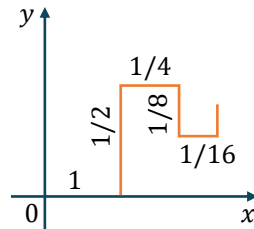


EXERCISE - O

SINGLE CORRECT TYPE QUESTIONS

1. A particle begins at the origin and moves successively in the following manner as shown,
 1 unit to the right, 1/2 unit up, 1/4 unit to the right,
 1/8 unit down, 1/16 unit to the right etc.



The length of each move is half the length of the previous move and movement continues in the 'zigzag' manner infinitely. The co-ordinates of the point to which the 'zigzag' converges is -

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

MSL001

2. Suppose ABC is a triangle with 3 acute angles A, B and C . The point whose coordinates are $(\cos B - \sin A, \sin B - \cos A)$ can be in the -
 (A) first and 2nd quadrant (B) second and 3rd quadrant
 (C) third and 4th quadrant (D) second quadrant only

MSL002

3. If in triangle ABC , $A \equiv (1, 10)$, circumcentre $\equiv \left(-\frac{1}{3}, \frac{2}{3}\right)$ and orthocentre $\equiv \left(\frac{11}{3}, \frac{4}{3}\right)$ then the co-ordinates of mid-point of side opposite to A is-
 (A) $(1, -11/3)$ (B) $(1, 5)$ (C) $(1, -3)$ (D) $(1, 6)$

MSL003

4. The co-ordinates of the orthocentre of the triangle bounded by the lines, $4x - 7y + 10 = 0$; $x + y = 5$ and $7x + 4y = 15$ is-
 (A) $(2, 1)$ (B) $(-1, 2)$ (C) $(1, 2)$ (D) $(1, -2)$

MSL004

5. A triangle has two of its vertices at $(0, 1)$ and $(2, 2)$ in the cartesian plane. Its third vertex lies on the x -axis. If the area of the triangle is 2 square units then the sum of the possible abscissae of the third vertex, is-
 (A) -4 (B) 0 (C) 5 (D) 6

MSL005

6. A line passes through $(2, 2)$ and cuts a triangle of area 9 square units from the first quadrant. The sum of all possible values for the slope of such a line, is-
 (A) -2.5 (B) -2 (C) -1.5 (D) -1

MSL006

7. Let $A(2, -3)$ and $B(-2, 1)$ be vertices of a $\triangle ABC$. If the centroid of $\triangle ABC$ moves on the line $2x + 3y = 1$, then the locus of the vertex C is-
 (A) $2x + 3y = 9$ (B) $2x - 3y = 7$
 (C) $3x + 2y = 5$ (D) $3x - 2y = 3$

MSL007

8. 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
MSL008
9. The area of the parallelogram formed by the lines $3x + 4y = 7a$; $3x + 4y = 7b$; $4x + 3y = 7c$ and $4x + 3y = 7d$ is-
 (A) $\frac{|(a-b)(c-d)|}{7}$ (B) $|(a-b)(c-d)|$
 (C) $\frac{|(a-b)(c-d)|}{49}$ (D) $7|(a-b)(c-d)|$
MSL009
10. If the lines $\left. \begin{array}{l} \lambda x + (\sin \alpha)y + \cos \alpha = 0 \\ x + (\cos \alpha)y + \sin \alpha = 0 \\ x - (\sin \alpha)y + \cos \alpha = 0 \end{array} \right\}$ pass through the same point where $\alpha \in R$ then λ lies in the interval -
 (A) $[-1,1]$ (B) $[-\sqrt{2},\sqrt{2}]$ (C) $[-2,2]$ (D) $(-\infty,\infty)$
MSL010
11. 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
MSL011
12. Consider a parallelogram whose sides are represented by the lines $2x + 3y = 0$; $2x + 3y - 5 = 0$; $3x - 4y = 0$ and $3x - 4y = 3$. The equation of the diagonal not passing through the origin, is-
 (A) $21x - 11y + 15 = 0$ (B) $9x - 11y + 15 = 0$
 (C) $21x - 29y - 15 = 0$ (D) $21x - 11y - 15 = 0$
MSL012
13. Let $S = \{(x, y) | x^2 + 2xy + y^2 - 3x - 3y + 2 = 0\}$, then S -
 (A) consists of two coincident lines.
 (B) consists of two parallel lines which are not coincident.
 (C) consists of two intersecting lines.
 (D) is a parabola.
MSL013
14. The line $x = c$ cuts the triangle with corners $(0,0)$; $(1,1)$ and $(9,1)$ into two region. For the area of the two regions to be the same c must be equal to-
 (A) $5/2$ (B) 3 (C) $7/2$ (D) 3 or 15
MSL014
15. If m and b are real numbers and $mb > 0$, then the line whose equation is $y = mx + b$ cannot contain the point-
 (A) $(0,2009)$ (B) $(2009,0)$
 (C) $(0,-2009)$ (D) $(20,-100)$
MSL015

Point and Straight Lines

16. In a triangle ABC , side AB has the equation $2x + 3y = 29$ and the side AC has the equation, $x + 2y = 16$. If the mid-point of BC is $(5,6)$ then the equation of BC is :
 (A) $x - y = -1$ (B) $5x - 2y = 13$ (C) $x + y = 11$ (D) $3x - 4y = -9$

MSL016

17. The vertex of the right angle of a right angled triangle lies on the straight line $2x - y - 10 = 0$ and the two other vertices, at points $(2,-3)$ and $(4,1)$ then the area of triangle in sq. units is-
 (A) $\sqrt{10}$ (B) 3 (C) $\frac{33}{5}$ (D) 11

MSL017

18. 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) $(0,5)$

MSL018

19. The line $(k + 1)^2x + ky - 2k^2 - 2 = 0$ 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) $y = 2x + 8$

MSL019

20. 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 x -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

MSL020

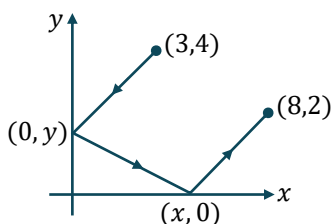
21. Given the points $A(0,4)$ and $B(0, -4)$, the equation of the locus of the point P such that $|AP - BP| = 6$ is -
 (A) $9x^2 - 7y^2 + 63 = 0$ (B) $9x^2 - 7y^2 - 63 = 0$
 (C) $7x^2 - 9y^2 + 63 = 0$ (D) $7x^2 - 9y^2 - 63 = 0$

MSL065

22. If x_1, y_1 are the roots of $x^2 + 8x - 20 = 0$, x_2, y_2 are the roots of $4x^2 + 32x - 57 = 0$ and x_3, y_3 are the roots of $9x^2 + 72x - 112 = 0$, then the points, (x_1, y_1) , (x_2, y_2) and (x_3, y_3) -
 (A) are collinear (B) form an equilateral triangle
 (C) form a right angled isosceles triangle (D) are concyclic

MSL066

23. Suppose that a ray of light leaves the point $(3,4)$, reflects off the y -axis towards the x -axis, reflects off the x -axis, and finally arrives at the point $(8,2)$. The value of x , is -



- (A) $x = 4\frac{1}{2}$ (B) $x = 4\frac{1}{3}$ (C) $x = 4\frac{2}{3}$ (D) $x = 5\frac{1}{3}$

