1. The centroid and a vertex of an equilateral triangle are (1, 1) and (1, 2) respectively. Another vertex of the triangle can be

(a*) $\left(\frac{1-\sqrt{3}}{2}, \frac{1}{2}\right)$ (b) $\left(\frac{2+3\sqrt{3}}{2}, \frac{1}{2}\right)$ (c*) $\left(\frac{2+\sqrt{3}}{2}, \frac{1}{2}\right)$ (d) none of these

2. If one vertex of an equilateral triangle of side 2 is the origin and another vertex lies on the line $x = \sqrt{3}y$ then the third vertex can be

(a*) (0, 2) (b*) $(\sqrt{3}, -1)$ (c) (0, – 2) (d) $(\sqrt{3}, 1)$

3. A line passing through the origin and making an angle $\pi/4$ with the line $y - 3x = 5$ has the equation

(a) $x + 2y = 0$ (b) $2x = y$ (c*) $x = 2y$ (d*) $y + 2x = 0$

4. A line perpendicular to the line $3x - 2y = 5$ cuts off an intercept 3 on the positive side of the x–axis. Then

(a) the slope of the line is 2/3

(b*) the intercept on the y–axis is 2

(c*) the area of the triangle formed by the line with the axes is 3 unit^2

(d) none of these

5. If $bx + cy = a$, where a, b, c are of the same sign, be a line such that the area enclosed by the line and the axes of reference is 1/8 unit^2 then

(a) b, a, c are in GP (b*) b, 2a, c are in GP

(c) b, a/2, c are in GP (d*) b, – 2a, c are in GP

6. A line has intercepts a and b on the coordinate axes. If keeping the origin fixed, the coordinate axes are rotated through 90°, the same line has intercepts p and q, then

(a) p =a, q = b (b) p = b, q = a

(c) p = – b, q = – a (d) p = b, q = – a

7. The equations of the lines representing the sides of a triangle are $3x - 4y = 0$, $x + y = 0$ and $2x - 3y = 7$. The line $3x + 2y = 0$ always passes through the

(a) incentre (b) centroid (c) circumcentre (d) orthocentre

8. If the mid–points P, Q and R of the sides of the ΔABC are (3, 3), (3, 4) and (2, 4) respectively, then ΔABC is

(a) right angled (b) acute angled (c) obtuse angled (d) isosceles

9. If $a^2 + b^2 - c^2 - 2ab = 0$, then the family of straight lines $ax + by + c = 0$ is concurrent at the points

(a) (– 1, 1) (b) (1, – 1) (c) (1, 1) (d) (– 1, – 1)

10. The coordinates of the middle points of the sides of a triangle are (3, 2), (4, 3) and (2, 2), then the coordinates of its centroid are

(a) (3, 7/3) (b) (3, 3) (c) (4, 3) (d) none of these

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

(a) Reflection about the line y = x

(b) Transformation through a distance 2 units along the positive direction of the x–axis

(c) Rotation through an angle $\pi/4$ about the origin in the anti clockwise direction.

12. The final position of the point is given by the co–ordinates

(a) $\left(\frac{4}{\sqrt{2}}, \frac{1}{\sqrt{2}}\right)$ (b) $\left(-\frac{1}{\sqrt{2}}, \frac{7}{\sqrt{2}}\right)$ (c) $\left(\frac{1}{\sqrt{2}}, \frac{7}{\sqrt{2}}\right)$ (d) $\left(\frac{3}{\sqrt{2}}, \frac{4}{\sqrt{2}}\right)$

13. The three lines $4x - 7y + 10 = 0$, $x + y = 5$ and $7x + 4y = 15$ form the sides of a triangle. Then the point (1, 2) is its

(a) centroid (b) incentre (c) orthocentre (d) none of these

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

(a) (– 1, 0) (b) (0, – 1) (c) (– 1, 1) (d) none of these

15. P (3, 1), Q (6, 5) and R (x, y) are three points such that the angle PRQ is a right angle and the area of ΔRPQ = 7. Then the number of such points R is

