + 4y = 1$ (D) none of these

16. The number of possible straight lines, passing through (2, 3) and forming a triangle with coordinate axes, whose area is 12 sq. units, is -

(A) one (B) two (C) three (D) four

17. Points A & B are in the first quadrant ; point 'O' is the origin. If the slope of OA is 1, slope of OB is 7 and OA = OB, then the slope of AB is -

(A) $-1/5$ (B) $-1/4$ (C) $-1/3$ (D) $-1/2$

18. A line is perpendicular to $3x + y = 3$ and passes through a point (2, 2). Its y intercept is -

(A) 2/3 (B) 1/3 (C) 1 (D) 4/3

19. The equation of the line passing through the point (c, d) and parallel to the line $ax + by + c = 0$ is -

(A) $a(x + c) + b(y + d) = 0$ (B) $a(x + c) - b(y + d) = 0$ (C) $a(x - c) + b(y - d) = 0$ (D) none of these

20. The position of the point (8,–9) with respect to the lines $2x + 3y - 4 = 0$ and $6x + 9y + 8 = 0$ is -

(A) point lies on the same side of the lines (B) point lies on one of the lines

(C) point lies on the different sides of the line (D) point lies between the lines

21. If origin and (3, 2) are contained in the same angle of the lines $2x + y - a = 0$, $x - 3y + a = 0$, then 'a' must lie in the interval -

(A) $(-\infty, 0) \cup (8, \infty)$ (B) $(-\infty, 0) \cup (3, \infty)$ (C) (0, 3) (D) (3, 8)

22. The line $3x + 2y = 6$ will divide the quadrilateral formed by the lines $x + y = 5$, $y - 2x = 8$, $3y + 2x = 0$ & $4y - x = 0$ in -

(A) two quadrilaterals (B) one pentagon and one triangle

(C) two triangles (D) one triangle and one quadrilateral

23. If the point (a, 2) lies between the lines $x - y - 1 = 0$ and $2(x - y) - 5 = 0$, then the set of values of a is -

(A) $(-\infty, 3) \cup (9/2, \infty)$ (B) (3, 9/2) (C) $(-\infty, 3)$ (D) $(9/2, \infty)$

24. $A(x_1, y_1)$, $B(x_2, y_2)$ and $C(x_3, y_3)$ are three non-collinear points in cartesian plane. Number of parallelograms that can be drawn with these three points as vertices is -

(A) one (B) two (C) three (D) four

25. If P = (1,0) ; Q = (–1,0) & R = (2,0) are three given points, then the locus of the points S satisfying the relation, $SQ^2 + SR^2 = 2\,SP^2$ is -

(A) A straight line parallel to x-axis (B) A circle passing through the origin

(C) A circle with the centre at the origin (D) A straight line parallel to y-axis

26. The area of triangle formed by the lines $x + y - 3 = 0$, $x - 3y + 9 = 0$ and $3x - 2y + 1 = 0$ is -

(A) $\frac{16}{7}$ sq. units (B) $\frac{10}{7}$ sq. units (C) 4 sq. units (D) 9 sq. units

27. The co-ordinates of foot of the perpendicular drawn on line $3x - 4y - 5 = 0$ from the point (0, 5) is -

(A) (1, 3) (B) (2, 3) (C) (3, 2) (D) (3, 1)

28. If the sum of the distances of a point from two perpendicular lines in a plane is 1, then its locus is- **[JEE 1992]**

(A) square (B) circle (C) straight line (D) two intersecting lines

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

(A) 15/2 (B) 9/2 (C) 5 (D) none

30. Three vertices of triangle ABC are A(–1, 11), B(–9, –8) and C(15, –2). The equation of angle bisector of angle A is -

(A) $4x - y = 7$ (B) $4x + y = 7$ (C) $x + 4y = 7$ (D) $x - 4y = 7$

31. Given the four lines with the equations

$x + 2y - 3 = 0,\ 3x + 4y - 7 = 0$

$2x + 3y - 4 = 0,\ 4x + 5y - 6 = 0$

then **[JEE 1980]**

(A) they are all concurrent (B) they are the sides of a quadrilateral

(C) only three lines are concurrent (D) none of the above

32. The co-ordinates of the point of reflection of the origin (0, 0) in the line $4x - 2y - 5 = 0$ is -

(A) (1, –2) (B) (2, –1) (C) $\left(\frac{4}{5}, -\frac{2}{5}\right)$ (D) (2, 5)

33. If the axes are rotated through an angle of 30 in the anti-clockwise direction, the coordinates of point $(4, -2\sqrt{3})$ with respect to new axes are-

(A) $(2, \sqrt{3})$ (B) $(\sqrt{3}, -5)$ (C) (2, 3) (D) $(\sqrt{3}, 2)$

34. If one diagonal of a square is along the line $x = 2y$ and one of its vertex is (3, 0), then its sides through this vertex are given by the equations -

(A) $y - 3x + 9 = 0,\ x - 3y - 3 = 0$ (B) $y - 3x + 9 = 0,\ x - 3y - 3 = 0$

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

35. The line $(p + 2q)x + (p - 3q)y = p - q$ for different values of p and q passes through a fixed point whose co-ordinates are -

(A) $\left(\frac{3}{2}, \frac{5}{2}\right)$ (B) $\left(\frac{2}{5}, \frac{2}{5}\right)$ (C) $\left(\frac{3}{5}, \frac{3}{5}\right)$ (D) $\left(\frac{2}{5}, \frac{3}{5}\right)$

36. The equation $2x^2 + 4xy - py^2 + 4x + qy + 1 = 0$ will represent two mutually perpendicular straight lines, if -

(A) p=1 and q = 2 or 6 (B) p = – 2 and q = – 2 or 8

(C) p = 2 and q = 0 or 8 (D) p = 2 and q = 0 or 6

37. Equation of the pair of straight lines through origin and perpendicular to the pair of straight lines $5x^2 - 7xy - 3y^2 = 0$ is -