MSL067

24. Family of lines represented by the equation $(\cos\theta + \sin\theta)x + (\cos\theta - \sin\theta)y - 3(3\cos\theta + \sin\theta) = 0$ passes through a fixed point M for all real values of θ . The reflection of M in the line $x - y = 0$, is-
 (A) (6,3) (B) (3,6) (C) (-6,3) (D) (3,-6) MSL068
25. If the equation $ax^2 - 6xy + y^2 + 2gx + 2fy + c = 0$ represents a pair of lines whose slopes are m and m^2 , then sum of all possible values of a is-
 (A) 17 (B) -19 (C) 19 (D) -17 MSL069
26. A triangle ABC 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 :
 (A) $\alpha \in [-1,2]$ and $\beta \in [-2,3]$ (B) $\alpha \in [-1,3]$ and $\beta \in [-2,4]$
 (C) $\alpha \in [-2,4]$ and $\beta \in [-3,4]$ (D) $\alpha \in [-1,3]$ and $\beta \in [-2,3]$ MSL070

MULTIPLE CORRECT TYPE QUESTIONS

27. The x -coordinates of the vertices of a square of unit area are the roots of the equation $x^2 - 3|x| + 2 = 0$ and the y -coordinates of the vertices are the roots of the equation $y^2 - 3y + 2 = 0$ then the possible vertices of the square is/are-
 (A) (1,1), (2,1), (2,2), (1,2) (B) (-1,1), (-2,1), (-2,2), (-1,2)
 (C) (2,1), (1,-1), (1,2), (2,2) (D) (-2,1), (-1,-1), (-1,2), (-2,2) MSL071
28. Line $\frac{x}{a} + \frac{y}{b} = 1$ cuts the co-ordinate axes at $A(a, 0)$ and $B(0, b)$ 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) $\left(0, \frac{bb'}{a}\right)$ MSL072
29. If $a^2 + 9b^2 - 4c^2 = 6ab$ then the family of lines $ax + by + c = 0$ are concurrent at :
 (A) (1/2, 3/2) (B) (-1/2, -3/2) (C) (-1/2, 3/2) (D) (1/2, -3/2) MSL073
30. The lines L_1 and L_2 denoted by $3x^2 + 10xy + 8y^2 + 14x + 22y + 15 = 0$ intersect at the point P and have gradients m_1 and m_2 respectively. The acute angles between them is θ . Which of the following relations hold good ?
 (A) $m_1 + m_2 = 5/4$
 (B) $m_1 m_2 = 3/8$
 (C) acute angle between L_1 and L_2 is $\sin^{-1}\left(\frac{2}{5\sqrt{5}}\right)$.
 (D) sum of the abscissa and ordinate of the point P is -1. MSL074
31. The equation $ax^2 - 6xy + y^2 + bx + cy + d = 0$ represents pair of lines whose slopes are m and m^2 , if angle between the lines is θ , then ($a > 0$)
 (A) $\tan\theta = \frac{4}{9}$ (B) $\tan\theta = \frac{2}{9}$ (C) $\tan 2\theta = \frac{18}{65}$ (D) $\tan 2\theta = \frac{36}{77}$ MSL075

32. Find the equations of the sides of a triangle having $(4, -1)$ as a vertex, if the lines $x - 1 = 0$ and $x - y - 1 = 0$ are the equations of two internal bisectors of its angles.
- (A) $2x - y + 3 = 0$ (B) $x + 2y - 6 = 0$
 (C) $2x + y - 7 = 0$ (D) $x - 2y - 6 = 0$

MSL076

COMPREHENSION TYPE QUESTIONS

Paragraph for Question No. 33 to 35

Consider two points $A \equiv (1, 2)$ and $B \equiv (3, -1)$. Let M be a point on the straight line $L \equiv x + y = 0$.

33. If M be a point on the line $L = 0$ such that $AM + BM$ is minimum, then the reflection of M in the line $x = y$ is -
- (A) $(1, -1)$ (B) $(-1, 1)$ (C) $(2, -2)$ (D) $(-2, 2)$

MSL089

34. If M be a point on the line $L = 0$ such that $|AM - BM|$ is maximum, then the distance of M from $N \equiv (1, 1)$ is -
- (A) $5\sqrt{2}$ (B) 7 (C) $3\sqrt{5}$ (D) 10

MSL090

35. If M be a point on the line $L = 0$ such that $|AM - BM|$ is minimum, then the area of $\triangle AMB$ equals -
- (A) $\frac{13}{4}$ (B) $\frac{13}{2}$ (C) $\frac{13}{6}$ (D) $\frac{13}{8}$

MSL091

Paragraph for Question Nos. 36 to 37

Let $ABCD$ is a square with sides of unit length. Points E and F are taken on sides AB and AD respectively so that $AE = AF$. Let P be a point inside the square $ABCD$.

36. The maximum possible area of quadrilateral $CDFE$ is -

- (A) $\frac{1}{8}$ (B) $\frac{1}{4}$ (C) $\frac{5}{8}$ (D) $\frac{3}{8}$

MSL092

37. The value of $(PA)^2 - (PB)^2 + (PC)^2 - (PD)^2$ can not be equal to -
- (A) 3 (B) 2 (C) 1 (D) 0

MSL093

MATCHING LIST TYPE QUESTION

- | 38. | List-I | List-II |
|-------|--|---------|
| (I) | If the incentre of the triangle formed by the coordinate axes and the line $3x + 4y = 2$ is at (a, b) , then $a + b$ equals | (P) 1 |
| (II) | The line $2x - 3y = 6$ is shifted by 1 unit closer to the origin, the equation of line in new position is $2x - 3y = 6 + k$, then value of $ k $ is | (Q) 2 |
| (III) | Sum of the abscissa of points on the line $x - y = 3$ which lie at a unit distance from the line $4x - 3y = 12$ is | (R) 3 |
| (IV) | The integral part of ' a ' for which the point $(2, a)$ lies between the parallel lines $x + 2y = 4$ and $x + 2y = 5$ is | (S) 6 |

Which of the following is correct ?

- (A) $I \rightarrow Q; II \rightarrow R; III \rightarrow P; IV \rightarrow S$ (B) $I \rightarrow P; II \rightarrow Q; III \rightarrow R; IV \rightarrow S$
 (C) $I \rightarrow Q; II \rightarrow P; III \rightarrow S; IV \rightarrow R$ (D) $I \rightarrow S; II \rightarrow R; III \rightarrow P; IV \rightarrow Q$

MSL094

MATRIX MATCH TYPE QUESTION

39. In $\triangle ABC$, let slope of side AB is $\frac{1}{3}$ & internal angle bisector AD is $3x = 4y$. Also mirror image of vertex B w.r.t. line AD is $(13, 16)$ & point D is $(12, 9)$ (where D lies on BC).

