1. The gradients of several lines are as follows:

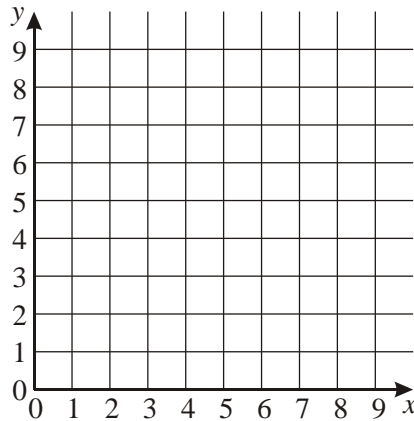| Line	a	b	c	d	e	f	g	h
Gradient	-3	$\dfrac{-5}{2}$	$\dfrac{1}{3}$	0.5	$\dfrac{3}{6}$	$\dfrac{-2}{5}$	$\dfrac{5}{-2}$	0.4

(a) Find two pairs of lines that are parallel to each other.

(b) Find any two pairs of lines that are at right angles to each other.

(Total 4 marks)

2. The equation of a line l_1 is $y = \dfrac{1}{2}\, x$.

(a) On the grid, draw and label the line l_1.

The line l_2 has the same gradient as l_1, but crosses the y-axis at 3.

(b) What is the geometric relationship between l_1 and l_2?

(c) Write down the equation of l_2.

(d) On the same grid as in part (a), draw the line l_2.
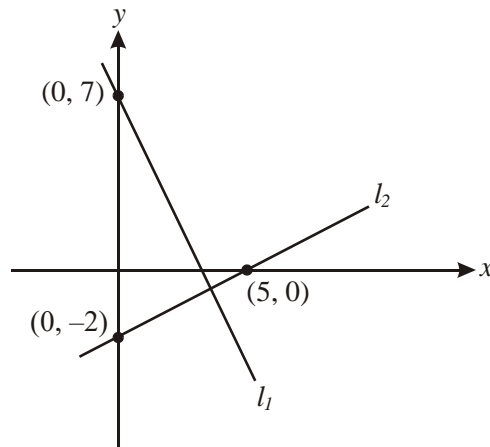
(Total 4 marks)

3. A is the point (2, 3), and B is the point (4, 9).

(a) Find the gradient of the line segment [AB].

(b) Find the gradient of a line perpendicular to the line segment [AB].

(c) The line $2x + by - 12 = 0$ is perpendicular to the line segment [AB]. What is the value of b?

(Total 4 marks)

4. The following diagram shows the lines l_1 and l_2, which are perpendicular to each other.

Diagram not to scale

(a) Calculate the gradient of line l_1.

(b) Write the equation of line l_1 in the form $ax + by + d = 0$ where a, b and d are integers, and $a > 0$.

(Total 8 marks)

5. Two functions are defined as follows

$$f(x) = \begin{cases} 6 - x \text{ for } 0 \le x < 6 \\ x - 6 \text{ for } x \ge 6 \end{cases}$$

$$g(x) = \frac{1}{2}x$$

(a) Draw the graphs of the functions f and g in the interval $0 \le x \le 14$, $0 \le y \le 8$ using a scale of 1 cm to represent 1 unit on both axes.

(5)

(b) (i) Mark the intersection points A and B of $f(x)$ and $g(x)$ on the graph.

(ii) Write down the coordinates of A and B.

(3)

(c) Calculate the midpoint M of the line AB.

(2)

(d) Find the equation of the straight line which joins the points M and N.

(4)

(Total 14 marks)

6. The coordinates of the vertices of a triangle are P (–2, 6), Q (6, 2) and R (–8, *a*).

    (a) On graph paper, mark the points P and Q on a set of coordinate axes.
         Use 1 cm to represent 1 unit on each axis.

(3)

    (b) (i) Calculate the distance PQ.

(2)

         (ii) Find the gradient of the line PQ.

(3)

         (iii) If angle RPQ is a right angle, what is the gradient of the line PR?

(1)

         (iv) Use your answer from (b) (iii), or otherwise, to find the value of '*a*'.

(2)

    (c) The length of PR is $\sqrt{180}$. Find the area of triangle PQR.

(2)
(Total 13 marks)

7. (a) Write down the gradient of the line $y = 3x + 4$.

(1)

    (b) Find the gradient of the line that is perpendicular to the line $y = 3x + 4$.

(1)

    (c) Find the equation of the line that is perpendicular to $y = 3x + 4$ and that passes through
        the point (6, 7).

(2)

    (d) Find the coordinates of the point of intersection of these two lines.

(2)
(Total 6 marks)

