1. A triangle has a vertex at $(1,\ 2)$ and the mid points of the two sides through it are $(-1,\ 1)$ and $(2,\ 3)$. Then the centroid of this triangle is:
(1) $\left(\frac{1}{3},1\right)$
(2) $\left(1,\ \frac{7}{3}\right)$
(3) $\left(\frac{1}{3},\ 2\right)$
(4) $\left(\frac{1}{3},\ \frac{5}{3}\right)$

2. If in a parallelogram $ABDC$, the coordinates of A, B and C are respectively $(1,2),(3,4)$ and $(2,5)$, then the equation of the diagonal AD is :
(1) $5x-3y+1=0$
(2) $5x+3y-11=0$
(3) $3x-5y+7=0$
(4) $3x+5y-13=0$

3. The equations of the sides $AB,\ BC$ & CA of a triangle ABC are $2x+y=0$, $x+py=21a\ (a\neq 0)$ and $x-y=3$ respectively. Let $P(2,a)$ be the centroid of the triangle ABC, then $(BC)^2$ is equal to

4. 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 of ΔABC, then $15(\alpha+\beta)$ is equal to
(1) 51
(2) 39
(3) 41
(4) 49

5. 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 is the point $\left(-\frac{7}{6},\ -\frac{1}{3}\right)$, is

6. If $(\alpha,\ \beta)$ is the orthocenter of the triangle ABC with vertices $A(3,\ -7),\ B(-1,\ 2)$ and $C(4,\ 5)$, then $9\alpha-6\beta+60$ is equal to
(1) 25
(2) 35
(3) 30
(4) 40

7. The distance of the origin from the centroid of the triangle whose two sides have the equations $x-2y+1=0$ and $2x-y-1=0$ and whose orthocenter is $\left(\frac{7}{3},\ \frac{7}{3}\right)$ is:
(1) $\sqrt{2}$
(2) 2
(3) $2\sqrt{2}$
(4) 4

8. 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 $\mathrm{y}-2\mathrm{x}=2$ such that ΔABC is an equilateral triangle. Then, the area of the ΔABC is
(1) $3\sqrt{3}$
(2) $2\sqrt{3}$
(3) $\frac{8}{\sqrt{3}}$
(4) $\frac{10}{\sqrt{3}}$

9. Let $A(\alpha,-2), B(\alpha,6)$ and $C\left(\frac{\alpha}{4},-2\right)$ be vertices of a ΔABC. If $\left(5,\frac{\alpha}{4}\right)$ is the circumcentre of ΔABC, then which of the following is NOT correct about ΔABC
(1) area is 24
(2) perimeter is 25
(3) circumradius is 5
(4) inradius is 2

10. In a triangle PQR, the co-ordinates of the points P and Q are $(-2,4)$ and $(4,-2)$ respectively. If the equation of the perpendicular bisector of PR is $2x-y+2=0$, then the centre of the circumcircle of the ΔPQR is:
(1) $(-1,\ 0)$
(2) $(-2,\ -2)$
(3) $(0,\ 2)$
(4) $(1,\ 4)$

11. Let a triangle be bounded by the lines $L_1: 2x+5y=10$; $L_2: -4x+3y=12$ and the line L_3, which passes through the point $P(2,3)$, intersect L_2 at A and L_1 at B. If the point P divides the line-segment AB, internally in the ratio $1:3$, then the area of the triangle is equal to
(1) $\frac{110}{13}$
(2) $\frac{132}{13}$
(3) $\frac{142}{13}$
(4) $\frac{151}{13}$

12. Let ABC be a triangle with $A(-3,1)$ and $\angle ACB=\theta, 0<\theta<\frac{\pi}{2}$. If the equation of the median through B is $2x+y-3=0$ and the equation of angle bisector of C is $7x-4\mathrm{y}-1=0$, then $\tan\theta$ is equal to:
(1) $\frac{3}{4}$
(2) $\frac{4}{3}$
(3) 2
(4) $\frac{1}{2}$

13. 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-ordinate axes, then α is equal to
(1) -7
(2) $-7\sqrt{3}$
(3) $7\sqrt{3}$
(4) 7

14. Two sides of a parallelogram are along the lines $4x+5y=0$ and $7x+2y=0$. If the equation of one of the diagonals of the parallelogram is $11x+7y=9$, then other diagonal passes through the point:
(1) $(1,2)$
(2) $(2,2)$
(3) $(2,1)$
(4) $(1,3)$