Column-I

Column-II

- | | | |
|--|-----|----------------|
| (A) Co-ordinates of vertex 'B' are (a, b) , then $(a - b)$ is equal to | (P) | $\frac{13}{9}$ |
| (B) Slope of side AC , is | (Q) | $\frac{25}{4}$ |
| (C) x -intercept of external angle bisector of vertex 'A' is | (R) | 11 |
| (D) Abscissa of point C is $\frac{a}{b}$ where a & b are coprime numbers, then $ a - b $ is equal to | (S) | 13 |
| | (T) | 15 |

MSL095

EXERCISE - S

1. Let $O(0, 0)$, $A(6, 0)$ and $B(3, \sqrt{3})$ be the vertices of ΔOAB . Let R be the region consisting of all those points P inside ΔOAB which satisfy $d(P, OA) \leq \text{minimum}(d(P, OB), d(P, AB))$ where $d(P, OA)$, $d(P, OB)$ and $d(P, AB)$ represent the distance of P from the sides OA, OB and AB respectively. If the area of region R is $9(a - \sqrt{b})$ where a and b are coprime, then find the value of $(a + b)$

MSL021

2. A triangle has side lengths 18, 24 and 30. Find the area of the triangle whose vertices are the incentre, circumcentre and centroid of the triangle. (In unit)

MSL022

3. 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 . (In Sq. unit)

MSL023

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

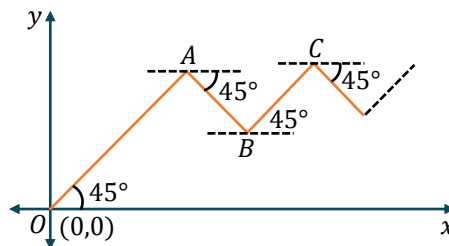
MSL024

5. The two line pairs $y^2 - 4y + 3 = 0$ and $x^2 + 4xy + 4y^2 - 5x - 10y + 4 = 0$ enclose a 4 sided convex polygon find area of the polygon.

MSL025

6. Point O, A, B, C are shown in figure where $OA = 2AB = 4BC = \dots$ so on. Let A be the centroid of a triangle whose orthocentre and circumcenter are $(2, 4)$ and $(\frac{7}{2}, \frac{5}{2})$ respectively. If an insect starts moving from the point $O(0,0)$ along the straight line in zig-zag fashion and terminates ultimately at point $P(\alpha, \beta)$ then find the value of $(\alpha + \beta)$

MSL026



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

MSL027

8. The sides of a triangle have the combined equation $x^2 - 3y^2 - 2xy + 8y - 4 = 0$. The third side, which is variable always passes through the point $(-5, -1)$. If the range of values of the slope of the third line so that the origin is an interior point of the triangle, lies in the interval (a, b) , then find $(a + \frac{1}{b^2})$.

MSL028

9. The interior angle bisector of angle A for the triangle ABC whose coordinates of the vertices are $A(-8, 5)$; $B(-15, -19)$ and $C(1, -7)$ has the equation $ax + 2y + c = 0$. Find $a + c$. **MSL029**
10. If algebraic sum of lengths of perpendiculars drawn from vertices of a hexagon $ABCDEF$, $A(-2, -1)$, $B(0, -2)$, $C(4, 0)$, $D(3, 2)$, $E(2, 3)$, $F(-1, 4)$ on a variable line $ax + by + c = 0$ is zero, then variable line always passes through a fixed point (p, q) , then the value of $p + q$ is **MSL030**
11. Number of value of b for which in an acute triangle ABC , if the coordinates of orthocenter ' H ' are $(4, b)$, centroid ' G ' are $(b, 2b - 8)$ and circumcenter ' S ' are $(-4, 8)$ is **MSL077**
12. The point A divided the join of $P(-5, 1)$, $Q(3, 5)$ in the ratio $k: 1$, then the integral value of k for which the area of ΔABC where B is $(1, 5)$ and C is $(7, -2)$ is equal to 2 units in magnitude is **MSL078**
13. If area of the triangle formed by the line $x + y = 3$ and the angle bisectors of the pair of lines $x^2 - y^2 + 4y - 4 = 0$ is A , then the value of $16A$ is **MSL079**
14. 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 **MSL080**
15. Consider a ΔABC whose sides AB, BC and CA are represented by the straight lines $2x + y = 0$, $x + py = q$ and $x - y = 3$, respectively. The point P is $(2, 3)$ is orthocentre then the value of $(p + q)/10$. **MSL081**
16. Triangle ABC with $AB = 13$, $BC = 5$ and $AC = 12$ slides on the coordinate axes with A and B on the x and y axis respectively. If the locus of vertex C is a line $12x - ky = 0$, then the value of k is **MSL082**

EXERCISE - JEE (Main) PYQ

1. Let the equations of two sides of a triangle be $3x - 2y + 6 = 0$ and $4x + 5y - 20 = 0$. If the orthocenter of this triangle is at $(1,1)$, then the equation of its third side is: **[JEE (Main) 2019]**
 (1) $122y - 26x - 1675 = 0$ (2) $26x + 61y + 1675 = 0$
 (3) $122y + 26x + 1675 = 0$ (4) $26x - 122y - 1675 = 0$
MSL031
2. Let S be the set of all triangles in the xy -plane, each having one vertex at the origin and the other two vertices lie on coordinate axes with integral coordinates. If each triangle in S has area 50 sq. units, then the number of elements in the set S is: **[JEE (Main) 2019]**
 (1) 9 (2) 18 (3) 32 (4) 36
MSL032
3. If the line $3x + 4y - 24 = 0$ intersects the x -axis at the point A and the y -axis at the point B , then the incentre of the triangle OAB , where O is the origin, is **[JEE (Main) 2019]**
 (1) $(3, 4)$ (2) $(2, 2)$ (3) $(4, 4)$ (4) $(4, 3)$
MSL033
4. Two vertices of a triangle are $(0,2)$ and $(4,3)$. If its orthocenter is at the origin, then its third vertex lies in which quadrant? **[JEE (Main) 2019]**
 (1) Fourth (2) Second (3) Third (4) First
MSL035
5. Two sides of a parallelogram are along the lines, $x + y = 3$ and $x - y + 3 = 0$. If its diagonals intersect at $(2,4)$, then one of its vertex is: **[JEE (Main) 2019]**
 (1) $(2,6)$ (2) $(2,1)$ (3) $(3,5)$ (4) $(3,6)$
MSL036
6. If a circle of radius R passes through the origin O and intersects the coordinate axes at A and B , then the locus of the foot of perpendicular from O on AB is : **[JEE (Main) 2019]**
 (1) $(x^2 + y^2)^2 = 4R^2x^2y^2$ (2) $(x^2 + y^2)(x + y) = R^2xy$
 (3) $(x^2 + y^2)^3 = 4R^2x^2y^2$ (4) $(x^2 + y^2)^2 = 4R^2x^2y^2$
MSL040
7. A point on the straight line, $3x + 5y = 15$ which is equidistant from the coordinate axes will lie only in: **[JEE (Main) 2019]**
 (1) 1st and 2nd quadrants (2) 4th quadrant
 (3) 1st, 2nd and 4th quadrant (4) 1st quadrant
MSL041
8. Suppose that the points (h, k) , $(1,2)$ and $(-3,4)$ lie on the line L_1 . If a line L_2 passing through the points (h, k) and $(4,3)$ is perpendicular to L_1 , then $\frac{k}{h}$ equals: **[JEE (Main) 2019]**
 (1) 3 (2) $-\frac{1}{7}$ (3) $\frac{1}{3}$ (4) 0
MSL042
9. Slope of a line passing through $P(2, 3)$ and intersecting the line, $x + y = 7$ at a distance of 4 units from P , is **[JEE (Main) 2019]**
 (1) $\frac{\sqrt{5}-1}{\sqrt{5}+1}$ (2) $\frac{1-\sqrt{5}}{1+\sqrt{5}}$ (3) $\frac{1-\sqrt{7}}{1+\sqrt{7}}$ (4) $\frac{\sqrt{7}-1}{\sqrt{7}+1}$
MSL043