(A) $3x^2 - 7xy - 5y^2 = 0$ (B) $3x^2 + 7xy + 5y^2 = 0$ (C) $3x^2 - 7xy + 5y^2 = 0$ (D) $3x^2 + 7xy - 5y^2 = 0$

38. If the straight lines joining the origin and the points of intersection of the curve $5x^2 + 12xy - 6y^2 + 4x - 2y + 3 = 0$ and $x + ky - 1 = 0$ are equally inclined to the co-ordinate axis, then the value of k -

(A) is equal to 1 (B) is equal to –1 (C) is equal to 2 (D) does not exist in the set of real numbers

SELECT THE CORRECT ALTERNATIVES (ONE OR MORE THAN ONE CORRECT ANSWERS)

39. Coordinates of a point which is at 3 units distance from the point (1, –3) on the line $2x + 3y + 7 = 0$ is/are -

(A) $\left(1 + \frac{9}{\sqrt{13}}, 3 - \frac{6}{\sqrt{13}}\right)$ (B) $\left(1 - \frac{9}{\sqrt{13}}, -3 + \frac{6}{\sqrt{13}}\right)$ (C) $\left(1 + \frac{9}{\sqrt{13}}, -3 - \frac{6}{\sqrt{13}}\right)$ (D) $\left(1 - \frac{9}{\sqrt{13}}, 3 - \frac{6}{\sqrt{13}}\right)$

40. The angle between the lines $y - x + 5 = 0$ and $\sqrt{3}x - y + 7 = 0$ is/are -

(A) 15 (B) 60 (C) 165 (D) 75

41. If line $y - x + 2 = 0$ is shifted parallel to itself towards the x-axis by a perpendicular distance of $3\sqrt{2}$ units, then the equation of the new line is may be -

(A) $y = x + 4$ (B) $y = x + 1$ (C) $y = x - (2 + 3\sqrt{2})$ (D) $y = x - 8$

42. Three lines $px + qy + r = 0$, $qx + ry + p = 0$ and $rx + py + q = 0$ are concurrent if - **[JEE 1985]**

(A) $p + q + r = 0$ (B) $p^2 + q^2 + r^2 = pr + qr + pq$

(C) $p^3 + q^3 + r^3 = 3pqr$ (D) none of these

43. All points lying inside the triangle formed by the points (1, 3), (5, 0) and (–1, 2) satisfy - **[JEE 1986]**

(A) $3x + 2y \geq 0$ (B) $2x + y - 13 \geq 0$ (C) $2x - 3y - 12 \leq 0$ (D) $-2x + y \geq 0$

44. The diagonals of a square are along the pair of lines whose equation is $2x^2 - 3xy - 2y^2 = 0$. If (2, 1) is a vertex of the square, then the vertex of the square adjacent to it may be -

(A) (1, 4) (B) (–1, –4) (C) (–1, 2) (D) (1, –2)

45. Equation of two equal sides of a triangle are the lines $7x + 3y - 20 = 0$ and $3x + 7y - 20 = 0$ and the third side passes through the point (–3, 3), then the equation of the third side can be -

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

CHECK YOUR GRASP			ANSWER KEY				EXERCISE-1			
Que.	1	2	3	4	5	6	7	8	9	10
Ans.	D	A	C	A	D	C	C	D	B	A
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	D	D	A	D	C	C	D	D	C	A
Que.	21	22	23	24	25	26	27	28	29	30
Ans.	A	A	B	C	D	B	D	A	C	B
Que.	31	32	33	34	35	36	37	38	39	40
Ans.	C	B	B	D	D	C	A	B	B,C	A,C
Que.	41	42	43	44	45					
Ans.	A,D	A,B,C	A,C	C,D	A,B					

EXERCISE - 02 BRAIN TEASERS

SELECT THE CORRECT ALTERNATIVES (ONE OR MORE THAN ONE CORRECT ANSWERS)

1. The co-ordinates of a point P on the line $2x - y + 5 = 0$ such that $|PA - PB|$ is maximum where A is (4, – 2) and B is (2, – 4) will be -

(A) (11, 27) (B) (–11, – 17) (C) (–11, 17) (D) (0, 5)

2. The line $x + y = p$ meets the axis of x and y at A and B respectively. A triangle APQ is inscribed in the triangle OAB, O being the origin, with right angle at Q. P and Q lie respectively on OB and AB. If the area of the triangle APQ is $3/8^{th}$ of the area of the triangle OAB, then $\frac{AQ}{BQ}$ is equal to -

(A) 2 (B) 2/3 (C) 1/3 (D) 3

3. Lines, $L_1 : x + \sqrt{3}y = 2$, and $L_2 : ax + by = 1$, meet at P and enclose an angle of 45 between them. Line $L_3 : y = \sqrt{3}x$, also passes through P then -

(A) $a^2 + b^2 = 1$ (B) $a^2 + b^2 = 2$ (C) $a^2 + b^2 = 3$ (D) $a^2 + b^2 = 4$

4. A triangle is formed by the lines $2x - 3y - 6 = 0$; $3x - y + 3 = 0$ and $3x + 4y - 12 = 0$. If the points $P(\alpha,0)$ and $Q(0,\beta)$ always lie on or inside the ΔABC, then range of α & β -

(A) $\alpha \in [-1, 2]$ & $\beta \in [-2, 3]$ (B) $\alpha \in [-1, 3]$ & $\beta \in [-2, 4]$

(C) $\alpha \in [-2, 4]$ & $\beta \in [-3, 4]$ (D) $\alpha \in [-1, 3]$ & $\beta \in [-2, 3]$

5. 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

6. A ray of light passing through the point A (1, 2) is reflected at a point B on the x-axis line mirror and then passes through (5, 3). Then the equation of AB is -