(a) 0 (b) 1 (c) 2 (d) infinity

16. The three lines $3x + 4y + 6 = 0$, $\sqrt{2}x + \sqrt{3}y + 2\sqrt{2} = 0$ and $4x + 7y + 8 = 0$ are

(a) the sides of a triangle (b) concurrent
(c) parallel (d) none of these

17. If P = (1, 0), Q = (– 1, 0), R = (2, 0) are 3 given points, then the locus of the point S satisfying the relation $SQ^2 + SR^2 = 2SP^2$ is

(a) a straight line parallel to the x–axis (b) circle through the origin
(c) circle with centre at the origin (d) a straight line parallel to the y–axis

18. The area enclosed by | x | + | y | = 1 is

(a) 1 (b) 2 (c) 3 (d) 4

19. Let the vertices of a triangle be (0, 0), (3, 0) and (0, 4). Its orthocentre is

(a) (0, 0) (b) (1, 4/3) (c) (3/2, 2) (d) none of these

20. The points (– a, – b), (0, 0), (a, b) and (a^2, ab) are

(a) collinear (b) vertices of a parallelogram
(c) vertices of a rectangle (d) none of these

21. A ray of light coming from the point (1, 2) is reflected at a point A on the x–axis and then passes through the point (5, 3). The coordinates of the point A are

(a) $\left(\frac{13}{7}, 0\right)$ (b) $\left(\frac{5}{12}, 10\right)$ (c) (– 7, 0) (d) none of these

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

(a) $x^2 + y^2 - 2x - 4y + 1 = 0$ (b) $3(x^2 + y^2) - 2x - 4y + 1 = 0$
(c) $x^2 + y^2 - 2x - 4y + 3 = 0$ (d) none of these

23. The co–ordinates of those points on the line $3x + 2y = 5$ which are equidistant from the lines $4x + 3y - 7 = 0$ and $2y - 5 = 0$ are

(a) $\left(-\frac{1}{14}, \frac{73}{28}\right)$ (b) $\left(\frac{11}{16}, \frac{47}{32}\right)$ (c) $\left(\frac{1}{14}, \frac{67}{28}\right)$ (d) $\left(\frac{1}{16}, \frac{77}{32}\right)$

24. In a rhombus ABCD, the diagonals AC and BD intersect at the point (1, 2). If the point B is (2, 3), the diagonal AC has equation

(a) $x + y = 0$ (b) $x - y = 3$ (c) $x - y = 0$ (d) $x + y = 3$

25. If 3a + 2b + 6c = 0, the family of lines ax + by + c = 0 passes through a fixed point whose coordinates are given by

(a) $\left(\frac{1}{2}, \frac{1}{3}\right)$ (b) (2, 3) (c) (3, 2) (d) $\left(\frac{1}{3}, \frac{1}{2}\right)$

26. Area of the parallelogram whose sides are $x \cos \alpha + y \sin \alpha = p$, $x \cos \alpha + y \sin \alpha = q$, $x \cos \beta + y \sin \beta = r$, $x \cos \beta + y \sin \beta = s$ is

(a) pq + rs
(b) $|pq \tan \alpha + rs \tan \beta|$
(c) $|(p - q)(r - s) \operatorname{cosec}(\alpha - \beta)|$
(d) $|(p - q)(r - s) \tan(\alpha + \beta)|$

27. If ΔOAB is an equilateral triangle (O is the origin and A is a point on the x–axis), then centroid of the triangle will be

(a) always rational
(b) rational if B is rational
(c) rational if A is rational
(d) never rational

28. If one vertex of an equilateral triangle is at (1, 2) and the base is x + y – 2 = 0, then the length of each of the side is

(a) $\sqrt{\frac{3}{2}}$ (b) $\sqrt{\frac{2}{3}}$ (c) $\frac{2}{3}$ (d) $\frac{3}{2}$

29. The equations of the lines through (– 1, – 1) and making angle 45° with the line x + y = 0 are given by

(a) $x^2 - xy + x - y = 0$
(b) $xy - y^2 + x - y = 0$
(c) $xy + x + y = 0$
(d) $xy + x + y + 1 = 0$

30. The equations 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) x + 4y = 13 and y = 4x – 7
(b) 4x + y = 13 and 4y = x – 7
(c) 4x + y = 13 and y = 4x – 7
(d) y – 4x = 13 and y + 4x = 7