- 10.** A rectangle is inscribed in a circle with a diameter lying along the line $3y = x + 7$. If the two adjacent vertices of the rectangle are $(-8, 5)$ and $(6, 5)$, then the area of the rectangle (in sq. units) is :- **[JEE (Main) 2019]**
 (1) 72 (2) 84 (3) 98 (4) 56 **MSL045**
- 11.** The region represented by $|x - y| \leq 2$ and $|x + y| \leq 2$ is bounded by a: **[JEE (Main) 2019]**
 (1) square of side length $2\sqrt{2}$ units (2) rhombus of side length 2 units
 (3) square of area 16 sq. units (4) rhombus of area $8\sqrt{2}$ sq. units **MSL046**
- 12.** A straight-line L at a distance of 4 units from the origin makes positive intercepts on the coordinate axes and the perpendicular from the origin to this line makes an angle of 60° with the line $x + y = 0$. Then an equation of the line L is: **[JEE (Main) 2019]**
 (1) $(\sqrt{3} + 1)x + (\sqrt{3} - 1)y = 8\sqrt{2}$ (2) $(\sqrt{3} - 1)x + (\sqrt{3} + 1)y = 8\sqrt{2}$
 (3) $\sqrt{3}x + y = 8$ (4) $x + \sqrt{3}y = 8$ **MSL049**
- 13.** The locus of the mid-points of the perpendiculars drawn from points on the line, $x = 2y$ to the line $x = y$ is : **[JEE (Main) 2020]**
 (1) $2x - 3y = 0$ (2) $7x - 5y = 0$ (3) $5x - 7y = 0$ (4) $3x - 2y = 0$ **MSL051**
- 14.** Let $A(1,0), B(6,2)$ and $C\left(\frac{3}{2}, 6\right)$ be the vertices of a triangle ABC . If P is a point inside the triangle ABC such that the triangles APC, APB and BPC have equal areas, then the length of the line segment PQ , where $Q\left(\frac{-7}{6}, \frac{-1}{3}\right)$ is the point, is _____. **[JEE (Main) 2020]**
MSL052
- 15.** Let two points be $A(1, -1)$ and $B(0,2)$. If a point $P(x', y')$ be such that the area of $\Delta PAB = 5$ sq. units and it lies on the line, $3x + y - 4\lambda = 0$, then a value of λ is **[JEE (Main) 2020]**
 (1) 1 (2) 4 (3) 3 (4) -3 **MSL053**
- 16.** Let C be the centroid of the triangle with vertices $(3, -1), (1, 3)$ and $(2, 4)$. Let P be the point of intersection of the lines $x + 3y - 1 = 0$ and $3x - y + 1 = 0$. Then the line passing through the points C and P also passes through the point: **[JEE (Main) 2020]**
 (1) $(7, 6)$ (2) $(-9, -6)$ (3) $(-9, -7)$ (4) $(9, 7)$ **MSL054**
- 17.** The set of all possible values of θ in the interval $(0, \pi)$ for which the points $(1, 2)$ and $(\sin \theta, \cos \theta)$ lie on the same side of the line $x + y = 1$ is: **[JEE (Main) 2020]**
 (1) $\left(0, \frac{\pi}{4}\right)$ (2) $\left(0, \frac{3\pi}{4}\right)$ (3) $\left(\frac{\pi}{4}, \frac{3\pi}{4}\right)$ (4) $\left(0, \frac{\pi}{2}\right)$ **MSL055**
- 18.** If the perpendicular bisector of the line segment joining the points $P(1, 4)$ and $Q(k, 3)$ has y -intercept equal to -4 , then a value of k is :- **[JEE (Main) 2020]**
 (1) $\sqrt{15}$ (2) -2 (3) $\sqrt{14}$ (4) -4 **MSL057**

19. If the line, $2x - y + 3 = 0$ is at a distance $\frac{1}{\sqrt{5}}$ and $\frac{2}{\sqrt{5}}$ from the lines $4x - 2y + \alpha = 0$ and $6x - 3y + \beta = 0$, respectively, then the sum of all possible values of α and β is. **[JEE (Main) 2020]**
MSL058
20. A ray of light coming from the point $(2, 2\sqrt{3})$ is incident at an angle 30° on the line $x = 1$ at the point A . The ray gets reflected on the line $x = 1$ and meets x -axis at the point B . Then, the line AB passes through the point: **[JEE (Main) 2020]**
(1) $\left(3, -\frac{1}{\sqrt{3}}\right)$ (2) $(3, -\sqrt{3})$ (3) $\left(4, -\frac{\sqrt{3}}{2}\right)$ (4) $(4, -\sqrt{3})$
MSL059
21. Let the equation of the pair of lines, $y = px$ and $y = qx$, can be written as $(y - px)(y - qx) = 0$. Then the equation of the pair of the angle bisectors of the lines $x^2 - 4xy - 5y^2 = 0$ is : **[JEE (Main) 2021]**
(1) $x^2 - 3xy + y^2 = 0$ (2) $x^2 + 4xy - y^2 = 0$
(3) $x^2 + 3xy - y^2 = 0$ (4) $x^2 - 3xy - y^2 = 0$
MSL061
22. If p and q are the lengths of the perpendiculars from the origin on the lines, $x \operatorname{cosec} \alpha - y \operatorname{sec} \alpha = k \cot 2\alpha$ and $x \sin \alpha + y \cos \alpha = k \sin 2\alpha$ respectively, then k^2 is equal to : **[JEE (Main) 2021]**
(1) $4p^2 + q^2$ (2) $2p^2 + q^2$ (3) $p^2 + 2q^2$ (4) $p^2 + 4q^2$
MSL062
23. Let the area of the triangle with vertices $A(1, \alpha)$, $B(\alpha, 0)$ and $C(0, \alpha)$ be 4 sq. units. If the point $(\alpha, -\alpha)$, $(-\alpha, \alpha)$ and (α^2, β) are collinear, then β is equal to **[JEE (Main) 2022]**
(1) 64 (2) -8 (3) -64 (4) 512
MSL063
24. The equations of the sides AB, BC and CA of a triangle ABC are $2x + y = 0, x + py = 15a$ and $x - y = 3$ respectively. If its orthocentre is $(2, a)$, $-\frac{1}{2} < a < 2$, then p is equal to **[JEE (Main) 2022]**
MSL064
25. In an isosceles triangle ABC , the vertex A is $(6, 1)$ and the equation of the base BC is $2x + y = 4$. Let the point B lie on the line $x + 3y = 7$. If (α, β) is the centroid ΔABC , then $15(\alpha + \beta)$ is equal to : **[JEE (Main) 2022]**
(1) 39 (2) 41 (3) 51 (4) 63
MSL096
26. The equations of the sides AB, BC and CA of a triangle ABC are $2x + y = 0, x + py = 39$ and $x - y = 3$ respectively and $P(2, 3)$ is its circumcentre. Then which of the following is NOT true : **[JEE (Main) 2022]**
(1) $(AC)^2 = 9p$ (2) $(AC)^2 + p^2 = 136$
(3) $32 < \text{area}(\Delta ABC) < 36$ (4) $34 < \text{area}(\Delta ABC) < 38$
MSL097

27. Let the circumcentre of a triangle with vertices $A(a, 3)$, $B(b, 5)$ and $C(a, b)$, $ab > 0$ be $P(1, 1)$. If the line AP intersects the line BC at the point $Q(k_1, k_2)$, then $k_1 + k_2$ is equal to : **[JEE (Main) 2022]**

- (1) 2 (2) $\frac{4}{7}$ (3) $\frac{2}{7}$ (4) 4

MSL098

28. Let m_1, m_2 be the slopes of two adjacent sides of a square of side a such that $a^2 + 11a + 3(m_1^2 + m_2^2) = 220$. If one vertex of the square is $(10(\cos\alpha - \sin\alpha), 10(\sin\alpha + \cos\alpha))$, where

