JEE MAIN + ADVANCED

MATHEMATICS

TOPIC NAME

STRAIGHT LINE

(PRACTICE SHEET)

Question based on **Slope of a Line & Different forms of Equation of Straight Line**

Q.1 The angle made by the line joining the points (1, 0) and (–2, $\sqrt{3}$) with x axis is -
(A) 120º (B) 60º (C) 150º (D) 135º

Q.2 If A(2,3), B(3,1) and C(5,3) are three points, then the slope of the line passing through A and bisecting BC is -
(A) 1/2 (B) –2 (C) –1/2 (D) 2

Q.3 If the vertices of a triangle have integral coordinates, then the triangle is -
(A) Isosceles (B) Never equilateral
(C) Equilateral (D) None of these

Q.4 The equation of a line passing through the point (–3, 2) and parallel to x-axis is -
(A) x – 3 = 0 (B) x + 3 = 0
(C) y – 2 = 0 (D) y + 2 = 0

Q.5 If the slope of a line is 2 and it cuts an intercept – 4 on y-axis, then its equation will be -
(A) y – 2x = 4 (B) x = 2y – 4
(C) y = 2x – 4 (D) None of these

Q.6 The equation of the line cutting of an intercept –3 from the y-axis and inclined at an angle $\tan^{-1} 3/5$ to the x axis is -
(A) 5y – 3x + 15 = 0 (B) 5y – 3x = 15
(C) 3y – 5x + 15 = 0 (D) None of these

Q.7 If the line y = mx + c passes through the points (2, 4) and (3, –5), then -
(A) m = –9, c = –22 (B) m = 9, c = 22
(C) m = –9, c = 22 (D) m = 9, c = –22

Q.8 The equation of the line inclined at an angle of 60º with x-axis and cutting y-axis at the point (0, –2) is -
(A) $\sqrt{3}$ y = x – 2 $\sqrt{3}$ (B) y = $\sqrt{3}$ x – 2
(C) $\sqrt{3}$ y = x + 2 $\sqrt{3}$ (D) y = $\sqrt{3}$ x + 2

Q.9 The equation of a line passing through the origin and the point (a cosθ, a sin θ) is-
(A) y = x sin θ (B) y = x tan θ
(C) y = x cos θ (D) y = x cot θ

Q.10 Slope of a line which cuts intercepts of equal lengths on the axes is -
(A) –1 (B) 2 (C) 0 (D) $\sqrt{3}$

Q.11 The intercept made by line x cosα + y sinα = a on y axis is -
(A) a (B) a cosecα
(C) a secα (D) a sinα

Q.12 The equation of the straight line which passes through the point (1, –2) and cuts off equal intercepts from axes will be-
(A) x + y =1 (B) x – y = 1
(C) x + y + 1 = 0 (D) x – y – 2 = 0

Q.13 The intercept made by a line on y-axis is double to the intercept made by it on x-axis. If it passes through (1, 2) then its equation-
(A) 2x + y = 4 (B) 2x + y + 4 = 0
(C) 2x – y = 4 (D) 2x – y + 4 = 0

Q.14 If the point (5, 2) bisects the intercept of a line between the axes, then its equation is-
(A) 5x + 2y = 20 (B) 2x + 5y = 20
(C) 5x – 2y = 20 (D) 2x – 5y = 20

Q.15 If the point (3,–4) divides the line between the x-axis and y-axis in the ratio 2 : 3 then the equation of the line will be -
(A) 2x + y = 10 (B) 2x – y = 10
(C) x + 2y = 10 (D) x – 2y = 10

Q.16 The equation to a line passing through the point (2, –3) and sum of whose intercept on the axes is equal to –2 is -
(A) x + y + 2 = 0 or 3x + 3y = 7
(B) x + y + 1 = 0 or 3x – 2y = 12
(C) x + y + 3 = 0 or 3x – 3y = 5
(D) x – y + 2 = 0 or 3x + 2y = 12

Q.17 The line $bx + ay = 3ab$ cuts the coordinate axes at A and B, then centroid of ΔOAB is-

(A) (b, a) (B) (a, b)

(C) (a/3, b/3) (D) (3a, 3b)

Q.18 The area of the triangle formed by the lines $x = 0$, $y = 0$ and $x/a + y/b = 1$ is-

(A) ab (B) ab/2

(C) 2ab (D) ab/3

Q.19 The equations of the lines on which the perpendiculars from the origin make 30º angle with x-axis and which form a triangle of area $\frac{50}{\sqrt{3}}$ with axes, are -

(A) $x \pm \sqrt{3}\, y - 10 = 0$

(B) $\sqrt{3}\, x + y - 10 = 0$

(C) $x + \sqrt{3}\, y \pm 10 = 0$

(D) None of these

Q.20 If a perpendicular drawn from the origin on any line makes an angle 60º with x axis. If the line makes a triangle with axes whose area is $54\sqrt{3}$ square units, then its equation is -

(A) $x + \sqrt{3}\, y = 18$

(B) $\sqrt{3}\, x + y + 18 = 0$

(C) $\sqrt{3}\, x + y = 18$

(D) None of these

Q.21 For a variable line $x/a + y/b = 1$, $a + b = 10$, the locus of mid point of the intercept of this line between coordinate axes is -

(A) $10x + 5y = 1$ (B) $x + y = 10$

(C) $x + y = 5$ (D) $5x + 10y = 1$

Q.22 If a line passes through the point P(1,2) makes an angle of 45º with the x-axis and meets the line $x + 2y - 7 = 0$ in Q, then PQ equals -

(A) $\frac{2\sqrt{2}}{3}$ (B) $\frac{3\sqrt{2}}{2}$

(C) $\sqrt{3}$ (D) $\sqrt{2}$

Q.23 A line passes through the point (1, 2) and makes 60º angle with x axis. A point on this line at a distance 3 from the point (1, 2) is -

