# JEE MAIN : CHAPTER WISE TEST PAPER-8

**SUBJECT :- MATHEMATICS** **DATE**........................................................
**CLASS :- 11th** **NAME**........................................................
**CHAPTER :- STRAIGHT LINE** **SECTION**....................................................

## (SECTION-A)

**1.** One side of a square is inclined at an acute angle $\alpha$ with the positive x-axis, and one of its extremities is at the origin. If the remaining three vertices of the square lie above the x-axis and the side of a square is 4, then the equation of the diagonal of the square which is not passing through the origin is
(A) $(\cos\alpha + \sin\alpha)x + (\cos\alpha - \sin\alpha)y = 4$
(B) $(\cos\alpha + \sin\alpha)x - (\cos\alpha - \sin\alpha)y = 4$
(C) $(\cos\alpha - \sin\alpha)x + (\cos\alpha + \sin\alpha)y = 4$
(D) $(\cos\alpha - \sin\alpha)x - (\cos\alpha + \sin\alpha)y = 4\cos 2\alpha$

**2.** A variable rectangle PQRS has its sides parallel to fixed directions. Q and S lie respectively on the lines $x = a$, $x = -a$ and P lies on the x – axis. Then the locus of R is
(A) a straight line
(B) a circle
(C) a parabola
(D) pair of straight lines

**3.** A rectangular billiard table has vertices at P(0, 0), Q(0, 7), R(10, 7) and S (10, 0). A small billiard ball starts at M(3, 4) and moves in a straight line to the top of the table, bounces to the right side of the table, then comes to rest at N(7, 1). The y-coordinate of the point where it hits the right side, is
(A) 3.7 (B) 3.8 (C) 3.9 (D) 4

**4.** If it is possible to draw a line which belongs to the following given family of lines
$(y - 2x + 1) + \lambda_1 (2y - x - 1) = 0,$
$(3y - x - 6) + \lambda_2 (y - 3x + 6) = 0,$
$(\alpha x + y - 2) + \lambda_3 (6x + \alpha y - \alpha) = 0,$
then the possible values of $\alpha$ can be
(A) 4 (B) + 3 (C) 1 (D) 0

**5.** TS is the perpendicular bisector of AB with coordinate of A (0, 4) and B(p, 6) and the point S lies on the x-axis. If x-coordinate of S is an integer then the number of integral values of '*p*' is
(A) 0 (B) 1 (C) 2 (D) 4

**6.** Given a triangle whose vertices are at (0, 0), (4, 4) and (10, 0). A square is drawn in it such that its base is on the x-axis and its two corners are on the 2 sides of the triangle. The area of the square is equal to
(A) $\frac{400}{49}$ (B) $\frac{400}{25}$ (C) $\frac{625}{16}$ (D) $\frac{625}{49}$

**7.** $A \equiv (-4, 0), B \equiv (4, 0)$, M and N are variable points on y-axis such that M lies below N and MN = 4. If the line joining AM and BN intersect at P, then locus of P is-
(A) $2xy + 16 + x^2 = 0$
(B) $2xy - 16 + x^2 = 0$
(C) $2xy - 16 - x^2 = 0$
(D) $2xy + 16 - x^2 = 0$

**8.** Line AB passes through point (2, 3) and intersects the positive x and y axes at A(a, 0) and B(0, b) respectively. If the area of $\Delta AOB$ is 11, the numerical value of $4b^2 + 9a^2$, is
(A) 220 (B) 240 (C) 248 (D) 284

**9.** If A (2, – 2) and B (– 2, 1) are vertices of a triangle ABC whose centroid is $\left(\frac{5}{3}, \frac{1}{3}\right)$, then co-ordinates of its circumcentre is equal to
(A) $\left(\frac{3}{2}, \frac{1}{2}\right)$ (B) $\left(\frac{3}{2}, \frac{3}{2}\right)$
(C) $\left(\frac{3}{2}, \frac{5}{2}\right)$ (D) $\left(\frac{5}{2}, \frac{5}{2}\right)$

**10.** Suppose the line $L_1$ has equation $10x - 12y = -17$. The line $L_2$ intersect $L_1$ at $\left(\frac{1}{2}, \frac{11}{6}\right)$ and is perpendicular to $L_1$. The abscissa of the point on $L_2$ whose ordinate is $\frac{1}{30}$, is equal to
(A) 1 (B) $\frac{179}{150}$ (C) 2 (D) $\frac{359}{150}$

**11.** The base BC of a triangle ABC is bisected at the point (p, q) and the equation to the side AB and AC are $px + qy = 1$ and $qx + py = 1$. The equation of the median through A is :
(A) $(p - 2q)x + (q - 2p)y + 1 = 0$
(B) $(p + q)(x + y) - 2 = 0$
(C) $(2pq - 1)(px + qy - 1) = (p^2 + q^2 - 1)(qx + py - 1)$
(D) none

**12.** Equation of a straight line which passes through the point of intersection of the lines $3x - 4y + 6 = 0$ and $x + y + 2 = 0$ and has equal intercepts on the coordinates axes, is
(A) $x - y + 2 = 0$
(B) $2x + 2y + 3 = 0$
(C) $x + y + 2 = 0$
(D) no such line can be found out

**13.** The ends of the base of an isosceles triangle are at (2, 0) and (0, 1) and the equation of one side is x = 2 then the orthocentre of the triangle is