$\alpha \in \left(0, \frac{\pi}{2}\right)$ and the equation of one diagonal is $(\cos\alpha - \sin\alpha)x + (\sin\alpha + \cos\alpha)y = 10$, then

$72(\sin^4\alpha + \cos^4\alpha) + a^2 - 3a + 13$ is equal to: **[JEE (Main) 2022]**
 (1) 119 (2) 128 (3) 145 (4) 155

MSL099

29. Let the point $P(\alpha, \beta)$ be at a unit distance from each of the two lines $L_1: 3x - 4y + 12 = 0$, and $L_2: 8x + 6y + 11 = 0$. If P lies below L_1 and above L_2 , then $100(\alpha + \beta)$ is equal to

[JEE (Main) 2022]
 (1) -14 (2) 42 (3) -22 (4) 14

MSL100

30. The distance between the two points A and A' which lie on $y = 2$ such that both the line segments AB and $A'B$ (where B is the point $(2, 3)$) subtend angle $\frac{\pi}{4}$ at the origin, is equal to :

[JEE (Main) 2022]
 (1) 10 (2) $\frac{48}{5}$ (3) $\frac{52}{5}$ (4) 3

MSL101

31. Let $A(1, 1)$, $B(-4, 3)$, $C(-2, -5)$ be vertices of a triangle ABC , P be a point on side BC , and Δ_1 and Δ_2 be the areas of triangle APB and ABC . Respectively. If $\Delta_1 : \Delta_2 = 4 : 7$, then the area enclosed by the lines AP, AC and the x -axis is

[JEE (Main) 2022]
 (1) $\frac{1}{4}$ (2) $\frac{3}{4}$ (3) $\frac{1}{2}$ (4) 1

MSL102

32. If the point $\left(\alpha, \frac{7\sqrt{3}}{3}\right)$ lies on the curve traced by the mid-points of the line segments of the lines x

$\cos\theta + y \sin\theta = 7$, $\theta \in \left(0, \frac{\pi}{2}\right)$ between the co-ordinates axes, then α is equal to **[JEE (Main) 2023]**

- (1) 7 (2) -7 (3) $-7\sqrt{3}$ (4) $7\sqrt{3}$

MSL103

33. A triangle is formed by X - axis, Y - axis and the line $3x + 4y = 60$. Then the number of points $P(a, b)$ which lie strictly inside the triangle, where a is an integer and b is a multiple of a , is_____.

[JEE (Main) 2023]

MSL104

Point and Straight Lines

34. A light ray emits from the origin making an angle 30° with the positive x -axis. After getting reflected by the line $x + y = 1$, if this ray intersects x -axis at Q , then the abscissa of Q is **[JEE (Main) 2023]**

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

MSL105

35. A straight line cuts off the intercepts $OA = a$ and $OB = b$ on the positive directions of x -axis and y -axis respectively. If the perpendicular from origin O to this line makes an angle of $\frac{\pi}{6}$ with

positive direction of y -axis and the area of ΔOAB is $\frac{98}{3}\sqrt{3}$, then $a^2 - b^2$ is equal to:

[JEE (Main) 2023]

(1) $\frac{392}{3}$ (2) 196 (3) $\frac{196}{3}$ (4) 98

MSL106

36. Let the equations of two adjacent sides of a parallelogram $ABCD$ be $2x - 3y = -23$ and $5x + 4y = 23$. If the equation of its one diagonal AC is $3x + 7y = 23$ and the distance of A from the other diagonal is d , then $50d^2$ is equal to ____ .

[JEE (Main) 2023]

MSL107

37. Let B and C be the two points on the line $y + x = 0$ such that B and C are symmetric with respect to the origin. Suppose A is a point on $y - 2x = 2$ such that ΔABC is an equilateral triangle. Then, the area of the ΔABC is

[JEE (Main) 2023]

(1) $3\sqrt{3}$ (2) $2\sqrt{3}$ (3) $\frac{8}{\sqrt{3}}$ (4) $\frac{10}{\sqrt{3}}$

MSL108

EXERCISE - JEE (Advanced) PYQ

1. Consider the lines given by
 $L_1 = x + 3y - 5 = 0$
 $L_2 = 3x - ky - 1 = 0$
 $L_3 = 5x + 2y - 12 = 0$ [JEE 2008]

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

- (A) L_1, L_2, L_3 are concurrent, if
 (B) One of L_1, L_2, L_3 is parallel to at least one of the other two, if
 (C) L_1, L_2, L_3 form a triangle, if
 (D) L_1, L_2, L_3 do not form a triangle, if

Column-II

- (P) $k = -9$
 (Q) $k = -\frac{6}{5}$
 (R) $k = \frac{5}{6}$
 (S) $k = 5$

MSL083

2. A straight-line L through the point $(3, -2)$ is inclined at an angle 60° to the line $\sqrt{3}x + y = 1$. If L also intersect the x -axis, then the equation of L is [JEE 2011]

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

MSL084

3. 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]

- (A) $a + b - c > 0$ (B) $a - b + c < 0$ (C) $a - b + c > 0$ (D) $a + b - c < 0$

MSL085

4. For a point P in the plane, let $d_1(P)$ and $d_2(P)$ be the distances of the point P from the lines $x - y = 0$ and $x + y = 0$ respectively. The area of the region R consisting of all points P lying in the first quadrant of the plane and satisfying $2 \leq d_1(P) + d_2(P) \leq 4$, is [JEE (Advanced) 2014]

MSL086

Question Stem for Question Nos. 5 and 6

Question Stem

Consider the lines L_1 and L_2 defined by

$L_1 : x\sqrt{2} + y - 1 = 0$ and $L_2 : x\sqrt{2} - y + 1 = 0$

For a fixed constant λ , let C be the locus of a point P such that the product of the distance of P from L_1 and the distance of P from L_2 is λ^2 . The line $y = 2x + 1$ meets C at two points R and S , where the distance between R and S is $\sqrt{270}$.

Let the perpendicular bisector of RS meet C at two distinct points R' and S' . Let D be the square of the distance between R' and S' .

5. The value of λ^2 is _____. [JEE (Advanced) 2021]

MSL087

6. The value of D is _____. [JEE (Advanced) 2021]

MSL088

JEE (Main) Practice Paper

This paper is for yourself practice and assessment the discussion of this paper is optional though you can see PDF solutions or video solutions or solutions in hardcopy whichever is provided.

SECTION-A

- This section contains **TWENTY** questions.
 - Each question has **FOUR** options (1), (2), (3) and (4). **ONLY ONE** of these four options is correct.
 - For each question, darken the bubble corresponding to the correct option in the ORS.
 - For each question, marks will be awarded in one of the following categories:
Full Marks : +4, if only the bubble corresponding to the correct option is darkened.
Zero Marks : 0, if none of the bubbles is darkened.
Negative Marks : -1 in all other cases.
-
1. The lines $p(p^2 + 1)x - y + q = 0$ and $(p^2 + 1)^2x + (p^2 + 1)y + 2q = 0$ are 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
MSL109
2. 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 :
 (1) $(-1, 1]$ (2) $(0, \infty)$ (3) $[1, \infty)$ (4) $(-1, \infty)$
MSL110
3. **Statement-1** : An equation of a common tangent to the parabola $y^2 = 16\sqrt{3}x$ and the ellipse $2x^2 + y^2 = 4$ is $y = 2x + 2\sqrt{3}$.
Statement-2 : If the line $y = mx + \frac{4\sqrt{3}}{m}$, ($m \neq 0$) is a common tangent to the parabola $y^2 = 16\sqrt{3}x$ and the ellipse $2x^2 + y^2 = 4$, then m satisfies $m^4 + 2m^2 = 24$.
 (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.
MSL111
4. 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 :
 (1) $-\frac{1}{2}$ (2) $-\frac{1}{4}$ (3) -4 (4) -2
MSL112
5. 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 :
 (1) $2bc - 3ad = 0$ (2) $2bc + 3ad = 0$ (3) $3bc - 2ad = 0$ (4) $3bc + 2ad = 0$
MSL113