(A) $(-5/2, 2 - 3\sqrt{3}/2)$ (B) $(3/2, 2 + 3\sqrt{3}/2)$

(C) $(5/2, 2 + 3\sqrt{3}/2)$ (D) None of these

Q.24 If the points (1, 3) and (5, 1) are two opposite vertices of a rectangle and the other two vertices lie on the line $y = 2x + c$, then the value of c is -

(A) 4 (B) – 4

(C) 2 (D) None of these

Question based on Angle between two Straight Lines

Q.25 The angle between the lines $y - x + 5 = 0$ and $\sqrt{3}\, x - y + 7 = 0$ is -

(A) 15º (B) 60º

(C) 45º (D) 75º

Q.26 The angle between the lines $2x + 3y = 5$ and $3x - 2y = 7$ is -

(A) 45º (B) 30º

(C) 60º (D) 90º

Q.27 The angle between the lines $2x - y + 5 = 0$ and $3x + y + 4 = 0$ is-

(A) 30º (B) 90º

(C) 45º (D) 60º

Q.28 The obtuse angle between the line $y = -2$ and $y = x + 2$ is -

(A) 120º (B) 135º

(C) 150º (D) 160º

Q.29 The acute angle between the lines $y = 3$ and $y = \sqrt{3}\, x + 9$ is -

(A) 30º (B) 60º

(C) 45º (D) 90º

Q.30 Orthocenter of the triangle whose sides are given by $4x - 7y + 10 = 0$, $x + y - 5 = 0$ & $7x + 4y - 15 = 0$ is -

(A) (–1, –2) (B) (1, –2)

(C) (–1, 2) (D) (1, 2)

Q.31 The angle between the lines $x - \sqrt{3}y + 5 = 0$ and y-axis is -

(A) 90º (B) 60º

(C) 30º (D) 45º

Q.32 If the lines $mx + 2y + 1 = 0$ and $2x + 3y + 5 = 0$ are perpendicular then the value of m is -

(A) –3 (B) 3 (C) –1/3 (D) 1/3

Q.33 If the line passing through the points (4, 3) and (2, λ) is perpendicular to the line $y = 2x + 3$, then λ is equal to -

(A) 4 (B) –4

(C) 1 (D) –1

Q.34 The equation of line passing through (2, 3) and perpendicular to the line adjoining the points (–5, 6) and (–6, 5) is -

(A) $x + y + 5 = 0$ (B) $x - y + 5 = 0$

(C) $x - y - 5 = 0$ (D) $x + y - 5 = 0$

Q.35 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

Q.36 If the foot of the perpendicular from the origin to a straight line is at the point (3, –4). Then the equation of the line is -

(A) $3x - 4y = 25$ (B) $3x - 4y + 25 = 0$

(C) $4x + 3y - 25 = 0$ (D) $4x - 3y + 25 = 0$

Question based on Equation of Parallel and Perpendicular lines

Q.37 Equation of the line passing through the point (1, –1) and perpendicular to the line $2x - 3y = 5$ is -

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

(C) $3x + 2y - 3 = 0$ (D) $3x + 2y + 5 = 0$

Q.38 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

Q.39 The equation of a line passing through the point (a, b) and perpendicular to the line $ax + by + c = 0$ is -

(A) $bx - ay + (a^2 - b^2) = 0$

(B) $bx - ay - (a^2 - b^2) = 0$

(C) $bx - ay = 0$

(D) None of these

Q.40 The line passes through (1, –2) and perpendicular to y-axis is -

(A) $x + 1 = 0$ (B) $x - 1 = 0$

(C) $y - 2 = 0$ (D) $y + 2 = 0$

Q.41 The equation of a line passing through (a, b) and parallel to the line $x/a + y/b = 1$ is -

(A) $x/a + y/b = 0$ (B) $x/a + y/b = 2$

(C) $x/a + y/b = 3$ (D) $x/a + y/b + 2 = 0$

Q.42 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

Q.43 The equation of a line parallel to $2x - 3y = 4$ which makes with the axes a triangle of area 12 units, is -

(A) $3x + 2y = 12$ (B) $2x - 3y = 12$

(C) $2x - 3y = 6$ (D) $3x + 2y = 6$

Q.44 The equation of a line parallel to $x + 2y = 1$ and passing through the point of intersection of the lines $x - y = 4$ and $3x + y = 7$ is -

(A) $x + 2y = 5$ (B) $4x + 8y - 1 = 0$

(C) $4x + 8y + 1 = 0$ (D) None of these

Q.45 The straight line L is perpendicular to the line $5x - y = 1$. The area of the triangle formed by the line L and coordinate axes is 5. Then the equation of the line will be -

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

(B) $x - 5y = 5\sqrt{2}$ or $x - 5y = 5\sqrt{2}$

(C) $x + 4y = 5\sqrt{2}$ or $x - 2y = 5\sqrt{2}$

(D) $2x + 5y = 5\sqrt{2}$ or $x + 5y = 5\sqrt{2}$

Q.46 If (0, 0), (–2, 1) and (5, 2) are the vertices of a triangle, Then equation of line passing through its centroid and parallel to the line $x - 2y = 6$ is-

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

(C) $x - 2y = 0$ (D) $x - 2y + 1 = 0$

Q.47 The equation of the line which passes through $(a\cos^3\theta, a\sin^3\theta)$ and perpendicular to the line $x\sec\theta + y\operatorname{cosec}\theta = a$ is -

(A) $x\cos\theta + y\sin\theta = 2a\cos2\theta$

(B) $x\sin\theta - y\cos\theta = 2a\sin2\theta$

(C) $x\sin\theta + y\cos\theta = 2a\cos2\theta$

(D) $x\cos\theta - y\sin\theta = a\cos2\theta$

Question based on **Equation of straight lines through (x_1, y_1) making an angle α with $y = mx + c$**

Q.48 The equation of the lines which passes through the point (3,–2) and are inclined at 60º to the line $\sqrt{3}x + y = 1$.