8. The vertices of quadrilateral ABCD as shown in the diagram are A (3, 1), B (0, 2), C (–2, 1) and D (–1, –1).
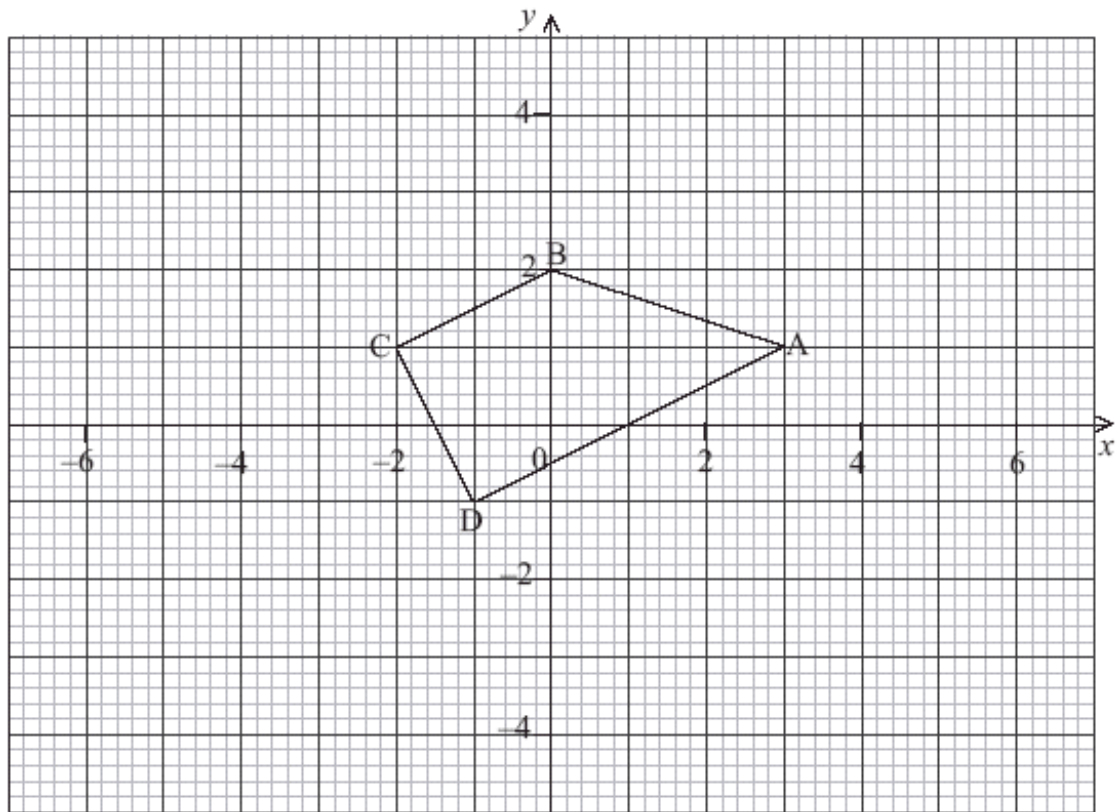
(a) Calculate the gradient of line CD.

(2)

(b) Show that line AD is perpendicular to line CD.

(2)

(c) Find the equation of line CD. Give your answer in the form $ax + by = c$ where $a, b, c \in \mathbb{Z}$.
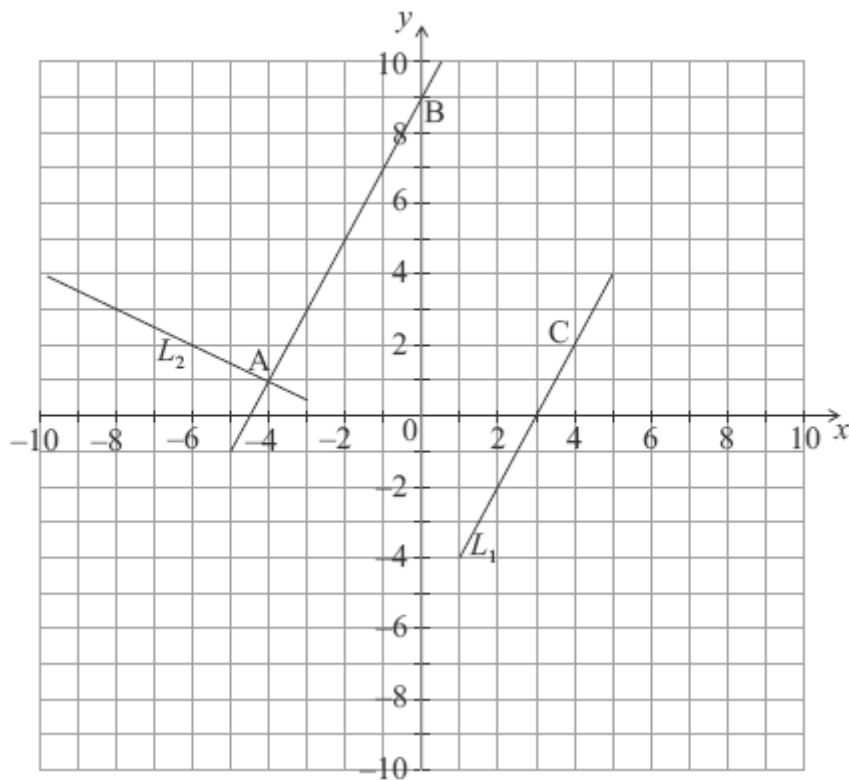
(3)

Lines AB and CD intersect at point E. The equation of line AB is $x + 3y = 6$.

(d) Find the coordinates of E.

(2)

(e) Find the distance between A and D.

(2)

The distance between D and E is $\sqrt{20}$.

(f) Find the area of triangle ADE.

(2)
(Total 13 marks)

9.   The points A(–4, 1), B(0, 9) and C(4, 2) are plotted on the diagram below. The diagram also shows the lines AB, L_1 and L_2.

(a)   Find the gradient of AB.

(2)

L_1 passes through C and is parallel to AB.

(b)   Write down the *y*-intercept of L_1.

(1)

L_2 passes through A and is perpendicular to AB.

(c)   Write down the equation of L_2. Give your answer in the form $ax + by + d = 0$ where a, b and $d \in \mathbb{Z}$.

(3)

(d)   Write down the coordinates of the point D , the intersection of L_1 and L_2.

(1)

There is a point R on L_1 such that ABRD is a rectangle.

(e)   Write down the coordinates of R.

(2)

The distance between A and D is $\sqrt{45}$.

(f)   (i)   Find the distance between D and R.

(ii)   Find the area of the triangle BDR.

(4)

(Total 13 marks)