6. Let PS be the median of the triangle with vertices $P(2, 2)$, $Q(6, -1)$ and $R(7, 3)$. The equation of the line passing through $(1, -1)$ and parallel to PS is :
 (1) $4x - 7y - 11 = 0$ (2) $2x + 9y + 7 = 0$ (3) $4x + 7y + 3 = 0$ (4) $2x - 9y - 11 = 0$
MSL114
7. Given three points P, Q, R with $P(5, 3)$ and R lies on the x -axis. If equation of RQ is $x - 2y = 2$ and PQ is parallel to the x -axis, then the centroid of ΔPQR lies on the line:
 (1) $x - 2y + 1 = 0$ (2) $5x - 2y = 0$ (3) $2x + y - 9 = 0$ (4) $2x - 5y = 0$
MSL115
8. The base of an equilateral triangle is along the line given by $3x + 4y = 9$. If a vertex of the triangle is $(1, 2)$, then the length of a side of the triangle is :
 (1) $\frac{4\sqrt{3}}{15}$ (2) $\frac{4\sqrt{3}}{5}$ (3) $\frac{2\sqrt{3}}{15}$ (4) $\frac{2\sqrt{3}}{5}$
MSL116
9. If the three distinct lines $x + 2ay + a = 0$, $x + 3by + b = 0$ and $x + 4ay + a = 0$ are concurrent, then the point (a, b) lies on a :-
 (1) circle (2) straight line (3) parabola (4) hyperbola
MSL117
10. If a line L is perpendicular to the line $5x - y = l$, and the area of the triangle formed by the line L and the coordinate axes is 5, then the distance of line L from the line $x + 5y = 0$ is :-
 (1) $\frac{7}{\sqrt{5}}$ (2) $\frac{5}{\sqrt{13}}$ (3) $\frac{7}{\sqrt{13}}$ (4) $\frac{5}{\sqrt{7}}$
MSL118
11. Locus of the image of the point $(2, 3)$ in the line $(2x - 3y + 4) + k(x - 2y + 3) = 0$, $k \in R$, is a
 (1) circle of radius $\sqrt{2}$ (2) circle of radius $\sqrt{3}$
 (3) straight line parallel to x -axis (4) straight line parallel to y -axis
MSL119
12. Let L be the line passing through the point $P(1, 2)$ such that its intercepted segment between the co-ordinate axes is bisected at P . If L_1 is the line perpendicular to L and passing through the point $(-2, 1)$, then the point of intersection of L and L_1 is :
 (1) $\left(\frac{3}{10}, \frac{17}{5}\right)$ (2) $\left(\frac{11}{20}, \frac{29}{10}\right)$ (3) $\left(\frac{4}{5}, \frac{12}{5}\right)$ (4) $\left(\frac{3}{5}, \frac{23}{10}\right)$
MSL120
13. A straight line L through the point $(3, -2)$ is inclined at an angle of 60° to the line $\sqrt{3}x + y = 1$. If L also intersects the x -axis, then the equation of L is :-
 (1) $\sqrt{3}y - x + 3 + 2\sqrt{3} = 0$ (2) $y - \sqrt{3}x + 2 + 3\sqrt{3} = 0$
 (3) $y + \sqrt{3}x + 2 - 3\sqrt{3} = 0$ (4) $\sqrt{3}y + x - 3 + 2\sqrt{3} = 0$
MSL121
14. Two sides of a rhombus are along the lines, $x - y + 1 = 0$ and $7x - y - 5 = 0$. If its diagonals intersect at $(-1, -2)$, then which one of the following is a vertex of this rhombus ?
 (1) $\left(-\frac{10}{3}, -\frac{7}{3}\right)$ (2) $(-3, -9)$ (3) $(-3, -8)$ (4) $\left(\frac{1}{3}, -\frac{8}{3}\right)$
MSL122

15. The point $(2, 1)$ is translated parallel to the line $L: x - y = 4$ by $2\sqrt{3}$ units. If the new point Q lies in the third quadrant, then the equation of the line passing through Q and perpendicular to L is :
 (1) $x + y = 3 - 3\sqrt{6}$ (2) $x + y = 3 - 2\sqrt{6}$ (3) $x + y = 2 - \sqrt{6}$ (4) $2x + 2y = 1 - \sqrt{6}$
MSL123
16. If a variable line drawn through the intersection of the lines $\frac{x}{3} + \frac{y}{4} = 1$ and $\frac{x}{4} + \frac{y}{3} = 1$, meets the coordinate axes at A and B , ($A \neq B$), then the locus of the midpoint of AB is :-
 (1) $14(x + y)^2 - 97(x + y) + 168 = 0$ (2) $6xy = 7(x + y)$
 (3) $7xy = 6(x + y)$ (4) $4(x + y)^2 - 28(x + y) + 49 = 0$
MSL124
17. A ray of light is incident along a line which meets another line, $7x - y + 1 = 0$, at the point $(0, 1)$. The ray is then reflected from this point along the line, $y + 2x = 1$. Then the equation of the line of incidence of the ray of light is :-
 (1) $41x - 25y + 25 = 0$ (2) $41x + 25y - 25 = 0$
 (3) $41x + 38y - 38 = 0$ (4) $41x - 38y + 38 = 0$
MSL125
18. A straight line through origin O meets the lines $3y = 10 - 4x$ and $8x + 6y + 5 = 0$ at points A and B respectively. Then O divides the segment AB in the ratio :-
 (1) $4 : 1$ (2) $1 : 2$ (3) $3 : 4$ (4) $2 : 3$
MSL126
19. On the portion of the straight line $x + 2y = 4$ intercepted between the axes, a square is constructed on the side of the line away from the origin. Then the point of intersection of its diagonals has co-ordinates :
 (1) $(2, 3)$ (2) $(3, 2)$ (3) $(3, 3)$ (4) $(2, 2)$
MSL127
20. If $P\left(1 + \frac{t}{\sqrt{2}}, 2 + \frac{t}{\sqrt{2}}\right)$ be any point on a line, then the range of values of t for which the point P lies between the parallel lines $x + 2y = 1$ and $2x + 4y = 15$ is
 (1) $-\frac{4\sqrt{2}}{3} < t < \frac{5\sqrt{2}}{6}$ (2) $0 < t < \frac{5\sqrt{2}}{6}$ (3) $-\frac{4\sqrt{2}}{5} < t < 0$ (4) $-\frac{4\sqrt{2}}{3} < t < \frac{\sqrt{2}}{6}$
MSL128

SECTION-B

- This section will have **TEN** questions. Candidate can choose to attempt any 5 question out of these 10 questions. In case if candidate attempts more than 5 questions, first 5 attempted questions will be considered for marking.
- The answer to each question is a **NUMERICAL VALUE**.
- For each question, enter the correct numerical value (Answer should be rounded off to the nearest integer).
- Answer to each question will be evaluated according to the following marking scheme:
 Full Marks : +4, if only correct answer is given.
 Zero Marks : 0, if no answer is given.
 Negative Marks : -1 for incorrect answer