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

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

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

(D) None of these

Q.49 (1, 2) is vertex of a square whose one diagonal is along the x – axis. The equations of sides passing through the given vertex are -

(A) $2x - y = 0,\ x + 2y + 5 = 0$

(B) $x - 2y + 3 = 0,\ 2x + y - 4 = 0$

(C) $x - y + 1 = 0,\ x + y - 3 = 0$

(D) None of these

Q.50 The equation of the lines which pass through the origin and are inclined at an angle $\tan^{-1} m$ to the line $y = mx + c$, are-

(A) $y = 0,\ 2mx + (1 - m^2)y = 0$

(B) $y = 0,\ 2mx + (m^2 - 1)y = 0$

(C) $x = 0,\ 2mx + (m^2 - 1)y = 0$

(D) None of these

Question based on **Length of Perpendicular, foot of the perpendicular & image of the point with respect to line**

Q.51 The length of the perpendicular from the origin on the line $\sqrt{3}x - y + 2 = 0$ is -

(A) 3 (B) 1

(C) 2 (D) 2.5

Q.52 The length of perpendicular from (2, 1) on line $3x - 4y + 8 = 0$ is-

(A) 5 (B) 4 (C) 3 (D) 2

Q.53 The length of perpendicular from the origin on the line $x/a + y/b = 1$ is -

(A) $\frac{b}{\sqrt{a^2 + b^2}}$ (B) $\frac{a}{\sqrt{a^2 + b^2}}$

(C) $\frac{ab}{\sqrt{a^2 + b^2}}$ (D) None of these

Q.54 The distance between the lines $5x + 12y + 13 = 0$ and $5x + 12y = 9$ is -

(A) 11/13 (B) 22/17

(C) 22/13 (D) 13/22

Q.55 The distance between the parallel lines $y = 2x + 4$ and $6x = 3y + 5$ is -

(A) $17/\sqrt{3}$ (B) 1

(C) $3/\sqrt{5}$ (D) $17\sqrt{5}/15$

Q.56 The foot of the perpendicular drawn from the point (7, 8) to the line $2x + 3y - 4 = 0$ is -

(A) $\left(\frac{23}{13}, \frac{2}{13}\right)$ (B) $\left(13, \frac{23}{13}\right)$

(C) $\left(-\frac{23}{13}, -\frac{2}{13}\right)$ (D) $\left(-\frac{2}{13}, \frac{23}{13}\right)$

Q.57 The coordinates of the point Q symmetric to the point P(–5, 13) with respect to the line $2x - 3y - 3 = 0$ are -

(A) (11, –11) (B) (5, –13)

(C) (7, –9) (D) (6, –3)

Question based on **Lines passing through the Point of Intersection of two lines**

Q.58 The line passing through the point of intersection of lines $x + y - 2 = 0$ and $2x - y + 1 = 0$ and origin is -

(A) $5x - y = 0$ (B) $5x + y = 0$

(C) $x + 5y = 0$ (D) $x - 5y = 0$

Q.59 The equation of the line through the point of intersection of the line $y = 3$ and $x + y = 0$ and parallel to the line $2x - y = 4$ is -

(A) $2x - y + 9 = 0$ (B) $2x - y - 9 = 0$

(C) $2x - y + 1 = 0$ (D) None of these

Q.60 The equation of the line passing through the point of intersection of the line $4x - 3y - 1 = 0$ and $5x - 2y - 3 = 0$ and parallel to the line $2x - 3y + 2 = 0$ is -

(A) $x - 3y = 1$ (B) $3x - 2y = 1$

(C) $2x - 3y + 1 = 0$ (D) $2x - y = 1$

Q.61 The equation of a line perpendicular to the line $5x - 2y + 7 = 0$ and passing through the point of intersection of lines $y = x + 7$ and $x + 2y + 1 = 0$, is -

(A) $2x + 5y = 0$ (B) $2x + 5y = 20$

(C) $2x + 5y = 10$ (D) None of these

Q.62 The equation of straight line passing through the point of intersection of the lines $x - y + 1 = 0$ and $3x + y - 5 = 0$ and perpendicular to one of them is -

(A) $x + y - 3 = 0$ or $x - 3y + 5 = 0$

(B) $x - y + 3 = 0$ or $x + 3y + 5 = 0$

(C) $x - y - 3 = 0$ or $x + 3y - 5 = 0$

(D) $x + y + 3 = 0$ or $x + 3y + 5 = 0$

Question based on Condition of concurrency

Q.63 If a, b, c are in A.P., then $ax + by + c = 0$ will always pass through a fixed point whose coordinates are -

(A) $(1, -2)$ (B) $(-1, 2)$

(C) $(1, 2)$ (D) $(-1, -2)$

Q.64 The straight lines $ax + by + c = 0$ where $3a + 2b + 4c = 0$ are concurrent at the point

(A) $(1/2, 3/4)$ (B) $(3/4, 1/2)$

(C) $(-3/4, -1/2)$ (D) $(-3/4, 1/2)$

Q.65 If the lines $ax + 2y + 1 = 0$, $bx + 3y + 1 = 0$, $cx + 4y + 1 = 0$ are concurrent, then a, b, c are in -

(A) AP (B) GP

(C) HP (D) None

Q.66 Find the fix point through which the line $x(a + 2b) + y(a + 3b) = a + b$ always passes for all values of a and b -

(A) $(2, 1)$ (B) $(1, 2)$

(C) $(2, -1)$ (D) $(1, -2)$

Question based on Bisector of Angle between two Lines

Q.67 The equation of the bisector of the angle between the lines $3x - 4y + 7 = 0$ and $12x - 5y - 8 = 0$ is -

(A) $99x - 77y + 51 = 0$, $21x + 27y - 131 = 0$

(B) $99x - 77y + 51 = 0$, $21x + 27y + 131 = 0$

(C) $99x - 77y + 131 = 0$, $21x + 27y - 51 = 0$

(D) None of these

Q.68 The equation of the bisector of the acute angle between the lines $3x - 4y + 7 = 0$ and $12x + 5y - 2 = 0$ is-

(A) $11x - 3y - 9 = 0$

(B) $11x - 3y + 9 = 0$

(C) $21x + 77y - 101 = 0$

(D) None of these

LEVEL-2

Q.1 The area of the parallelogram formed by the lines $4y-3x=1$, $4y-3x-3=0$, $3y-4x+1=0$, $3y-4x+2=0$ is -