(A) $\left(\frac{3}{4},\frac{3}{2}\right)$ (B) $\left(\frac{5}{4},1\right)$

(C) $\left(\frac{3}{4},1\right)$ (D) $\left(\frac{4}{3},\frac{7}{12}\right)$

**14.** The lines y = mx + b and y = bx + m intersect at the point (m – b, 9), where $m \neq b$. The sum of the x-intercepts of the lines is

(A) 9 (B) $-\frac{41}{20}$ (C) $\frac{41}{20}$

(D) can not be computed as data is insufficient

**15.** Let $a, b, c \in R$ and satisfying $(a + c)^2 + 4b^2 - 4ab - 4bc = 0$ then the variable line ax + by + c = 0 passes through a fixed point whose co-ordinates are

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

**16.** The equation of the base of an equilateral triangle ABC is x + y = 2 and the vertex is (2, –1). The area of the triangle ABC is :

(A) $\frac{\sqrt{2}}{6}$ (B) $\frac{\sqrt{3}}{6}$ (C) $\frac{\sqrt{3}}{8}$ (D) none

**17.** A piece of cheese is located at (12, 10) in a coordinate plane. A mouse is at (4, – 2) and is running up the line y = – 5x + 18. At the point (a, b), the mouse starts getting farther from the cheese rather than closer to it. The value of (a + b) is

(A) 6 (B) 10 (C) 18 (D) 14

**18.** If a > 0 then maximum area of the triangle formed by straight line $x + a(a^2 + 1)y - a = 0$ with co-ordinate axes is equal to

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

**19.** A point (x, y) in the first quadrant lies on a line with intercepts (a, 0) and (0, b), where a, b > 0. Rectangle M has vertices (0, 0), (x, 0), (x, y) and (0, y) while rectangle N has vertices (x, y), (x, b), (a, b) and (a, y). The ratio of the area of M to that of N is

(A) 1 (B) 2 (C) $\frac{1}{2}$

(D) dependent on the value of a, b, x and y.

**20.** Let C denotes the rectangular hyperbola xy = 1 and $C_1$ is the reflection of C in the line y = 2x. If the equation of the curve $C_1$ can be written in the form $12x^2 + bxy + cy^2 + d = 0$, then the value of (b + c + d) is equal to

(A) 6 (B) 20 (C) 30 (D) 44

**(SECTION-B)**

**21.** Consider a square ABCD of side 12 and let M, N be the midpoints of AB, CD respectively. If a point P is taken on MN such that AP = r, PC = s and the area of triangle whose sides are r, s and 12 is $\Delta$, then find the value of $\sqrt{\Delta}$.

**22.** Two parallel lines $l_1$ and $l_2$ having non-zero slope, are passing through the points (0, 1) and (– 1, 0) respectively. Two other lines $l_3$ and $l_4$ are drawn through (0, 0) and (1, 0), which are perpendicular to $l_1$ and $l_2$ respectively. The two sets of lines intersect in four points which are vertices of a square. If the area of this square can be expressed in the form $\frac{p}{q}$ where $p, q \in N$, then find the least value of (p + q).

**23.** Straight line $L_1$ is parallel to the bisector of first and third quadrant, forms a triangle of area 2 square units with coordinate axes in second quadrant. Line $L_2$ passes through M(1, 1) and has positive x and y intercepts. $L_2$ makes a triangle of minimum area with coordinates axes. Find the area of triangle formed by $L_1$, $L_2$ and x-axis.

**24.** The slopes of sides BC, CA, AB of triangle ABC whose orthocentre is origin are – 1, – 2, – 3 respectively. If locus of centroid of triangle ABC is $y = \left(\frac{m}{n}\right)x$, where m, n are relatively prime then find (n – m).

**25.** A(3, 1) and C(6, 2) are two points, B and D lie on the lines x – 3y – 1= 0 and x – 3y + 4 = 0 respectively such that a convex quadrilateral ABCD is formed. If area of quadrilateral ABCD is $\frac{p}{q}$, $p, q \in N$ then find the least value of (p – q).

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

**27.** If locus of a point $P(3 + r\cos\alpha, 4 + r\sin\alpha)$ where $\alpha = \pi - \tan^{-1} 2$ and r is a parameter, in the line mirror 4x + y = 16 is the curve C which meets the line y = 21x at $(x_0, y_0)$ then find the value of $x_0$.

**28.** Consider a $\Delta ABC$ formed by lines $L_1 : x + y = 30$ ; $L_2 : y - x = 12$ and $L_3 : x - 3y = 30$. If the points $(a, a^2)$ lies in or on the triangle then find the sum of all possible integral values of a.

**29.** Let $A_r$ ; $r = 1, 2, 3, \ldots\ldots$ be points on the number line such that $OA_1, OA_2, OA_3, \ldots\ldots$ are in G.P. where O is the origin. The common ratio of the G.P. is $\frac{1}{2}$ and $OA_1 = 4$. If $M_r$ is the middle point of line segment $A_{r+1}A_r$, then find the value of $\sum_{r=1}^{\infty} OM_r$ .

**30.** Let $(\alpha_1, \beta_1), (\alpha_2, \beta_2), (\alpha_3, \beta_3)$ be vertices of a $\Delta ABC$ with $\alpha_1, \alpha_2, \alpha_3, \ \beta_1, \beta_2, \beta_3$ are prime values of k in increasing order for which one root of equation $(k - 5)x^2 - 2kx + k - 4 = 0$ is smaller than 1 and other exceed 2. If P (p, q) is a point inside the triangle such that area of $\Delta PAC$ = area of $\Delta PAB$ = area of $\Delta PBC$, then find the value of $\left(\frac{p+q}{10}\right)$.