1. Area of the triangle formed by the line $x + y = 3$ and angle bisectors of the pair of straight lines $x^2 - y^2 + 2y = 1$ is
MSL129
2. 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 m , then the value of $|m| =$
MSL130
3. Find number of integral values of λ if $(\lambda, \lambda + 1)$ is an interior points of ΔABC , where $A \equiv (0, 3)$, $B \equiv (-2, 0)$ and $C \equiv (6, 1)$.
MSL131
4. Let ABC be a triangle such that the coordinates of the vertex A are $(-3, 1)$. Equation of the median through B is $2x + y - 3 = 0$ and equation of the angular bisector of C is $7x - 4y - 1 = 0$. Find the slope of line BC .
MSL132
5. $A(3, 4)$, $B(0, 0)$ and $C(3, 0)$ are vertices of ΔABC . If ' P ' is the point inside the ΔABC , such that $d(P, BC) \leq \min. \{d(P, AB), d(P, AC)\}$. Then the maximum of $d(P, BC)$ is.
(where $d(P, BC)$ represent distance between P and BC).
MSL133
6. Drawn from the origin are two mutually perpendicular straight lines forming an isosceles triangle together with the straight line $2x + y = 5$. Then find the area of the triangle.
MSL134
7. On the straight line $y = x + 2$, a point (a, b) is such that the sum of the square of distances from the straight lines $3x - 4y + 8 = 0$ and $3x - y - 1 = 0$ is least, then find value of $11(a + b)$.
MSL135
8. Let $\tan\alpha, \tan\beta$ and $\tan\gamma$; $\alpha, \beta, \gamma \neq \frac{(2n-1)\pi}{2}, n \in N$ be the slopes of three line segments OA, OB and OC , respectively, where O is origin. If circumcentre of ΔABC coincides with origin and its orthocentre lies on y -axis, then the value of $\left(\frac{\cos 3\alpha + \cos 3\beta + \cos 3\gamma}{\cos \alpha \cos \beta \cos \gamma}\right)^2$ is equal to :
MSL136
9. A is a variable point on x -axis and $B(0, b)$ is a fixed point. An equilateral triangle ABC is completed with vertex C away from origin. If the locus of the point C is $\alpha x + \beta y = b$, then $\alpha^2 + \beta^2$ is
MSL137
10. Two lines $(L_1$ and $L_2)$ are drawn from point (α, α) making an angle 45° with the lines $L_3 \equiv x + y - f(\alpha) = 0$ and $L_4 \equiv x + y + f(\alpha) = 0$. L_1 intersects L_3 and L_4 at A and B and L_2 intersects L_3 and L_4 at C and D respectively ($|2\alpha| > |f(\alpha)|$). If the area of trapezium $ABDC$ is independent of α . if $f(\alpha) = \lambda\alpha^q$, where λ is a constant, then $|q|$ is
MSL138

JEE (Advanced) Practice Paper

This paper is for yourself practice and assessment the discussion of this paper is optional though you can see PDF solutions or video solutions or solutions in hardcopy whichever is provided.

SECTION-I

- This section contains **FIVE** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is correct.
- For each question, darken the bubble corresponding to the correct option in the ORS.
- For each question, marks will be awarded in one of the following categories:

Full Marks : +3 If only the bubble corresponding to the correct option is darkened.

Zero Marks : 0 If none of the bubbles is darkened.

Negative Marks : -1 In all other cases

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

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

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

(C) $x + y + \frac{1}{2} = 0$

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

MSL139

2. The coordinates of the feet of \perp from the vertices of a Δ on the opposite sides are $(20, 25)$, $(8, 16)$ and $(8, 9)$. Then find the coordinates of a vertices of the Δ

(A) $(2, 10)$, $(50, -1)$, $(15, 30)$

(B) $(5, 10)$, $(40, -5)$, $(15, 20)$

(C) $(5, 10)$, $(50, -5)$, $(15, 30)$

(D) $(5, 15)$, $(50, -5)$, $(10, 30)$

MSL140

3. Let P is any point inside the triangle ABC of side lengths 6, 5, 5 units and p_1, p_2, p_3 be the lengths of perpendiculars drawn from P to the sides of triangle. Find the maximum value of $p_1 \cdot p_2 \cdot p_3$.

(A) $\frac{256}{73}$

(B) $\frac{265}{71}$

(C) $\frac{256}{79}$

(D) $\frac{256}{75}$

MSL141

4. Through the origin O a straight line is drawn to cut the lines $y = 2x + 4$ and $y = 5x + 4$ at Q and R , respectively. Find the locus of the point P on this variable line, such that OP is the geometric mean of OQ and OR .

(A) $2y^2 + 5x^2 - 7xy - 12 = 0$

(B) $y^2 + 10x^2 - 7xy - 12 = 0$

(C) $y^2 + 5x^2 - 7xy - 10 = 0$

(D) $y^2 + 5x^2 - 2xy - 12 = 0$

MSL142

5. Find the acute angle between two straight lines passing through the point $M(-6, -8)$ and the points in which the line segment $2x + y + 10 = 0$ enclosed between the co-ordinate axes is divided in the ratio 1 : 2 : 2 in the direction from the point of its intersection with the x -axis to the point of intersection with the y -axis.

(A) $\frac{\pi}{4}$

(B) $\frac{2\pi}{3}$

(C) $\frac{\pi}{3}$

(D) $\frac{\pi}{6}$

MSL143

SECTION-II

- This section contains **FIVE** questions.
- Each question has **FOUR** options for correct answer(s). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct option(s).
- For each question, choose the correct option(s) to answer the question.
- Answer to each question will be evaluated according to the following marking scheme:

Full Marks	:	+4	if only (all) the correct option(s) is (are) chosen.
Partial Marks	:	+3	if all the four options are correct but ONLY three options are chosen.
Partial Marks	:	+2	if three or more options are correct but ONLY two options are chosen, both of which are correct options.
Partial Marks	:	+1	if two or more options are correct but ONLY one option is chosen and it is a correct option.
Zero Marks	:	0	if none of the options is chosen (i.e. the question is unanswered).
Negative Marks	:	-2	in all other cases.

For Example : If first, third and fourth are the **ONLY** three correct options for a question with second option being an incorrect option; selecting only all the three correct options will result in +4 marks. Selecting only two of the three correct options (e.g. the first and fourth options), without selecting any incorrect option (second option in this case), will result in +2 marks. Selecting only one of the three correct options (either first or third or fourth option), without selecting any incorrect option (second option in this case), will result in +1 marks. Selecting any incorrect option(s) (second option in this case), with or without selection of any correct option(s) will result in -2 marks.

6. A is a point on either of two rays $y + \sqrt{3}|x| = 2$ at a distance of $\frac{4}{\sqrt{3}}$ units from their point of intersection. The co-ordinates of the foot of perpendicular from A on the bisector of the angle between them is/are

- (A) $\left(-\frac{2}{\sqrt{3}}, 2\right)$ (B) (0, 0) (C) $\left(\frac{2}{\sqrt{3}}, 2\right)$ (D) (0, 4)

MSL144

7. A straight line L with negative slope passes through the point (8, 2) and cuts the positive coordinate axes at points P and Q , then the correct statement(s) among the following is/are (O is origin)

- (A) The absolute minimum value of $OP + OQ$, where O is origin is $18\sqrt{2}$
 (B) Minimum area of ΔOPQ is 32
 (C) The absolute minimum value of $OP + OQ$, where O is origin is 18
 (D) Area of ΔOPQ is minimum for slope $\left(\frac{-1}{4}\right)$.