(A) $5x + 4y = 13$ (B) $5x - 4y = -3$ (C) $4x + 5y = 14$ (D) $4x - 5y = -6$

7. Let the algebraic sum of the perpendicular distances from the points (3, 0), (0, 3) & (2, 2) to a variable straight line be zero, then the line passes through a fixed point whose co-ordinates are-

(A) (3, 2) (B) (2, 3) (C) $\left(\frac{3}{5}, \frac{3}{5}\right)$ (D) $\left(\frac{5}{3}, \frac{5}{3}\right)$

8. The image of the pair of lines respresented by $ax^2 + 2h\,xy + by^2 = 0$ by the line mirror $y = 0$ is :

(A) $ax^2 - 2hxy + by^2 = 0$ (B) $bx^2 - 2h\,xy + ay^2 = 0$

(C) $bx^2 + 2h\,xy + ay^2 = 0$ (D) $ax^2 - 2h\,xy - by^2 = 0$

9. The pair of straight lines $x^2 - 4xy + y^2 = 0$ together with the line $x + y + 4\sqrt{6} = 0$ form a triangle which is :

(A) right angled but not isosscles (B) right isosceles

(C) scalene (D) equilateral

10. Let A ≡ (3, 2) and B ≡ (5, 1). ABP is an equilateral triangle is constructed on the side of AB remote from the origin then the orthocentre of triangle ABP is -

(A) $\left(4 - \frac{1}{2}\sqrt{3}, \frac{3}{2} - \sqrt{3}\right)$ (B) $\left(4 + \frac{1}{2}\sqrt{3}, \frac{3}{2} + \sqrt{3}\right)$ (C) $\left(4 - \frac{1}{6}\sqrt{3}, \frac{3}{2} - \frac{1}{3}\sqrt{3}\right)$ (D) $\left(4 + \frac{1}{6}\sqrt{3}, \frac{3}{2} + \frac{1}{3}\sqrt{3}\right)$

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

(A) $y = -\sqrt{2}$ (B) $y = 2$ (C) $x = 2$ (D) $x = -2$

12. Distance between two lines respresented by the line pair, $x^2 - 4xy + 4y^2 + x - 2y - 6 = 0$ is -

(A) $\frac{1}{\sqrt{5}}$ (B) $\sqrt{5}$ (C) $2\sqrt{5}$ (D) none

13. The circumcentre of the triangle formed by the lines, $xy + 2x + 2y + 4 = 0$ and $x + y + 2 = 0$ is -

(A) (–1, –1) (B) (–2, –2) (C) (0, 0) (D) (–1, –2)

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

(A) $\frac{c^2}{2ab}$ (B) $\frac{2c^2}{ab}$ (C) $\frac{4c^2}{ab}$ (D) $\frac{ab}{4c^2}$

15. If the lines $ax + y + 1 = 0$, $x + by + 1 = 0$ & $x + y + c = 0$ where a, b & c are distinct real numbers different from 1 are concurrent, then the value of $\frac{1}{1-a}+\frac{1}{1-b}+\frac{1}{1-c}=$

(A) 4 (B) 3 (C) 2 (D) 1

16. If one vertex of an equilateral triangle of side 'a' lies at the origin and the other lies on the line $x-\sqrt{3}y=0$, then 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) $\left(-\frac{\sqrt{3}\ a}{2},\frac{a}{2}\right)$

17. The area enclosed by $2|x| + 3|y| \le 6$ is -

(A) 3 sq. units (B) 4 sq. units (C) 12 sq. units (D) 24 sq. units

18. The point (4, 1) undergoes the following three transformations successively -

(i) Reflection about the line $y = x$

(ii) Translation through a distance 2 units along the positive directions of x-axis.

(iii) Rotation through an angle $\pi/4$ about the origin.

The final position of the point is given by the coordinates :

(A) $\left(\frac{7}{\sqrt{2}}, -\frac{1}{\sqrt{2}}\right)$ (B) $\left(\frac{7}{\sqrt{2}}, \frac{1}{\sqrt{2}}\right)$ (C) $\left(-\frac{1}{\sqrt{2}}, \frac{7}{\sqrt{2}}\right)$ (D) none of these

19. If the equation $ax^2 - 6xy + y^2 + bx + cx + d = 0$ represents a pair of lines whose slopes are m and m^2, then value(s) of a is/are -

(A) $a = -8$ (B) $a = 8$ (C) $a = 27$ (D) $a = -27$

20. Given the family of lines, $a(3x + 4y + 6) + b(x + y + 2) = 0$. The line of the family situated at the greatest distance from the point P (2,3) has equation -

(A) $4x + 3y + 8 = 0$ (B) $5x + 3y + 10 = 0$ (C) $15x + 8y + 30 = 0$ (D) none

21. If the vertices P, Q, R of a triangle PQR are rational points, which of the following points of the triangle PQR is/are always rational point (s) ? **[JEE 98]**

(A) centriod (B) incentre (C) circumcentre (D) orthocentre

22. Let PQR be a right angled isosceles triangle, right angled at P (2, 1). If the equation of the line QR is $2x + y = 3$, then the equation representing the pair of lines PQ and PR is - **[JEE 99]**

(A) $3x^2 - 3y^2 + 8xy + 20x + 10y + 25 = 0$ (B) $3x^2 - 3y^2 + 8xy - 20x - 10y + 25 = 0$

(C) $3x^2 - 3y^2 + 8xy + 10x + 15y + 20 = 0$ (D) $3x^2 - 3y^2 - 8xy - 10x - 15y - 20 = 0$

BRAIN TEASERS	ANSWER KEY					EXERCISE-2			
Que.	1	2	3	4	5	6	7	8	9	10
Ans.	B	D	B	D	C	A	D	A	D	D
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	C	B	A	B	D	A,B,C,D	C	C	B,D	A
Que.	21	22								
Ans.	A,C,D	B								

EXERCISE-03 MISCELLANEOUS TYPE QUESTIONS

MATCH THE COLUMN

Following questions contains statements given in two columns, which have to be matched. The statements in **Column-I** are labelled as A, B, C and D while the statements in **Column-II** are labelled as p, q, r and s. Any given statement in **Column-I** can have correct matching with **ONE** statement in **Column-II**.

