Topic 1 – Coordinate Geometry

Exercise 1A

Question 7

$M(5,7)$ is the mid-point of the line segment joining $A(3,4)$ to B. Find the coordinates of B.

Question 8

$A(1,-2)$, $B(6,-1)$, $C(9,3)$ and $D(4,2)$ are the vertices of a parallelogram.
Verify that the mid-points of the diagonals AC and BD coincide.

Question 9

Which one of the points $A(5,2)$, $B(6,-3)$ and $C(4,7)$ is the mid-point of the other two?
Check your answer by calculating two distances.

Question 10

Find the gradients of the lines joining the following pairs of points.

(a) $(3,8),(5,12)$
(b) $(1,-3),(-2,6)$
(c) $(-4,-3),(0,-1)$
(d) $(-5,-3),(3,-9)$
(e) $(p+3,p-3),(2p+4,-p-5)$
(f) $(p+3,q-5),(q-5,p+3)$
(g) $(p+q-1,q+p-3),(p-q+1,q-p+3)$
(h) $(7,p),(11,p)$

Question 14

A triangle has vertices $A(-2,1)$, $B(3,-4)$ and $C(5,7)$.

(a) Find the coordinates of M, the mid-point of AB, and N, the mid-point of AC.

(b) Show that MN is parallel to BC.

Question 15

The points $A(2,1)$, $B(2,7)$ and $C(-4,-1)$ form a triangle. M is the mid-point of AB and N is the mid-point of AC.

(a) Find the lengths of MN and BC.
(b) Show that $BC = 2MN$.

Exercise 1B

Question 5

Find the equation of the line through $(-2,1)$ parallel to $y = \frac{1}{2}x - 3$.

Question 7

Find the equation of the line through $(1,2)$ parallel to the line joining $(3,-1)$ and $(-5,2)$.

Question 9

Find the equation of the line through $(1,7)$ parallel to the x-axis.

Exercise 1C

Question 3

Find the equation of the line through the point $(-2,5)$ which is perpendicular to the line $y = 3x + 1$. Find also the point of intersection of the two lines.

Question 5

A line through a vertex of a triangle which is perpendicular to the opposite side is called an altitude. Find the equation of the altitude through the vertex A of the triangle ABC where A is the point $(2,3)$, B is $(1,-7)$ and C is $(4,-1)$.

Miscellaneous Exercise 1

Question 6

P is the point $(7,5)$ and l_1 is the line with equation $3x + 4y = 16$.

(a) Find the equation of the line l_2 which passes through P and is perpendicular to l_1.

(b) Find the point of intersection of the lines l_1 and l_2.

(c) Find the perpendicular distance of P from the line l_1.

Question 7

Prove that the triangle with vertices $(-2,8)$, $(3,20)$ and $(11,8)$ is isosceles. Find its area.

Question 12

The point P is the foot of the perpendicular from the point $A(0,3)$ to the line $y = 3x$.

(a) Find the equation of the line AP.

(b) Find the coordinates of the point P.

(c) Find the perpendicular distance of A from the line $y = 3x$.

Question 13

Points which lie on the same straight line are called collinear. Show that the points $(-1,3)$, $(4,7)$ and $(-11,-5)$ are collinear.

Question15

The coordinates of the points A and B are $(3,2)$ and $(4,-5)$ respectively. Find the coordinates of the mid-point of AB, and the gradient of AB.

Hence find the equation of the perpendicular bisector of AB, giving your answer in the form $ax + by + c = 0$, where a, b and c are integers. (OCR)

Question 16

The curve $y = 1 + \frac{1}{2+x}$ crosses the x-axis at the point A and the y-axis at the point B.

(a) Calculate the coordinates of A and of B.

(b) Find the equation of the line AB.

(c) Calculate the coordinates of the point of intersection of the line AB and the line with equation $3y = 4x$. (OCR)

Exercise 1A

16 The vertices of a quadrilateral $ABCD$ are $A(1,1)$, $B(7,3)$, $C(9,-7)$ and $D(-3,-3)$. The points P, Q, R and S are the mid-points of AB, BC, CD and DA respectively.

(a) Find the gradient of each side of $PQRS$. (b) What type of quadrilateral is $PQRS$?

17 The origin O and the points $P(4,1)$, $Q(5,5)$ and $R(1,4)$ form a quadrilateral.

(a) Show that OR is parallel to PQ. (b) Show that OP is parallel to RQ.

(c) Show that $OP = OR$. (d) What shape is $OPQR$?

18 The origin O and the points $L(-2,3)$, $M(4,7)$ and $N(6,4)$ form a quadrilateral.

(a) Show that $ON = LM$. (b) Show that ON is parallel to LM.

(c) Show that $OM = LN$. (d) What shape is $OLMN$?

19 The vertices of a quadrilateral $PQRS$ are $P(1,2)$, $Q(7,0)$, $R(6,-4)$ and $S(-3,-1)$.

(a) Find the gradient of each side of the quadrilateral.

(b) What type of quadrilateral is $PQRS$?

20 The vertices of a quadrilateral are $T(3,2)$, $U(2,5)$, $V(8,7)$ and $W(6,1)$. The mid-points of UV and VW are M and N respectively. Show that the triangle TMN is isosceles.

21 The vertices of a quadrilateral $DEFG$ are $D(3,-2)$, $E(0,-3)$, $F(-2,3)$ and $G(4,1)$.

(a) Find the length of each side of the quadrilateral.

(b) What type of quadrilateral is $DEFG$?

22 The points $A(2,1)$, $B(6,10)$ and $C(10,1)$ form an isosceles triangle with AB and BC of equal length. The point G is $(6,4)$.