

# 2.1 Linear Functions & Graphs

## Question Paper

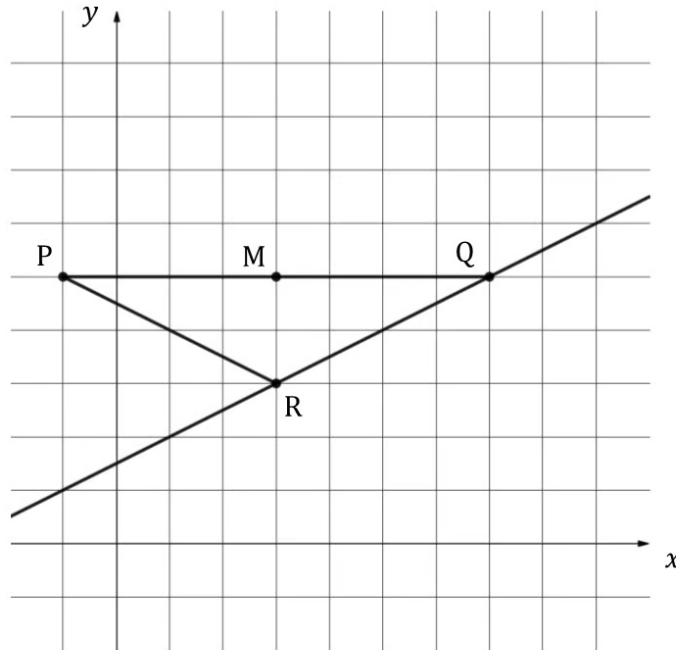
Course	DPIB Maths
Section	2. Functions
Topic	2.1 Linear Functions & Graphs
Difficulty	Hard

**Time allowed:** 80  
**Score:** /66  
**Percentage:** /100

**Question 1a**

The diagram below shows the line  $l$  with the equation  $2x - 4y + 6 = 0$ .

Point P has coordinates  $(-1, 5)$ , point Q has coordinates  $(7, 5)$  and point R has coordinates  $(3, 3)$ .  
M is the midpoint of [PQ].



(a) Write down the coordinates of M.

[1 mark]

**Question 1b**

(b) Show that Q lies on  $l$ .

[2 marks]

**Question 1c**

(c) Show that R lies on  $l$ .

[2 marks]

**Question 1d**

(d) Find the area of PQR.

[2 marks]

**Question 2a**

The line  $l_1$  passes through the points (1, 7) and (5, 5).

(a) Find the equation of  $l_1$ . Give your answer in the form of  $y = mx + c$ .

[2 marks]

**Question 2b**

A new line,  $l_2$ , is perpendicular to  $l_1$  and passes through the point (4, 8).

(b) Find the equation of  $l_2$ . Give your answer in the form of  $y = mx + c$ .

[2 marks]

**Question 2c**

The point  $Z$  is the intersection of  $l_1$  and  $l_2$ .

(c) Find the coordinates of  $Z$ .

[2 marks]

**Question 3a**

Point  $A$  has coordinates  $(x, 4)$  and point  $B$  has coordinates  $(9, y)$ .  $M$  is the midpoint of  $[AB]$  and has coordinates  $(-2, 7)$ .

(a) Find the value of  $x$  and  $y$ .

[3 marks]

**Question 3b**

The line  $l_1$  passes through A and B.

(b) Find the equation of  $l_1$ . Give your answer in the form  $ax + by + d = 0$ , where  $a$ ,  $b$  and  $d$  are integers.

[2 marks]

**Question 4a**

The line  $l_1$  passes through  $A(-3, -5)$  and  $B(-1, -7)$ .

(a) Find the equation of  $l_1$ . Give your answer in the form  $y = mx + c$ .

[2 marks]

**Question 4b**

Point C is such that B is the midpoint of [AC].

(b) Find the coordinates of C.

[2 marks]

**Question 4c**

Point D is such that C is the midpoint of [AD].

(c) Find the coordinates of D.

[2 marks]

**Question 5a**

Point A has coordinates (11, 12) and point B has coordinates (4, -8). The line  $l_1$  passes through M, the midpoint of [AB]. The gradient of  $l_1$  is -2.

(a) Write down the equation of  $l_1$ , giving your answer in the form  $y = mx + c$ .

[3 marks]

**Question 5b**

The line  $l_2$  passes through A and has a gradient of 5.

(b) Write down the equation of  $l_2$ , giving your answer in the form  $y = mx + c$ .

[1 mark]

**Question 5c**

Point C is the intersection of  $l_1$  and  $l_2$ .

(c) Write down the coordinates of C, giving the  $x$  and  $y$  coordinates as fractions.

[2 marks]

**Question 6a**

Finn borrows \$3200 from his parents and decides to pay them back \$ $c$  in the first month and then \$ $m$  each subsequent month.

After two months Finn has paid back his parents a total of \$1000, this can be expressed as  $m + c = 1000$ . After half a year he still owes his parents \$1000.

(a) Write down another equation connecting  $m$  and  $c$ .

[2 marks]

**Question 6b**

(b) Find the value of  $m$  and  $c$ .

[2 marks]

**Question 6c**

Finn's parents apply a 6.25% net interest to the \$3200 total.

(c) Calculate the number of months it takes Finn to pay back his parents.

[2 marks]

**Question 7a**

The line  $l_1$  has the equation  $5y - 2x + 1 = 0$ . Point A has coordinates  $(x, 3)$  and is the intersection of  $l_1$  and  $l_2$ .  $l_2$  is perpendicular to  $l_1$ .

(a) Write down the equation of  $l_2$ , giving your answer in the form  $y = mx + c$ .

[3 marks]

**Question 7b**

Point B lies on  $l_2$  and is positioned such that AB is 12 units and the  $x$ -coordinate for B is less than the  $x$ -coordinate for A.

(b) Find the coordinates of B.

[5 marks]



**Question 8**

The points  $K(6, y)$  and  $N(x, 9)$  lie on the line  $l_1$ , where  $x, y \in \mathbb{Z}$ .

KN has a length of 5 units.

Find all the possible values for  $x$  and  $y$ .

[8 marks]

**Question 9a**

Point A has coordinates  $(2, 1)$ , point B has coordinates  $(5, 7)$ , and point C has coordinates  $(8, 1)$ .

(a) Calculate the length of AC.

[2 marks]

**Question 9b**

Point D lies on the line (AC). The line (BD) is perpendicular to the line (AC).

(b) Find the coordinates of D.

[3 marks]

**Question 9c**

(c) Calculate the area of the triangle ABC.

[3 marks]

**Question 10a**

The distance between points  $P(20, 40)$  and  $Q(x, 20)$  is equal to 25 units.

(a) Find the possible values of  $x$ .

[3 marks]

**Question 10b**

It is given that  $x < 20$ .

Point R is such that point Q is the midpoint of the line segment with endpoints P and R.

(b) Write down the coordinates of R.

[3 marks]