(A) 3/8 (B) 2/7

(C) 1/6 (D) None of these

Q.2 If the intercept of a line between coordinate axes is bisected at the point (2, 2), then its equation is –

(A) $x+y=4$ (B) $2x+y=6$

(C) $x+2y=6$ (D) $3x-y=4$

Q.3 If sides of a triangle are $y=mx+a$, $y=nx+b$ and $x=0$, then its area is -

(A) $\frac{1(a-b)^2}{2(m-n)}$ (B) $\frac{1}{2}\frac{(a-b)^2}{m+n}$

(C) $\frac{1(a+b)^2}{2(m-n)}$ (D) None of these

Q.4 A variable line passes through a fixed point (a, b) and meets the co-ordinates axes in A and B. The locus of the point of intersection of lines through A, B parallel to coordinate axes is -

(A) $x/a+y/b=2$ (B) $a/x+b/y=1$

(C) $x/a+y/b=1$ (D) $x/a+y/b=3$

Q.5 The straight line $x=a$ and $x^2-3y^2=0$ encloses a triangle which is -

(A) isosceles (B) Right angled

(C) equilateral (D) None of these

Q.6 A straight line cuts intercepts from the coordinate axes sum of whose reciprocals is1/p. It passes through a fixed point -

(A) (1/p,p) (B) (p,1/p)

(C) (1/p,1/p) (D) (p, p)

Q.7 The diagonal of the parallelogram whose sides are $\ell x+my+n=0$, $\ell x+my+n'=0$, $mx+\ell y+n=0$, $mx+\ell y+n'=0$ include an angle -

(A) $\tan^{-1}\left(\frac{2\ell m}{\ell^2+m^2}\right)$ (B) $\tan^{-1}\left(\frac{\ell^2-m^2}{\ell^2+m^2}\right)$

(C) $\pi/2$ (D) $\pi/3$

Q.8 In the equation $y-y_1=m(x-x_1)$ if m and x_1 are fixed and different lines are drawn for different values of y_1, then; (where $m\neq\infty$) –

(A) There will be one line only

(B) There will be a set of parallel lines

(C) The lines will pass through the single point

(D) None of these

Q.9 If the coordinates of the points A, B, C be (–1, 5), (0, 0) and (2,2) respectively and D be the middle point of BC, then the equation of the perpendicular drawn from B to the line AD is -

(A) $2x+y=0$ (B) $x+2y=0$

(C) $x-2y=0$ (D) $2x-y=0$

Q.10 If p and q are length of the perpendiculars from the origin on the lines $x\sec\theta+y\,\text{cosec}\,\theta=a$ and $x\cos\theta-y\sin\theta=a\cos2\theta$, then $4p^2+q^2$ equals -

(A) $2a^2$ (B) a^2 (C) $3a^2$ (D) $4a^2$

Q.11 The lines 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 45º 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) $x=-2$

Q.12 If one diagonal of a rhombus is $x-2y=1$, then other diagonal will be -

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

(C) $2x+y=3$ (D) $x-2y=4$

Q.13 If the three lines $p_1x+q_1y=1$, $p_2x+q_2y=1$ and $p_3x+q_3y=1$ are concurrent, then the points (p_1, q_1), (p_2, q_2) and (p_3, q_3) are -

(A) vertices of right angle triangle

(B) vertices of an equilateral triangle

(C) vertices of isosceles triangle

(D) collinear

Q.14 The points on the line $x + y = 4$ which lie at a unit distance from the line $4x + 3y = 10$, are -

(A) (3, 1), (–7, 11) (B) (–3, 1), (–7, 11)

(C) (3, 1), (7, 11) (D) (1, 3), (–7, 11)

Q.15 If the lines $ax + by + c = 0$, $bx + cy + a = 0$ and $cx + ay + b = 0$ be concurrent, then -

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

(B) $a^3 + b^3 + c^3 + 3abc = 0$

(C) $a^3 + b^3 + c^3 - 3abc = 0$

(D) None of these

Q.16 The equation to a pair of opposite sides of a parallelogram are $x^2 - 5x + 6 = 0$ and $y^2 - 6y + 5 = 0$. The equations to its diagonals are -

(A) $4x + y = 13$ and $4y = x - 7$

(B) $x + 4y = 13$ and $y = 4x - 7$

(C) $4x + y = 13$ and $y = 4x - 7$

(D) $y - 4x = 13$ and $y + 4x = 7$

Q.17 Find the fix point through which the line $(2\cos\theta + 3\sin\theta)x + (3\cos\theta - 5\sin\theta)y - (5\cos\theta - 2\sin\theta) = 0$ passes for all values of θ -

(A) (0, 0) (B) (1, 1)

(C) (2, 1) (D) None of these

Q.18 Variable line $ax + by + c = 0$ passes a fixed point if a, b and c are three consecutive odd natural number, the fixed point is –

(A) (1, 1) (B) (2, –1)

(C) (1, –2) (D) None of these

Q.19 The point P (a, b) lies on the straight line $3x + 2y = 13$ and the point Q (b, a) lies on the straight line $4x - y = 5$, then the equation of line PQ is-

(A) $x - y = 5$ (B) $x + y = 5$

(C) $x + y = -5$ (D) $x - y = -5$

Q.20 If $a + b + c = 0$ and $p \neq 0$, the lines $ax + (b + c)y = p$, $bx + (c + a)y = p$ and $cx + (a + b)y = p$

(A) Do not intersect (B) Intersect

(C) Are concurrent (D) None of these

Q.21 The equation of the line joining the point (3, 5) to the point of intersection of the lines $4x + y - 1 = 0$ and $7x - 3y - 35 = 0$ is equidistant from the points (0, 0) and (8, 34)

(A) True

(B) False

(C) Nothing can be said

(D) None of these

Q.22 A straight line passes through a fixed point (h, k). The locus of the foot of perpendicular on it drawn from the origin is-