1.

	Column-I		Column-II
(A)	If $3a - 2b + 5c = 0$, then family of straight lines $ax + by + c = 0$ are always concurrent at a point whose co-ordinates is (a, b), then the values of $a - 5b$	(p)	$3\sqrt{2}$
(B)	Number of integral values of b for which the origin and the point (1, 1) lie on the same side of the straight line $a^2x + aby + 1 = 0$ for all $a \in R - \{0\}$ is	(q)	5
(C)	Vetices of a right angled triangle lie on a circle and extrimites of whose hypotenuse are (6, 0) and (0, 6), then radius of circle is	(r)	12
(D)	If the slope of one of the lines represented by $ax^2 - 6xy + y^2 = 0$ is square of the other, then a is	(s)	3
		(t)	8

2.

	Column-I		Column-II
(A)	Two adjacent sides of a parallogram are $4x + 5y = 0$ and $7x + 2y = 0$ and one diagonal is $ax + by + c = 0$, then $a + b + c$ is equal to	(p)	1
(B)	If line $2x - by + 1 = 0$ intersects the curve $2x^2 - by^2 + (2b - 1)xy - x - by = 0$ at points A & B and AB subtends a right angle at origin, then value of $b + b^2$ is equal to	(q)	0
(C)	A line passes through point (3, 4) and the point of intersection of the lines $4x + 3y = 12$ and $3x + 4y = 12$ and length of intercepts on the co-ordinate axes are a and b, then ab is equal to	(r)	5
(D)	A light ray emerging from the point source placed at P(2, 3) is reflected at a point 'Q' on the y-axis and then passes through the point R(5, 10). If co-ordinates of Q are (a, b), then $a + b$ is	(s)	4

ASSERTION & REASON

These questions contain, Statement-I (assertion) and Statement-II (reason).

(A) Statement-I is true, Statement-II is true ; Statement-II is 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.

1. Let $L_1 : a_1x + b_1y + c_1 = 0$, $L_2 : a_2x + b_2y + c_2 = 0$ and $L_3 : a_3x + b_3y + c_3 = 0$.

Statement-I : If L_1, L_2 and L_3 are three concurrent lines, then $\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix} = 0$.

Because

Statement-II : If $\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix} = 0$, then the lines L_1, L_2 and L_3 must be concurrent.

(A) A (B) B (C) C (D) D

2. **Statement-I :** The diagonals of the parallelogram whose sides are $\ell x + my + n = 0$, $\ell x + my + n' = 0$, $mx + \ell y + n = 0$, $mx + \ell y + n' = 0$ are perpendicular.

Because

Statement-II : If the perpedicular distances between parallel sides of a parallelogram are equal, then it is a rhombus.

(A) A (B) B (C) C (D) D

3. **Statement-I :** The equation $2x^2 + 3xy - 2y^2 + 5x - 5y + 3 = 0$ represents a pair of perpendicular straight lines.

Because

Statement-II : A pair of lines given by $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ are perpendicular, if $a + b = 0$

(A) A (B) B (C) C (D) D

4. **Statement-I :** The joint equation of lines $2y = x+1$ and $2y = -(x+1)$ is $4y^2 = -(x + 1)^2$.

Because

Statement-II : The joint equation of two lines satisfy every point lying on any one of the line.

(A) A (B) B (C) C (D) D

COMPREHENSION BASED QUESTIONS

Comprehension # 1 :

A locus is the curve traced out by a point which moves under certain geomatrical conditions:

To find the locus of a point first we assume the co-ordinates of the moving point as (h,k) and then try to find a relation between h and k with the help of the given conditions of the problem. If there is any variable involved in the process then we eliminate them. At last we replace h by x and k by y and get the locus of the point which will be an equation in x and y.

On the basis of above information, answer the following questions :

1. Locus of centroid of the triangle whose vertices are (acost, asint), (bsint, – bcost) and (1, 0) where t is a parameter is -

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

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

2. A variable line cuts x-axis at A, y-axis at B where OA = a, OB = b (O as origin) such that $a^2 + b^2 = 1$ then the locus of circumcentre of Δ OAB is -

(A) $x^2 + y^2 = 4$ (B) $x^2 + y^2 = 1/4$ (C) $x^2 - y^2 = 4$ (D) $x^2 - y^2 = 1/4$

3. The locus of the point of intersection of the lines $x\cos\alpha + y\sin\alpha = a$ and $x\sin\alpha - y\cos\alpha = b$ where α is variable is -

(A) $x^2 + y^2 = a^2 + b^2$ (B) $x^2 + y^2 = a^2 - b^2$ (C) $x^2 - y^2 = a^2 - b^2$ (D) $x^2 - y^2 = a^2 + b^2$

Comprehension # 2 :

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

On the basis of above information, answer the following questions :

1. Let R(x, y), such that R is equidistant from the points O and A with respect to new distance and if $0 \le x < 1$ and $0 \le y < 2$, then R lies on a line segment whose equation is -

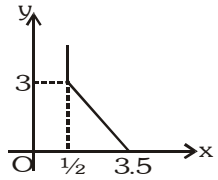
(A) $x + y = 3$ (B) $x + 2y = 3$ (C) $2x + y = 3$ (D) $2x + 2y = 3$