15. 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

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

16. A triangle ABC lying in the first quadrant has two vertices as $A(1,2)$ and $B(3,1)$. If $\angle BAC=90^{\circ}$, and ar(Δ ABC)$=5\sqrt{5}$ sq. units, then the abscissa of the vertex C is :

(1) $1+\sqrt{5}$
(2) $1+2\sqrt{5}$
(3) $2+\sqrt{5}$
(4) $2\sqrt{5}-1$

17. Lines are drawn parallel to the line $4x-3y+2=0$, at a distance $\frac{3}{5}$ units from the origin. Then which one of the following points lies on any of these lines?

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

18. Suppose that the points $(h,\ k)$, $(1,\ 2)$ and $(-3,\ 4)$ lie on the line L_1. If a line L_2 is passing through the points $(h,\ k)$ and $(4,\ 3)$ is perpendicular to L_1, then $\frac{k}{h}$ equals:

(1) $-\frac{1}{7}$
(2) 3
(3) 0
(4) $\frac{1}{3}$

19. 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?

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

20. 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 ______.

21. 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

(1) -14
(2) 42
(3) -22
(4) 14

22. The image of the point $(3,5)$ in the line $x-y+1=0$, lies on :

(1) $(x-2)^2+(y-4)^2=4$
(2) $(x-4)^2+(y-4)^2=8$
(3) $(x-4)^2+(y+2)^2=16$
(4) $(x-2)^2+(y-2)^2=12$

23. Let R be the point $(3,7)$ and let P and Q be two points on the line $x+y=5$ such that PQR is an equilateral triangle. Then the area of ΔPQR is

(1) $\frac{25}{4\sqrt{3}}$
(2) $\frac{25\sqrt{3}}{2}$
(3) $\frac{25}{\sqrt{3}}$
(4) $\frac{25}{2\sqrt{3}}$

24. Let L denote the line in the xy-plane with x and y intercepts as 3 and 1 respectively. Then the image of the point $(-1,\ -4)$ in the line is :

(1) $\left(\frac{11}{5},\frac{28}{5}\right)$
(2) $\left(\frac{29}{5},\frac{8}{5}\right)$
(3) $\left(\frac{8}{5},\frac{29}{5}\right)$
(4) $\left(\frac{29}{5},\frac{11}{5}\right)$

25. The number of integral values of m so that the abscissa of point of intersection of lines $3x+4y=9$ and $y=mx+1$ is also an integer, is:

(1) 1
(2) 2
(3) 3
(4) 0

26. Consider the set of all lines $px+qy+r=0$ such that $3p+2q+4r=0$. Which one of the following statements is true?

(1) The lines are not concurrent.
(2) The lines are concurrent at the point $\left(\frac{3}{4},\frac{1}{2}\right)$.
(3) The lines are all parallel.
(4) Each line passes through the origin.

27. A line, with the slope greater than one, passes through the point $A(4,3)$ and intersects the line $x-y-2=0$ at the point B. If the length of the line segment AB is $\frac{\sqrt{29}}{3}$, then B also lies on the line

(1) $2x+y=9$
(2) $3x-2y=7$
(3) $x+2y=6$
(4) $2x-3y=3$

28. Let $A(0,1)$, $B(1,1)$ and $C(1,0)$ be the mid-points of the sides of a triangle with incentre at the point D. If the focus of the parabola $y^2=4ax$ passing through D is $\left(\alpha+\beta\sqrt{2},0\right)$, where α and β are rational numbers, then $\frac{\alpha}{\beta^2}$ is equal to

(1) 8
(2) 12
(3) 6
(4) $\frac{9}{2}$

29. Let $A(-1,1),\ B(3,4)$ and $C(2,0)$ be given three points. A line $y=mx,\ m>0$, intersects lines AC and BC at point P and Q respectively. Let A_1 and A_2 be the areas of ΔABC and ΔPQC respectively, such that $A_1=3A_2$, then the value of m is equal to :

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

30. Consider the triangles with vertices $A(2,\ 1),\ B(0,\ 0)$ and $C(t,\ 4),\ t=[0,\ 4]$. If the maximum and the minimum perimeters of such triangles are obtained at $t=\alpha$ and $t=\beta$ respectively, then $6\alpha+21\beta$ is equal to ________.