(A) $x^2 + y^2 - hx - ky = 0$

(B) $x^2 + y^2 + hx + ky = 0$

(C) $3x^2 + 3y^2 + hx - ky = 0$

(D) None of these

Q.23 The area bounded by the curves $y = |x| - 1$ and $y = -|x| + 1$ is -

(A) 1 (B) 2

(C) $2\sqrt{2}$ (D) 4

Q.24 The point $(a^2, a + 1)$ lies in the angle between the lines $3x - y + 1 = 0$ and $x + 2y - 5 = 0$ containing the origin, then -

(A) $a \in (0, 1)$ (B) $a \geq 1$ or $a \leq -3$

(C) $a \in (-3, 0) \cup \left(\frac{1}{3}, 1\right)$ (D) None of these

Q.25 In an isosceles triangle ABC, the coordinates of the points B and C on the base BC are respectively (2, 1) and (1, 2). If the equation of the line AB is $y = \frac{1}{2}x$, then the equation of the line AC is -

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

(C) $y = \frac{1}{2}(x - 1)$ (D) $y = x - 1$

Q.26 The number of lines that are parallel to $2x + 6y - 7 = 0$ and have an intercept 10 between the co-ordinate axis is

(A) 1 (B) 2

(C) 4 (D) Infinitely many

Q.27 The locus of the point of intersection of the lines $\sqrt{3}\,x - y - 4\sqrt{3}\,k = 0$ and $\sqrt{3}\,kx + ky - 4\sqrt{3} = 0$ for different value of k is

(A) Circle (B) Parabola

(C) Hyperbola (D) Ellipse

Q.28 The lines $x + (a - 1)\,y + 1 = 0$ and $2x + a^2y - 1 = 0$ are perpendicular if

(A) $|a| = 2$ (B) $0 < a < 1$

(C) $-1 < a < 0$ (D) $a = -1$

Q.29 Let α be the distance between the lines $-x + y = 2$ and $x - y = 2$, and β be the distance between the lines $4x - 3y = 5$ and $6y - 8x = 1$, then

(A) $20\sqrt{2}\,\beta = 11\alpha$ (B) $20\sqrt{2}\,\alpha = 11\beta$

(C) $11\sqrt{2}\,\beta = 20\alpha$ (D) None of these

Q.30 Given vertices A(1,1), B(4, –2) and C(5,5) of a triangle, then the equation of the perpendicular dropped from C to the interior bisector of the angle A is

(A) $y - 5 = 0$ (B) $x - 5 = 0$

(C) $y + 5 = 0$ (D) $x + 5 = 0$

LEVEL-3

Q.1 The incentre of the triangle formed by the axes and the line $\frac{x}{a}+\frac{y}{b}=1$ is -

(A) $\left(\frac{a}{2},\frac{b}{2}\right)$

(B) $\left(\frac{ab}{a+b+\sqrt{ab}},\frac{ab}{a+b+\sqrt{ab}}\right)$

(C) $\left(\frac{a}{3},\frac{b}{3}\right)$

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

Q.2 A straight line through the point (2, 2) intersects the lines $\sqrt{3}x+y=0$ and $\sqrt{3}x-y=0$ at the point A & B. The equation to the line AB so that triangle OAB is equilateral -

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

(C) $y-2=0$ (D) None of these

Q.3 $\frac{x}{a}+\frac{y}{b}=1$ is a variable line such that $\frac{1}{a^2}+\frac{1}{b^2}=\frac{1}{k^2}$. The locus of the foot of perpendicular from origin to the line is-

(A) $x^2+y^2-ax-by=0$

(B) $x^2+y^2+ax+by=a^2+b^2$

(C) $x^2+y^2=k^2$

(D) $x^2-y^2=2k^2$

Q.4 If a ray traveling along the line x = 1 gets reflected from the line x + y = 1 then the equation of the line along which the reflected ray travels is -

(A) $y=0$ (B) $x-y=1$

(C) $x=0$ (D) none of these

Q.5 The sides of a triangle are x = 2, y + 1 = 0 and x + 2y = 4. Its circumcentre is-

(A) (4, 0) (B) (2, – 1)

(C) (0, 4) (D) (2, 3)

Q.6 If r is the geometric mean of p and q, then the line px + qy + r = 0 -

(A) has a fixed direction

(B) passes through a fixed point

(C) forms with the axes a triangle of constant area

(D) sum of its intercepts on the axes is constant

Q.7 If $16a^2-40ab+25b^2-c^2=0$, then the line ax + by + c = 0 passes through the points -

(A) (4, – 5) and (– 4, 5)

(B) (5, – 4) and (– 5, 4)

(C) (1, – 1) and (– 1, 1)

(D) None of these

Q.8 The equations of two sides of a square whose area is 25 square units are 3x – 4y = 0 and 4x + 3y = 0. The equations of the other two sides of the square are-

(A) $3x-4y\pm25=0,\ 4x+3y\pm25=0$

(B) $3x-4y\pm5=0,\ 4x+3y\pm5=0$

(C) $3x-4y\pm5=0,\ 4x+3y\pm25=0$

(D) none of these

Q.9 The equation of base of an equilateral triangle is x + y = 2. The vertex is (2, –1) then area of triangle is-

(A) $2\sqrt{3}$ (B) $\frac{\sqrt{3}}{6}$ (C) $\frac{1}{\sqrt{3}}$ (D) $\frac{2}{\sqrt{3}}$

Q. 10 ABCD is a rectangle A ≡ (1, 2), B ≡ (3, –4). If line CD passes through (3, 8), then mid-point of CD is

(A) (2, 6) (B) (6, 2)

(C) (2, 5) (D) $\left(\frac{28}{5},\frac{1}{5}\right)$

Q. 11 The line L has intercepts a and b on the coordinate axes. When keeping the origin fixed, the coordinate axes are rotated through a fixed angle, then the same line has intercepts p and q on the rotated axes. Then

(A) $a^2+b^2=p^2+q^2$ (B) $\frac{1}{a^2}+\frac{1}{b^2}=\frac{1}{p^2}+\frac{1}{q^2}$