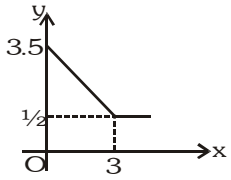
2. Let S(x, y), such that S is equidistant from points O and B with respect to new distance and if $x \geq 2$ and $0 \leq y < 3$, then locus of S is -

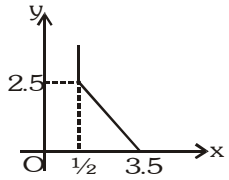
(A) a line segment (B) a line

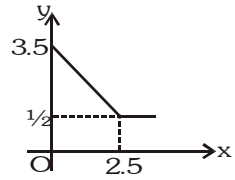
(C) a vertical ray (D) a horizontal ray

3. Let T(x, y), such that T is equidistant from point O and C with respect to new distance and if T lies 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) 

MISCELLANEOUS TYPE QUESTION **ANSWER KEY** EXERCISE-3

- ***Match the Column***

  1. (A)→(q); (B)→(s); (C)→(p); (D)→(t) **2.** (A)→(q); (B)→(s); (C)→(p); (D)→(r)

- ***Assertion & Reason***

  1. C **2.** A **3.** D **4.** D

- ***Comprehension Based Questions***

  Comprehension # 1 : 1. B **2.** B **3.** A

  Comprehension # 2 : 1. D **2.** D **3.** A

EXERCISE - 04 [A] CONCEPTUAL SUBJECTIVE EXERCISE

1. Determie the ratio in which the point P(3, 5) divides the join of A(1, 3) & B(7, 9). Find the harmonic conjugate of P w.r.t. A & B.

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

3. Two vertices of a triangle are (4, – 3) & (– 2, 5). If the orthocentre of the triangle is at (1, 2), find the coordinates of the third vertex.

4. The line 3x + 2y = 24 meets the y-axis at A & the x-axis at B. The perpendicular bisector of AB meets the line through (0,–1) parallel to x-axis at C. Find the area of the triangle ABC.

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

6. A straight line L is perpendicular to the line 5x – y = 1. The area of the triangle formed by the line L & the coordinate axes is 5. Find the equation of the line.

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

[IIT-JEE 1990]

8. 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 & intersecting the sides OB & OC, whose perpendicular distance from the point (0, 0) is half.

9. If the straight line drawn through the point $P\left(\sqrt{3},2\right)$ & making an angle $\frac{\pi}{6}$ with the x-axis, meets the line $\sqrt{3}x-4y+8=0$ at Q. Find the length PQ.

10. The points (1, 3) & (5, 1) are two opposite vertices of a rectangle. The other two vertices lie on the line y = 2x + c. Find c & the remaining vertices.

11. If a, b, c are all different and the points $\left(\frac{r^3}{r-1},\frac{r^2-3}{r-1}\right)$ where r = a, b, c are collinear, then prove that 3(a + b + c) = ab + bc + ca – abc.

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. find possible co-ordinates of A. **[IIT-JEE 1985]**

13. Find the direction in which a straight line may be drawn through the point (2, 1) so that its point of intersection with the line $4y - 4x + 4 + 3\sqrt{2} + 3\sqrt{10} = 0$ is at a distance of 3 unit from (2, 1).

14. Straight lines 3x + 4y = 5 and 4x – 3y = 15 intersect at the point A. Points B and C are chosen on these two lines such that AB = AC. Determine the possible equations of the line BC passing through the point (1, 2) **[IIT-JEE 1990]**

15. Find the equation of the line which bisects the obtuse angle between the lines x – 2y + 4 = 0 and 4x – 3y + 2 = 0. **[IIT-JEE 1978]**

16. A line through A (–5, –4) meets the line x + 3y + 2 = 0, 2x + y + 4 = 0 and x – y – 5 = 0 at the points B, C & D respectively, 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.

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

18. In a triangle ABC, D is a point on BC such that $\frac{BD}{DC} = \frac{AB}{AC}$. The equation of the line AD is $2x + 3y + 4 = 0$ & the equation of the line AB is $3x + 2y + 1 = 0$. Find the equation of the line AC.

19. Show that all the chords of the curve $3x^2 + 3y^2 - 2x + 4y = 0$ which subtend a right angle at the origin are concurrent. Also find the point of concurrency.

CONCEPTUAL SUBJECTIVE EXERCISE — ANSWER KEY — EXERCISE-4(A)

1. 1 : 2 ; Q (–5, –3) **2.** $\left(\frac{7}{2}, \frac{13}{2}\right)$ or $\left(-\frac{3}{2}, \frac{3}{2}\right)$ **3.** (33, 26) **4.** 91 sq. units

5. $83x - 35y + 92 = 0$ **6.** $x + 5y + 5\sqrt{2} = 0$ or $x + 5y - 5\sqrt{2} = 0$

7. $x^2 + y^2 - 7x + 5y = 0$ **8.** $2x + 2y + \sqrt{2} = 0$ **9.** 6 units

10. C = – 4 ; B (2, 0) ; D (4, 4) **12.** $\left(0, \frac{5}{2}\right), (0,0)$ **13.** 171 , 99 **14.** x– 7y + 13 = 0 and 7x + y – 9 = 0

15. $\left(4+\sqrt{5}\right)x - \left(2\sqrt{5}+3\right)y + \left(4\sqrt{5}+2\right) = 0$ **16.** $2x + 3y + 22 = 0$ **18.** $9x + 46y + 83 = 0$

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

EXERCISE - 04 [B] BRAIN STORMING SUBJECTIVE EXERCISE

1. Find the equation of the straight lines passing through (–2, – 7) & having an intercept of length 3 between the straight lines $4x + 3y = 12$, $4x + 3y = 3$.

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

3. Find the co-ordinates of the orthocentre of the triangle, the equations of whose sides are $x + y = 1$, $2x + 3y = 6$, $4x - y + 4 = 0$, without finding the co-ordinates of its vertices.

