2.1 Linear Functions & Graphs

Question Paper

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

Time allowed: **80**

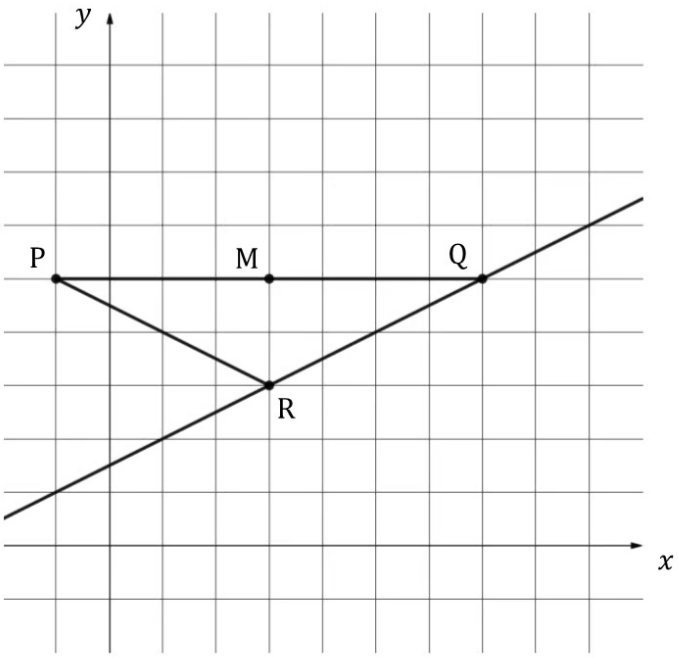
Score: **/66**

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]