(C) $a^2+p^2=b^2+q^2$ (D) $\frac{1}{a^2}+\frac{1}{p^2}=\frac{1}{b^2}+\frac{1}{q^2}$

Q. 12 A variable line drawn through the point (1, 3) meets the x- axis at A and y- axis at B. It the rectangle OAPB is completed, where 'O' is the origin, then locus of 'P' is-

(A) $\frac{1}{y}+\frac{3}{x}=1$ (B) $x + 3y = 1$

(C) $\frac{1}{x}+\frac{3}{y}=1$ (D) $3x + y = 1$

Q. 13 If we reduce $3x + 3y + 7 = 0$ to the form $x \cos\alpha + y \sin\alpha = p$, then the value of p is

(A) $\frac{7}{2\sqrt{3}}$ (B) $\frac{7}{3}$

(C) $\frac{3\sqrt{7}}{2}$ (D) $\frac{7}{3\sqrt{2}}$

Q. 14 $ax - by - a^2 = 0$, where a, b are non-zero, is the equation to the straight line perpendicular to a line ℓ and passing through the point where ℓ crosses the x- axis. Then equation to the line ℓ is

(A) $\frac{x}{b}-\frac{y}{a}=1$ (B) $\frac{x}{a}+\frac{y}{b}=1$

(C) $\frac{x}{b}+\frac{y}{a}=ab$ (D) $\frac{x}{a}-\frac{y}{b}=ab$

Direction: **Assertion/Reason type Question.**

The following questions (Q. 15 to 24) given below consist of an "Assertion" (1) and "Reason "(2) Type questions. Use the following key to choose the appropriate answer.

(A) Both (1) and (2) are true and (2) is the correct explanation of (1)

(B) Both (1) and (2) are true but (2) is not the correct explanation of (1)

(C) (1) is true but (2) is false

(D) (1) is false but (2) is true

Q.15 **Statement (1) :** The st. lines $3x + 4y = 9$ and $6x + 8y + 15 = 0$ are parallel.

Statement (2) : They are on the opposite side of the origin.

Q.16 **Statement (1) :** Equation of the bisector of acute angle between the lines $4x - 3y + 7 = 0$ and $3x - 4y + 3 = 0$ is $x - y + 2 = 0$.

Statement (2): Any point on the bisector of the two lines always equidistant from the given lines.

Q.17 Three (or more) lines are said to be concurrent lines if all the lines pass through the same point.

Statement (1): If $3a - 2b + 5c = 0$ then the family of lines $ax + by + c = 0$ are concurrent.

Statement (2): If $L_1 = 0$ and $L_2 = 0$ are any two non-parallel lines then $L_1 + \lambda L_2 = 0$ represents a set of lines through the intersection of $L_1 = 0$ and $L_2 = 0$, where λ is a non-zero real number.

Q.18 The line joining two points A(–3, 2) and B(1, –2) make angle α with positive direction of x- axis. Then

Statement (1): $\sin 2\alpha \neq \cos 2\alpha = 1$

Statement (2): If a line makes angle θ with positive direction of x- axis then slope of line $= \tan\theta$

Q.19 **Statement (1)**: Area of triangle formed by line $3x + 4y + 12 = 0$ and coordinate axis is 6.

Statement (2): Area of triangle formed by line $Ax + By + C = 0$ and coordinate axis is $\frac{2C^2}{|AB|}$

Q.20 Sides of a triangle are $2x - 3y - 1 = 0$, $3x + 2y - 5 = 0$ and $x + y - 1 = 0$ then

Statement (1): Orthocentre of the triangle is (1, 1)

Statement (2) : Orthocentre of a right angled triangle is the vertex at which angle is right angle.

Q.21 **Statement (1)** : If p is length of perpendicular from origin to the line $\frac{x}{a}+\frac{y}{b}=1$ then a^2, $2p^2$ and b^2 are in H.P.

Statement (2) : If p is the perpendicular distance of line $\frac{x}{a}+\frac{y}{b}=1$ from (0, 0), then $\frac{1}{p^2}=\frac{1}{a^2}+\frac{1}{b^2}$

Q.22 A pair of straight line drawn through the origin form with the line $2x + 3y = 6$ an isosceles, right angled triangle then

Statement (1): Area of the triangle is $\frac{36}{13}$

Statement (2): If ABC is a right angled isosceles triangle right angled at A, and AD is perpendicular from A to BC, then area of $\Delta ABC = (AD)^2$

Q.23 **Statement (1)** : Area enclosed by the lines represented by $\pm 2x \pm 3y + 6 = 0$ is 6..

Statement (2): Area enclosed by the lines represented by equation $\pm ax \pm by + c = 0$ is $\frac{2c^2}{|ab|}$

Q.24 **Statement (1)**: Point (–1, –1) and (3, 7) lies on the same side of line $3x – 8y – 7 = 0$

Statement (2): If (x_1, y_1) and (x_2, y_2) lies on same side of line $ax + by + c = 0$ then $\frac{ax_1 + by_1 + c}{ax_2 + by_2 + c} > 0$.

Passage -1

A(0, 3), B (–2, 0) and C(6, 1) be the vertices of a triangle and M($\beta, \beta + 1$) be a moving point then

Q.25 M lies on the curve

(A) $y = x + 1$ (B) $y = x^2$

(C) $x = y + 1$ (D) None of these

Q.26 If M and A lie on same side of BC then

(A) $\beta > 2$ (B) $\beta < 2$

(C) $\beta > -\frac{6}{7}$ (D) $\beta < \frac{3}{4}$

Q.27 M lies within ΔABC if

(A) $-\frac{6}{7} < \beta < 4$ (B) $-4 < \beta < -\frac{6}{7}$

(C) $-\frac{6}{7} < \beta < \frac{3}{2}$ (D) None of these

Passage-2

Given the equations of two sides of a square as $5x + 12y – 10 = 0$, $5x + 12y + 29 = 0$. Also given is a point M(–3, 5) lying on one of its sides. Answer the following questions