4. Let ABC be a triangle with AB = AC. If D is the midpoint of BC, E is the foot of the perpendicular drawn from D to AC and F the mid-point of DE, prove that AF is perpendicular to BE. **[IIT-JEE 1989]**

5. Find the condition that the diagonals of the parallelogram formed by the lines $ax + by + c = 0$; $ax + by + c' = 0$; $a'x + b'y + c = 0$ & $a'x + b'y + c' = 0$ are at right angles. Also find the equation to the diagonals of the parallelogram.

6. Find the co-ordinates of the incentre of the triangle formed by the line $x + y + 1 = 0$; $x - y + 3 = 0$ & $7x - y + 3 = 0$. Also find the centre of the circle escribed to $7x - y + 3 = 0$.

7. Lines $L_1 \equiv ax + by + c = 0$ and $L_2 \equiv \ell x + my + n = 0$ intersect at the point P and makes an angle θ with each other. Find the equation of a line L different from L_2 which passes through P and makes the same angle θ with L_1 **[IIT-JEE 1988]**

8. A triangle is formed by the lines whose equations are AB : $x + y - 5 = 0$, BC : $x + 7y - 7 = 0$ and CA : $7x + y - 14 = 0$. Find the bisector of the interior angle at B and the exterior angle at C. Determine the nature of the interior angle at A and find the equation of the bisector.

9. The distance of a point (x_1, y_1) from each of two straight lines which passes through the origin of co-ordinates is δ ; find the combined equation of these straight lines.

10. Equation of a line is given by $y + 2at = t(x - at^2)$, t being the parameter. Find the locus of the point intersection of the lines which are at right angles.

11. 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. **[IIT-JEE 1996]**

12. A variable straight line of slope 4 intersects the hyperbola $xy=1$ at two points. Find the locus of the point which divides the line segment between these two points in the ratio 1 : 2. **[IIT-JEE 1997]**

13. The vertices of a triangle are A $(x_1, x_1 \tan\theta_1)$, B $(x_2, x_2 \tan\theta_2)$ & C $(x_3, x_3 \tan\theta_3)$. If the circumcentre O of the triangle ABC is at the origin & H $(\bar{x}, \bar{y})$ be its orthocentre, then show that $\frac{\bar{x}}{\bar{y}} = \frac{\cos\theta_1 + \cos\theta_2 + \cos\theta_3}{\sin\theta_1 + \sin\theta_2 + \sin\theta_3}$.

14. The ends A, B of a straight line segment of constant length 'c' slide upon the fixed rectangular axes OX & OY respectively. If the rectangle OAPB be completed then show that the locus of the foot of the perpendicular drawn from P to AB is $x^{2/3} + y^{2/3} = c^{2/3}$.

BRAIN STORMING SUBJECTIVE EXERCISE — ANSWER KEY — EXERCISE-4(B)

1. $7x + 24y + 182 = 0$ or $x = -2$ **2.** $-\frac{3}{2} < \alpha < -1 \cup \frac{1}{2} < \alpha < 1$ **3.** $\left(\frac{3}{7}, \frac{22}{7}\right)$

5. $a^2 + b^2 = a'^2 + b'^2$; $(a + a')x + (b + b')y + (c + c') = 0$; $(a - a')x + (b - b')y = 0$ **6.** $(-1, 1)$; $(4, 1)$

7. $2(a\ell + bm)(ax + by + c) - (a^2 + b^2)(\ell x + my + n) = 0$

8. $3x + 6y - 16 = 0$; $8x + 8y - 21 = 0$; acute angle bisector, $12x + 6y - 39 = 0$

9. $(y_1^2 - \delta^2)x^2 - 2x_1y_1xy + (x_1^2 - \delta^2)y^2 = 0$ **10.** $y^2 = a(x - 3a)$

11. $(m^2 - 1)x - my + b(m^2 + 1) + am = 0$ **12.** $16x^2 + y^2 + 10xy = 2$

EXERCISE - 05 [A] JEE-[MAIN] : PREVIOUS YEAR QUESTIONS

1. The angle between the straight lines $x^2 + 4xy + y^2 = 0$ is- **[AIEEE 2002]**

(1) 30 (2) 45 (3) 60 (4) 90

2. The distance between a pair of parallel lines $9x^2 - 24xy + 16y^2 - 12x + 16y - 12 = 0$ **[AIEEE 2002]**

(1) 5 (2) 8 (3) 8/5 (4) 5/8

3. A square of sides a lies above the x-axis and has one vertex at the origin. The side passing through the origin makes an angle α $(0 < \alpha < \pi/4)$ with the positive direction of x-axis.The equation of its diagonal not passing through the origin is- **[AIEEE 2003]**

(1) $y(\cos\alpha + \sin\alpha) + x(\cos\alpha - \sin\alpha) = a$ (2) $y(\cos\alpha - \sin\alpha) - x(\sin\alpha - \cos\alpha) = a$

(3) $y(\cos\alpha + \sin\alpha) + x(\sin\alpha - \cos\alpha) = a$ (4) $y(\cos\alpha + \sin\alpha) + x(\sin\alpha + \cos\alpha) = a$

4. If the pair of straight lines $x^2 - 2pxy - y^2 = 0$ and $x^2 - 2qxy - y^2 = 0$ be such that each pair bisects the angle between the other pair, then- **[AIEEE 2003]**

(1) $pq = -1$ (2) $p = q$

(3) $p = -q$ (4) $pq = 1$

5. Locus of centroid of the triangle whose vertices are (a cos t, a sin t), (b sin t, – b cos t) and (1,0), where t is a parameter, is- **[AIEEE 2003]**

