

## COORDINATE GEOMETRY PROBLEMS

1. Find the equation of the line joining  $(a,0)$  and  $(0,a)$ .
2. Find the equation of the line joining  $(a,b)$  and  $(b,a)$ .
3. Find the equation of the line which passes through the origin and is perpendicular to  $ax+by+c=0$ .
4. Find the equation of the line which passes through the origin and the point of intersection of  $y=x+4$  and  $x+y=6$ .
5. Find the equation of the line which passes through  $(-3,2)$  and is perpendicular to the line  $2x+3y-2=0$ .
6. A triangle has vertices  $A(4,1)$ ,  $B(-2,3)$  and  $C(2,-3)$ . Find the equation of the altitude through A ie. the line which passes through A and is perpendicular to BC.
7. Points A and B lie on the curve  $y=x^3-2$ . A has  $x$  coordinate 0 and B has  $x$  coordinate 2. Find the equation of the chord AB.
8. Find the equation of the line joining the points of intersection of the curves  $y=x^2+6$  and  $y=8x-x^2$ .
9. Show that ABCD is a parallelogram where A is  $(-2,3)$ , B is  $(-1,7)$ , C is  $(3,9)$  and D is  $(2,5)$ .
10. Show that the lines  $3x-y+7=0$ ,  $x-2y+4=0$  and  $3y-2x-7=0$  intersect at the same point.
11. The vertices of a quadrilateral ABCD are  $A(0,2)$ ,  $B(3,1)$ ,  $C(2,5)$  and  $D(-1,4)$ . Find the equations of the diagonals AC and BD and hence find the coordinates of their point of intersection.
12. Show that the shape bounded by the lines  $2x-y+1=0$ ,  $3x-y+6=0$ ,  $6x+2y-7=0$  and  $y=3x+1$  is a trapezium and find the coordinates of the vertices.
13. The sides of a triangle are given by the equations  $3x-4y+5=0$ ,  $4x-3y-5=0$  and  $x+y=3$ . Show that the triangle is isosceles.
14. A triangle has vertices  $(-1,-4)$ ,  $(0,3)$  and  $(-4,0)$ . What is special about the triangle?
15. A quadrilateral has vertices  $(5,4)$ ,  $(-2,5)$ ,  $(-1,-2)$  and  $(6,-3)$ . Show that the quadrilateral is a rhombus.
16. The triangle ABC is isosceles. B is  $(-2,-1)$  and C is  $(1,-4)$ . Find the  $x$  coordinate of A if the  $y$  coordinate is 1.
17. The distance between the points  $(t,0)$  and  $(0,t)$  is the same as the distance between  $(1,2)$  and  $(-1,3)$ . If  $t > 0$ , find the value of  $t$ .
18. The line  $y=x+5$  intersects the curve  $y=2x^2-x+1$  at the points A and B. Find the length of the chord AB.

19. The points P and Q on the curve  $y = \frac{1}{2}x^2$  both have a  $y$  coordinate of 18. Find the length of the line PQ.
  20. M is the midpoint of the line joining the origin to point P. If the coordinates of M are (3,-2), find the coordinates of the point P.
  21. M is the midpoint of the line joining the point Q (7,-5) to the point P. If the coordinates of M are (3,-2), find the coordinates of the point P.
  22. A(4,-1), B(6,5), C(0,11) and D(-6,1) are the vertices of the quadrilateral ABCD. Find the coordinates of the midpoints of the sides of the quadrilateral and show that these midpoints are the vertices of a parallelogram.
  23. P(0,-3), Q(3,-2), R(4,5) and S(1,4) are the vertices of the quadrilateral PQRS. Show that the diagonals of the PQRS bisect each other. What type of quadrilateral is PQRS?
  24. Choose coordinates for the vertices of a triangle ABC. If P is the midpoint of AB and Q is the midpoint of AC, show that PQ is parallel to BC. Show also that PQ is half the length of BC.
  25. K(4,1), L(-1,6) and M(-4,-3) are the vertices of a triangle. If a circle is drawn with K, L and M on the circumference (ie. the circumcircle of the triangle), find the coordinates of the centre of the circle. (Hint - find the equations of the perpendicular bisectors of KL and LM and then solve the equations simultaneously to find where the perpendicular bisectors intersect.)
  26. A triangle ABC has vertices A(-2,-11), B(10,5) and C(12,3). Show that the circle with AB as diameter passes through point C.
  27. The median of a triangle is the line joining a vertex to the midpoint of the opposite side. Triangle PQR has vertices P(0,2), Q(8,-4) and R(-1,-6). Find the coordinates of the point of intersection of the medians through the vertices P and R.
  28. A quadrilateral ABCD has vertices A(1,5), B(9,6), C(5,-1) and D(-3,-2). Show that the diagonals bisect each other at right angles. What name is given to this type of quadrilateral?
  29. Find the equation of the line of negative gradient which makes an acute angle of  $45^\circ$  with the  $x$ -axis and which passes through the point (-2,7).
  30. Find the area of the triangle whose sides have equations  $y = 3x + 2$ ,  $y = -10$ ,  $x = 3$ .
- (1)  $y = a - x$  (2)  $y = a + b - x$  (3)  $bx - ay = 0$  (4)  $y = 5x$  (5)  $3x - 2y + 13 = 0$   
(6)  $x + 3y + 6 = 0$  (7)  $y = 4x - 2$  (8)  $y = 4x + 3$  (11)  $(5/9, 17/6)$  (12)  $(-5, -9)$   $(-5/12, 19/4)$   $(5/12, 9/4)$   
(0,1) (17)  $\sqrt{5/2}$  (18)  $3\sqrt{2}$  (19) 12 (20) (6,-4) (21) (-1,1) (25) (-1,1)