Q.28 The number of possible squares must be

(A) one (B) two

(C) four (D) None of these

Q.29 The area of the square must be

(A) 9 units (B) 6 units

(C) 5 units (D) None of these

Q.30 If the possible equations of the remaining sides is $12x – 5y + \lambda = 0$ then λ cannot be-

(A) 61 (B) 22

(C) 100 (D) 36

LEVEL- 4

(Question asked in previous AIEEE and IIT-JEE)

SECTION –A

Q.1 A square of side a lies above the x- axis and has one vertex at the origin. The side passing through the origin makes an angle α $(0 < \alpha < \frac{\pi}{4})$ with the positive direction of x- axis. The equation of its diagonal not passing through the origin is- **[AIEEE 2003]**

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

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

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

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

Q.2 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]**

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

Q.3 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]**

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

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

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

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

Q.4 The line parallel to the x-axis and passing through the intersection of the lines $ax + 2by + 3b = 0$ and $bx - 2ay - 3a = 0$, where $(a, b) \neq (0, 0)$ is - **[AIEEE-2005]**

(A) below the x-axis at a distance of 3/2 from it

(B) below the x-axis at a distance of 2/3 from it

(C) above the x-axis at a distance of 3/2 from it

(D) above the x-axis at a distance of 2/3 from it

Q.5 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]**

(A) (–1, 2) (B) (–1, –2)

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

Q.6 A straight line through the point A(3, 4) is such that its intercept between the axes is bisected at A. Its equation is – **[AIEEE 2006]**

(A) $3x - 4y + 7 = 0$ (B) $4x + 3y = 24$

(C) $3x + 4y = 25$ (D) $x + y = 7$

Q.7 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]**

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

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

Q.8 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]**

(A) 2 (B) –2

(C) –4 (D) 1

Q.9 The line $p(p^2 + 1)x - y + q = 0$ and $(p^2 + 1)^2 x + (p^2 + 1)y + 2q = 0$ are perpendicular to a common line for **[AIEEE- 2009]**

(A) Exactly one value of p

(B) Exactly two values of p

(C) More than two values of p

(D) No value of p

Q.10 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]**

(A) $\frac{23}{\sqrt{15}}$ (B) $\sqrt{17}$

(C) $\frac{17}{\sqrt{15}}$ (D) $\frac{23}{\sqrt{17}}$

Q.11 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]**

(A) $(0, \infty)$ (B) $(1, \infty)$

(C) $(-1, \infty)$ (D) $(-1, 1]$

Q.12 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]**

(A) –4 (B) – 2

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

Q.13 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]**

(A) $y = \sqrt{3}\, x - \sqrt{3}$ (B) $\sqrt{3}\, y = x - 1$

(C) $y = x + \sqrt{3}$ (D) $\sqrt{3}\, y = x - \sqrt{3}$

SECTION –B

Q.1 The orthocentre of the triangle formed by the lines xy = 0 and x + y = 1 is **[IIT 1995]**

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

(C) (0, 0) (D) $\left(\frac{1}{4},\frac{1}{4}\right)$

Q.2 The diagonals of parallelogram PQRS are along the lines x + 3y = 4 and 6x – 2y = 7. Then PQRS must be a **[IIT 1998]**

(A) rectangle

(B) square

(C) cyclic quadrilateral

(D) rhombus

Q.3 Orthocentre of the triangle whose vertices are A (0, 0), B (3, 4) & C (4, 0) is : **[IIT Scr. 2003]**

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

(C) (3, 12) (D) (2, 0)

Q.4 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 - **[IIT-Scr.-2000]**

(A) 2x – 9y – 7 = 0 (B) 2x – 9y – 11 = 0

(C) 2x + 9y – 11 = 0 (D) 2x + 9y + 7 = 0

Q.5 Find the number of integer value of m which makes the x coordinates of point of intersection of lines. 3x + 4y = 9 and y = mx + 1 integer. **[IIT-Scr.-2001]**

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

Q.6 Area of the parallelogram formed by the lines y = mx, y = mx + 1, y = nx, y = nx + 1 is **[IIT-Scr.-2001]**

(A) $|m + n| / (m - n)^2$ (B) $2 / |m + n|$

(C) $1 / |m + n|$ (D) $1 / |m - n|$

Q.7 A straight line through the origin O meets the parallel lines 4x + 2y = 9 and 2x + y + 6 = 0 at the points P and Q respectively. Then the point O divides the segment PQ in the ratio- **[IIT-Scr.-2002]**

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

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

Q.8 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-**[IIT-Scr.-2002/AIEEE-07]**

(A) $(\sqrt{3}/2)\, x + y = 0$ (B) $x + \sqrt{3}\, y = 0$

(C) $\sqrt{3}\, x + y = 0$ (D) $x + (\sqrt{3}/2)\, y = 0$

Q.9 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. **[IIT-2007/AIEEE-11]**

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

Q.10 The locus of the orthocenter of the triangle formed by the lines **[IIT- 2009]**

$(1 + p) x - py + p (1 + p) = 0$,

$(1 + q) x - qy + q (1 + q) = 0$,

and $y = 0$, where $p \neq q$, is

(A) a hyperbola (B) a parabola

(C) an ellipse (D) a straight line

Q.11 A straight line L through the point (3, –2) is inclined at an angle 60° to the line $\sqrt{3}\,x + y = 1$. If L also intersects the x-axis, then the equation of L is - **[IIT- 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) $\sqrt{3}\,y + x - 3 + 2\sqrt{3} = 0$

Q.12 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 - Advance 2013]**

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

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

ANSWER KEY

LEVEL-1

Qus.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	C	C	B	C	C	A	C	B	B	A	B	C	A	B	B	B	B	B	B	A
Qus.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Ans.	C	A	C	B	A	D	C	B	B	D	B	A	A	D	C	A	A	C	C	D
Qus.	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ans.	B	D	B	B	A	D	D	A	C	B	B	D	C	C	D	A	A	A	A	C
Qus.	61	62	63	64	65	66	67	68												
Ans.	A	A	A	B	A	C	A	B												