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

(3) $(3x - 1)^2 + (3y)^2 = a^2 + b^2$ (4) $(3x + 1)^2 + (3y)^2 = a^2 + b^2$

6. 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- **[AIEEE 2003]**

(1) $\sqrt{a_1^2 + b_1^2 - a_2^2 - b_2^2}$ (2) $\frac{1}{2}(a_2^2 + b_2^2 - a_1^2 - b_1^2)$

(3) $a_1^2 - a_2^2 + b_1^2 - b_2^2$ (4) $\frac{1}{2}(a_1^2 + a_2^2 + b_1^2 + b_1^2)$

7. The equation of the straight line passing through the point (4,3) and making intercepts on the coordinate axes whose sum is –1 is- **[AIEEE 2004]**

(1) $\frac{x}{2} + \frac{y}{3} = -1$ and $\frac{x}{-2} + \frac{y}{1} = -1$ (2) $\frac{x}{2} - \frac{y}{3} = -1$ and $\frac{x}{-2} + \frac{y}{1} = -1$

(3) $\frac{x}{2} + \frac{y}{3} = 1$ and $\frac{x}{2} + \frac{y}{1} = 1$ (4) $\frac{x}{2} - \frac{y}{3} = 1$ and $\frac{x}{-2} + \frac{y}{1} = 1$

8. If the sum of the slopes of the lines given by $x^2 - 2cxy - 7y^2 = 0$ is four times their product, then c has the value- **[AIEEE 2004]**

(1) 1 (2) –1 (3) 2 (4) –2

9. If one of the lines given by $6x^2 - xy + 4cy^2 = 0$ is $3x + 4y = 0$, then c equals- **[AIEEE 2004]**

(1) 1 (2) –1 (3) 3 (4) –3

10. The line parallel to the x-axis and passing through the intersection of the lines $ax + 2by + 3b = 0$ and $bx - 2ay - 3a = 0$ is, (where $(a,b) \neq (0,0)$) **[AIEEE 2005]**

(1) below the x-axis at a distance of $\frac{3}{2}$ from it (2) below the x-axis at a distance of $\frac{2}{3}$ from it

(3) above the x-axis at a distance of $\frac{3}{2}$ from it (4) above the x-axis at a distance of $\frac{2}{3}$ from it

11. If non-zero numbers a,b,c are in H.P., then the straight line $\frac{x}{a}+\frac{y}{b}+\frac{1}{c}=0$ always passes through a fixed point that point is- **[AIEEE 2005]**

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

12. A straight line passing through the point A(3,4) is such that its intercept between the axes is bisected at A. Then its equation is- **[AIEEE 2006]**

(1) 3x – 4y + 7 = 0 (2) 4x + 3y = 24 (3) 3x + 4y = 25 (4) x + y = 7

13. 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- **[AIEEE 2006]**

(1) $(3,\infty)$ (2) $\left(\frac{1}{2},3\right)$ (3) $\left(-3,-\frac{1}{2}\right)$ (4) $\left(0,\frac{1}{2}\right)$

14. Let P(–1,0) Q(0,0) and R$(3,3\sqrt{3})$ be three points. The equation of the bisector of the angle PQR is- **[AIEEE 2007], [IIT Scr. 2002]**

(1) $\sqrt{3}$ x + y = 0 (2) $x+\frac{\sqrt{3}}{2}y=0$ (3) $\frac{\sqrt{3}}{2}x+y=0$ (4) $x+\sqrt{3}y=0$

15. If one of the lines of $my^2 + (1 - m^2)xy - mx^2 = 0$ is a bisector of the angle between the lines xy=0, then m is- **[AIEEE 2007]**

(1) $-\frac{1}{2}$ (2) –2 (3) 1 (4) 2

16. The perpendicular bisector of the line segment joining P (1, 4) and Q (k, 3) has y–intercept –4. Then a possible value of k is- **[AIEEE 2008]**

(1) 1 (2) 2 (3) –2 (4) –4

17. The lines $p(p^2 + 1) x - y + q = 0$ and $(p^2 + 1)^2x + (p^2 + 1)y + 2q = 0$ are **[AIEEE 2009]**

Perpendicular to a common line for :

(1) Exactly two values of p (2) More than two values of p

(3) No value of p (4) Exactly one value of p

18. 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 : **[AIEEE-2010]**

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

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

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

Statement - 2 : In any triangle, bisector of an angle divides the triangle into two similar triangles. **[AIEEE 2011]**

(1) Statement-1 is true, Statement-2 is false.

(2) Statement-1 is false, Statement-2 is true

(3) Statement-1 is true, Statement-2 is true; Statement-2 is a correct explanation for Statement-1

(4) Statement-1 is true, Statement-2 is true; Statement-2 is **not** a correct explanation for Statement-1.

20. The lines $x + y = |a|$ and $ax - y = 1$ intersect each other in the first quadrant. Then the set of all possible values of a is the interval : **[AIEEE 2011]**

(1) $(-1, 1]$ (2) $(0, \infty)$ (3) $[1, \infty)$ (4) $(-1, \infty)$

21. A line is drawn through the point (1, 2) to meet the coordinate axes at P and Q such that it forms a triangle OPQ, where O is the origin. If the area of the triangle OPQ is least, then the slope of the line PQ is : **[AIEEE 2012]**

(1) $-\frac{1}{2}$ (2) $-\frac{1}{4}$ (3) -4 (4) -2

22. 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 : **[AIEEE 2012]**

(1) $\frac{11}{5}$ (2) $\frac{29}{5}$ (3) 5 (4) 6

23. A ray of light along $x + \sqrt{3}y = \sqrt{3}$ gets reflected upon reaching x-axis, the equation of the reflected ray is : **[JEE(Main)-2013]**

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

24. The x-coordinate of the incentre of the triangle that has the coordinates of mid points of its sides as (0, 1)(1, 1) and (1, 0) is : **[JEE(Main)-2013]**