MSL145

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

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

MSL146

Point and Straight Lines

9. Let $u \equiv ax + by + a\sqrt[3]{b} = 0$, $v \equiv bx - ay + b\sqrt[3]{b} = 0$, where $a, b \in R$ be two straight lines, then find the equations of the bisectors of the angles formed by $k_1u - k_2v = 0$ & $k_1u + k_2v = 0$ for non zero real k_1 & k_2 are :
 (A) $u = 0$ (B) $k_2u + k_1v = 0$ (C) $k_2u - k_1v = 0$ (D) $v = 0$ MSL147
10. The two lines pairs $y^2 - 4y + 3 = 0$ and $x^2 + 4xy + 4y^2 - 5x - 10y + 4 = 0$ enclose a 4 sided convex polygon, then the correct statement among the following is/are
 (A) Area of polygon is 6 (B) Length of its diagonals are $\sqrt{5}$ & $\sqrt{53}$
 (C) Point of intersection of diagonals is $(-2, 2)$ (D) Polygon is parallelogram. MSL148

SECTION-III

- This section contains **ONE** paragraph.
- Based on each paragraph, there are **THREE** questions.
- Each question has **FOUR** options (A), (B), (C) and (D) **ONLY ONE** of these four options is correct.
- For each question, darken the bubble corresponding to the correct option in the ORS.
- For each question, marks will be awarded in one of the following categories :

Full Marks	:	+3	if only the bubble corresponding to the correct answer is darkened.
Zero Marks	:	0	in all other cases.

Comprehension # 1 (Q. No. 11 - 13)

Let ABC be an acute angled triangle and AD, BE and CF are its medians, where E and F are the points $(3, 4)$ and $(1, 2)$ respectively and centroid of ΔABC is $G(3, 2)$, then answer the following questions :

11. The equation of side AB is
 (A) $2x + y = 4$ (B) $x + y - 3 = 0$ (C) $4x - 2y = 0$ (D) none of these MSL149
12. Co-ordinates of D are
 (A) $(7, -4)$ (B) $(5, 0)$ (C) $(7, 4)$ (D) $(-3, 0)$ MSL150
13. Height of altitude drawn from point A is (in units)
 (A) $4\sqrt{2}$ (B) $3\sqrt{2}$ (C) $6\sqrt{2}$ (D) $2\sqrt{3}$ MSL151

SECTION-IV

- This section contains **ONE** question.
- Each question contains two columns, Column-I and Column-II.
- Column-I has four entries (A), (B), (C) and (D).
- Column-II has four entries (p), (q), (r), (s).
- Match the entries in Column-I with the entries in Column-II.
- For each question, marks will be awarded in one of the following categories:

Full Marks	:	+4	If only correct answer is given.
Zero Marks	:	0	If no answer is given.
Negative Marks	:	-1	For incorrect answer

14. Match The Followings:

Column - I		Column - II
(A) P lies on the line $y = x$ and Q lies on $y = 2x$. The equation for the locus of the mid point of PQ , if $ PQ = 4$, is $25x^2 - \lambda xy + 13y^2 = 4$, then λ equals	(p)	36
(B) The line $(K + 1)^2 x + ky - 2K^2 - 2 = 0$ passes through a point (α, β) regardless of value K . Then $(\alpha - \beta)$ equals :	(q)	6
(C) Let two lines be $C_1: 3x - 4y + 1 = 0$ and $C_2: 8x + 6y + 1 = 0$ suppose (α, β) is a point which is at unit distance from each of the given lines. then sum of all possible value of α is	(r)	-4/5
(D) If distance between the pair of parallel lines $x^2 + 2xy + y^2 - 8ax - 8ay - 9a^2 = 0$ is $25\sqrt{2}$, then 'a/5' is equal to	(s)	- 1

MSL152

SECTION-V

- This section contains **FOUR** questions.
- The answer to each question is a **NUMERICAL VALUE**.
- For each question, enter the correct numerical value of the answer using the mouse and the on-screen virtual numeric keypad in the place designated to enter the answer. If the numerical value has more than two decimal places, truncate/round-off the value to TWO decimal places.
- Answer to each question will be evaluated according to the following marking scheme:

Full Marks	:	+3	ONLY if the correct numerical value is entered;
Zero Marks	:	0	In all other cases.

15. If the points $\left(\frac{a^3}{a-1}, \frac{a^2-3}{a-1}\right), \left(\frac{b^3}{b-1}, \frac{b^2-3}{b-1}\right)$ and $\left(\frac{c^3}{c-1}, \frac{c^2-3}{c-1}\right)$ are collinear for three distinct values a, b, c and $a \neq 1, b \neq 1$ and $c \neq 1$, then find the value of $abc - (ab + bc + ac) + 3(a + b + c)$. MSL153
16. Parallelogram $ABCD$ is cut by $(2n - 1)$ number of parallel lines in which one is diagonal AC . Distance between any two nearest lines is same which is also equal to distance of B, D from respective nearest line among these. Ratio of area of smallest triangle so formed to area of parallelogram is $\frac{1}{32}$. Find n . MSL154
17. A is a variable point on x -axis and $Q(0, b)$ is a fixed point. P equilateral triangle PQR is completed with vertex R away from origin. If the locus of the point R is $\sqrt{3}ax + \beta y = b$, then $|\alpha - \beta|$ is MSL155
18. 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 MSL156

ANSWER KEY

EXERCISE - O

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	B	D	A	C	A	A	A	B	D	B
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	D	D	B	B	B	C	B	B	A	B
Que.	21	22	23	24	25	26	27	28	29	30
Ans.	A	A	B	B	B	D	A,B	B,C	C,D	B,C,D
Que.	31	32	33	34	35	36	37	38	39	
Ans.	B,D	A,C,D	B	D	A	C	A,B,C	C	A→R; B→P; C→Q; D→T	

EXERCISE - S

1.	5	2.	3	3.	91	4.	47	5.	6
6.	8	7.	6	8.	24	9.	89	10.	2
11.	0	12.	7	13.	8	14.	2	15.	5
16.	5								

EXERCISE - JEE (Main) PYQ

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	4	4	2	2	4	3	1	3	3	2
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	1	1 or 2	3	5	3	2	4	4	30	2
Que.	21	22	23	24	25	26	27	28	29	30
Ans.	3	1	3	3	3	4	2	2	4	3
Que.	31	32	33	34	35	36	37			
Ans.	3	1	31	2	1	529	3			

EXERCISE - JEE (Advanced) PYQ

Que.	1	2	3	4	5	6
Ans.	A→S; B→P,Q; C→R; D→P,Q,S	B	A,C	6	9.00	77.14

JEE (Main) Practice Paper

Section-A	Q.	1	2	3	4	5	6	7	8	9	10
	A.	4	3	3	4	3	2	4	1	2	2
	Q.	11	12	13	14	15	16	17	18	19	20
	A.	1	3	2	4	2	3	4	1	3	1
Section-B	Q.	1	2	3	4	5	6	7	8	9	10
	A.	2	2	2	18	1	5	52	144	4	1

JEE (Advanced) Practice Paper

Section-I	Q.	1	2	3	4	5	
	A.	A	C	D	B	A	
Section-II	Q.	6	7	8	9	10	
	A.	B	B,C,D	A,C	A,D	A,B,D	
Section-III	Q.	11	12	13			
	A.	A	B	C			
Section-IV	Q.	14					
	A.	$A \rightarrow p; B \rightarrow q; C \rightarrow r; D \rightarrow s$					
Section-V	Q.	15	16	17	18		
	A.	0	4	2	780		