LEVEL-2

Qus.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	B	A	A	B	C	D	C	B	C	B	C	C	D	A	C	C	B	C	B	A
Qus.	21	22	23	24	25	26	27	28	29	30										
Ans.	A	A	B	C	B	B	C	D	A	B										

LEVEL-3

Qus.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	D	C	C	A	A	C	A	A	B	D	B	C	D	B	B	D	A	D	C	D
Qus.	21	22	23	24	25	26	27	28	29	30										
Ans.	A	A	D	A	A	C	C	B	A	D										

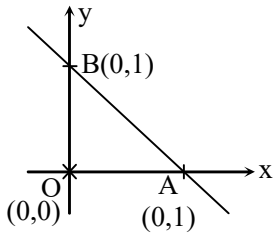
LEVEL- 4

SECTION-A

Q.No.	1	2	3	4	5	6	7	8	9	10	11	12	13
Ans.	A	C	D	A	C	B	B	C	A	D	B	B	D

SECTION-B

1.[C]



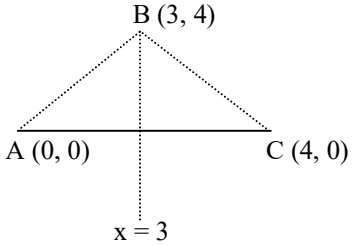
$xy = 0$ … (1)

$x + y = 0$ … (2)

$\because$ ΔOAB is a right angled triangle, so, right angle vertex will be the orthocentre, i.e.,(0, 0)

2.[D] As diagonals are perpendicular to each other so it must be rhombus.

3.[A]



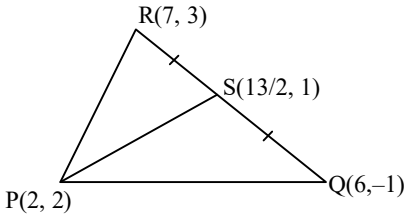
Slope BC = –4

Equation of altitude through A

$y = \frac{1}{4}x$

Therefore, orthocentre is $\left(3, \frac{3}{4}\right)$

4.[D]



Slope of PS = $\frac{2-1}{2-\frac{13}{2}} = \frac{1\times 2}{-9} = -\frac{2}{9}$

Equation of required line is

$y + 1 = \left(-\frac{2}{9}\right)(x-1) \Rightarrow 2x + 9y + 7 = 0$

5.[A] $3x + 4y = 9$

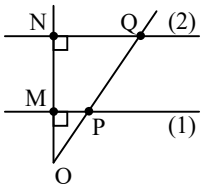
$mx - y = -1$

$x = \frac{5}{3+4m}$

$m = -1, -2$

6.[D] Area = $\left|\frac{(1-0)(1-0)}{m-n}\right| = \frac{1}{|m-n|}$

7.[B]



$4x + 2y = 9$ … (1)

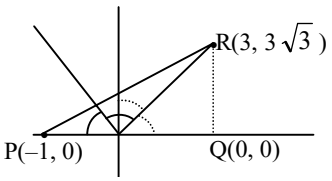
$2x + y + 6 = 0$ … (2)

$\because$ ΔOPM & ΔOQN

are similar Δ's

Then, $\frac{OP}{OQ} = \frac{OM}{ON} = -\frac{(-9)}{12} = \frac{3}{4}$

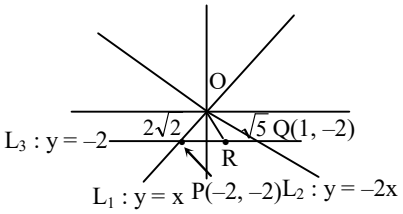
8.[C]



$y = (-\cot 30°)\, x$

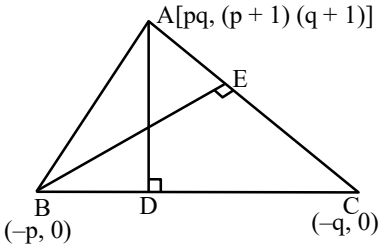
$y = -\sqrt{3}\, x$

9.[C]



As PR : RQ = OP : OQ = $2\sqrt{2} : \sqrt{5}$

10.[D] Intersection points of given lines are (–p, 0), (–q, 0), [pq, (p + 1) (q + 1)] respectively



now equation of altitudes AD and BE are

$x = pq$, and $qx + (q + 1)\, y + pq = 0$

Their point of intersection is (pq, – pq)

so $h = pq, k = -pq$

so locus is $h = -k$

$h + k = 0$

$\Rightarrow x + y = 0$ which is a straight line

11.[B] Let the slope of the line is m

$\tan 60^o = \left|\frac{m+\sqrt{3}}{1-\sqrt{3}m}\right|$

$\sqrt{3} = \left|\frac{m+\sqrt{3}}{1-\sqrt{3}m}\right|$

so $m + \sqrt{3} = \pm\sqrt{3}(1-\sqrt{3}m)$

$m + \sqrt{3} = \sqrt{3} - 3m$	$m + \sqrt{3} = -\sqrt{3} + 3m$
$m = 0$	$m = \sqrt{3}$
hence line	hence line
$y = -2$	$y + 2 = \sqrt{3}\,(x-3)$
	$y - \sqrt{3}x + 2 + 3\sqrt{3} = 0$

As line intersect x axis

So line will be $y - \sqrt{3}x + 2 + 3\sqrt{3} = 0$

12.[A] $ax + by + c = 0$

$bx + ay + c = 0$

Intersection point

$\left(-\frac{c}{a+b}, -\frac{c}{a+b}\right)$

Distance

$\left(1+\frac{c}{a+b}\right)^2 + \left(1+\frac{c}{a+b}\right)^2 < 8$

$2(a + b + c)^2 < 8(a + b)^2$

$(a + b + c)^2 < (2a + 2b)^2$

$(2a + 2b)^2 - (a + b + c)^2 > 0$

$(a + b - c)(3a + 3b + c) > 0$

so, $(a + b - c) > 0$