(1) $2 + \sqrt{2}$ (2) $2 - \sqrt{2}$ (3) $1 + \sqrt{2}$ (4) $1 - \sqrt{2}$

PREVIOUS YEARS QUESTIONS **ANSWER KEY** EXERCISE-5 [A]

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans	3	3	1	1	3	2	4	3	4	1	3	2	2	1	3
Que.	16	17	18	19	20	21	22	23	24						
Ans	4	4	4	1	3	4	4	2	2						

EXERCISE - 05 [B] JEE-[ADVANCED] : PREVIOUS YEAR QUESTIONS

1. (a) Area of the parallelogram formed by the lines $y = mx$, $y = mx + 1$, $y = nx$ and $y = nx + 1$ equals

(A) $\frac{|m+n|}{(m-n)^2}$ (B) $\frac{2}{|m+n|}$ (C) $\frac{1}{|m+n|}$ (D) $\frac{1}{|m-n|}$

(b) The number of integer values of m, for which the x co-ordinate of the point of intersection of the lines $3x + 4y = 9$ and $y = mx + 1$ is also an integer, is

(A) 2 (B) 0 (C) 4 (D) 1

[JEE 2001 (Screening)]

2. (a) Let P = (–1, 0), Q = (0, 0) and R = $(3, 3\sqrt{3})$ be three points. Then the equation of the bisector of the angle PQR is

(A) $\frac{\sqrt{3}}{2}x + y = 0$ (B) $x + \sqrt{3}y = 0$ (C) $\sqrt{3}x + y = 0$ (D) $x + \frac{\sqrt{3}}{2}y = 0$

(b) A straight line through the origin O meets the parallel lines $4x + 2y = 9$ and $2x + y + 6 = 0$ at points P and Q respectively. Then the point O divides the segment PQ in the ratio

(A) 1 : 2 (B) 3 : 4 (C) 2 : 1 (D) 4 : 3

(c) The area bounded by the curves $y = |x| - 1$ and $y = -|x| + 1$ is

(A) 1 (B) 2 (C) $2\sqrt{2}$ (D) 4

[JEE 2002 (Screening)]

(d) A straight line L through the origin meets the line $x+ y = 1$ and $x + y = 3$ at P and Q respectively. Through P and Q two straight lines L_1 and L_2 are drawn, parallel to $2x - y = 5$ and $3x + y = 5$ respectively. Lines L_1 and L_2 intersect at R. Show that the locus of R, as L varies, is a straight line. **[JEE 2002 (Mains)]**

(e) A straight line L with negative slope passes through the point (8,2) and cuts the positive coordinates axes at points P and Q. Find the absolute minimum value of OP + OQ, as L varies, where O is the origin. **[JEE 2002 Mains, 5]**

3. The area bounded by the angle bisectors of the lines $x^2 - y^2 + 2y = 1$ and the line $x + y = 3$, is

(A) 2 (B) 3 (C) 4 (D) 6

[JEE 2004 (Screening)]

4. The area of the triangle formed by the intersection of a line parallel to x-axis and passing through P(h,k) with the lines $y = x$ and $x + y = 2$ is $4h^2$. Find the locus of the point P. **[JEE 2005, Mains, 2]**

5. (a) Let O(0, 0), P (3, 4), Q(6, 0) be the vertices of the triangle OPQ. The point R inside the triangle OPQ is such that the triangles OPR, PQR, OQR are of equal area. The coordinates of R are

(A) $(4/3, 3)$ (B) $(3, 2/3)$ (C) $(3, 4/3)$ (D) $(4/3, 2/3)$

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

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

because

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

(A) Statement-1 is true, statement-2 is true; statement-2 is a correct explanation for statement-1.

(B) Statement-1 is true, statement-2 is true; statement-2 is NOT a correct explanation for statement-1.

(C) Statement-1 is true, statement-2 is false.

(D) Statement-1 is false, statement-2 is true. **[JEE 2007, 3+3]**

6. Consider the lines given by

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

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

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

Match the statements / Expression in **Column-I** with the statements / Expressions in **Column-II** and indicate your answer by darkening the appropriate bubbles in the 4 4 matrix given in OMR.

	Column-I		**Column-II**
(A)	L_1, L_2, L_3 are concurrent, if	(P)	$k = -9$
(B)	One of L_1, L_2, L_3 is parallel to at least one of the other two, if	(Q)	$k = -\frac{6}{5}$
(C)	L_1, L_2, L_3 form a triangle, if	(R)	$k = \frac{5}{6}$
(D)	L_1, L_2, L_3 do not form a triangle, if	(S)	$k = 5$

[JEE 2008, 6]

7. Let P, Q, R and S be the points on the plane with position vectors $-2\tilde{i} - \tilde{j}, 4\tilde{i}, 3\tilde{i} + 3\tilde{j}$ and $-3\tilde{i} + 2\tilde{j}$ respectively.

The quadrilateral PQRS must be a

(A) parallelogram, which is neither a rhombus nor a rectangle

(B) square

(C) rectangle, but not a square

(D) rhombus, but not a square **[JEE 2010, 3]**

8. 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 intersect the x-axis, then the equation of L is **[JEE 2011, 3 (–1)]**

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

9. For a > b > c > 0, 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 **[JEE(Advanced) 2013, 2M]**

(A) a + b – c > 0 (B) a – b + c < 0

(C) a – b + c > 0 (D) a + b – c < 0

PREVIOUS YEARS QUESTIONS	ANSWER KEY	EXERCISE-5 [B]

1. (a) D; (b) A **2.** **(a)** C; **(b)** B; **(c)** B; **(d)** x – 3y + 5 = 0; **(e)** 18

3. A **4.** y = 2x + 1, y = – 2x + 1 **5.** (a) C; (b) C

6. (A) S; (B) P,Q; (C) R ; (D) P,Q,S **7.** A **8.** B **9.** A or C or A,C