

# IB Maths: AA HL

## Linear Functions & Graphs

### Topic Questions

These practice questions can be used by students and teachers and is Suitable for IB Maths AA HL Topic Questions

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

**Level: IB Maths**

**Subject: IB Maths AA HL**

**Board: IB Maths**

**Topic: Linear Functions & Graphs**

## Question 1

The equation of a line  $l_1$  is  $2x - y + 6 = 0$ .

(a) For the line  $l_1$ , find:

- (i) the  $y$ -intercept
- (ii) the  $x$ -intercept
- (iii) the gradient.

[3 marks]

A new line,  $l_2$ , intersects the  $x$ -axis at  $(4, 0)$  and is perpendicular to  $l_1$ .

(b) Find:

- (i) the gradient of the line  $l_2$
- (ii) the equation of the line  $l_2$ . Give your answer in the form  $ax + by + d = 0$ , where  $a, b$  and  $d$  are integers.

[3 marks]

## Question 2

The coordinates of point A are  $(2, 8)$  and the coordinates of point B are  $(-8, 2)$ . M is the midpoint of  $[AB]$ .

(a) Find the coordinates of M.

[2 marks]

$l_1$  passes through A and B.

(b) Find the gradient of  $l_1$ .

[2 marks]

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

[3 marks]

### Question 3

The coordinates of point A are (1, 7) and the coordinates of point B are (5, 5). M is the midpoint of [AB].

(a) Find the coordinates of M.

[2 marks]

The line  $l_1$  passes through the points A and B.

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

[2 marks]

A new line,  $l_2$ , is the perpendicular bisector to  $l_1$ .

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

[3 marks]

### Question 4

Plumber A charges a fixed fee of \$25 plus \$15 per hour.

- (a) Using  $t$  for the number of hours a job takes, and  $C_A$  for the total cost of a job, in dollars, from Plumber A, write down an equation connecting  $t$  and  $C_A$ .

[2 marks]

A job takes the plumber seven hours.

- (b) Calculate the total cost of the job.

[2 marks]

Plumber B charges a fixed fee of \$20 plus \$16 per hour.

- (c) Using  $t$  for the number of hours a job takes, and  $C_B$  for the total cost of a job, in dollars, from Plumber B, write down an equation connecting  $t$  and  $C_B$ .

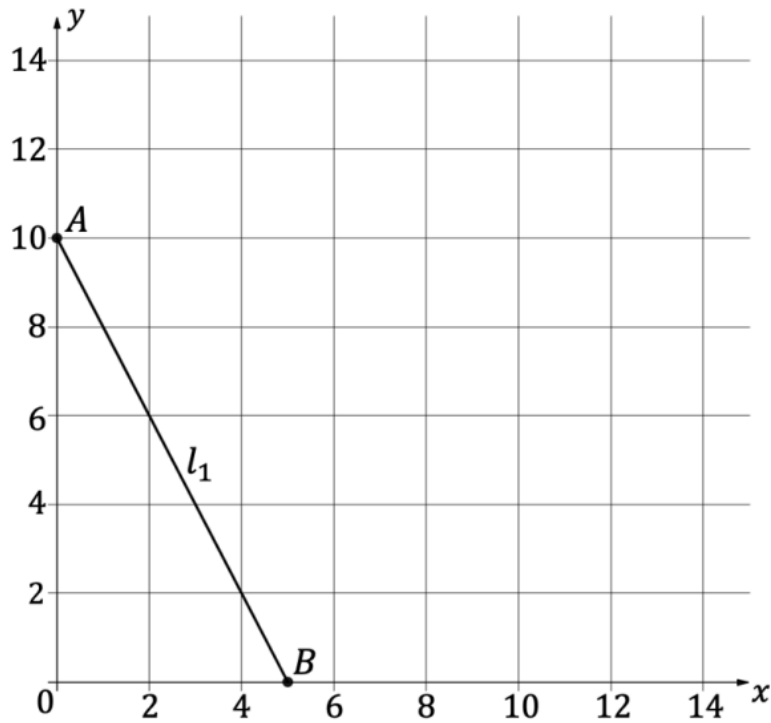
[2 marks]

- (d) Determine which plumber would be the cheapest for a job taking six hours.

[3 marks]

### Question 5

The diagram below shows the line  $l_1$ , which intersects the  $y$ -axis at  $A(0, 10)$  and the  $x$ -axis at  $B(5, 0)$ .



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

[2 marks]

(b) Find the length of  $[AB]$ .

[2 marks]

A second line,  $l_2$ , is parallel to  $l_1$  and intersects the  $x$ -axis at  $C(8, 0)$ .

(c) Find the equation of  $l_2$ . Give your answer in the form  $ax + by + d = 0$ , where  $a, b$  and  $d$  are integers.

[2 marks]

(d) Where does  $l_2$  intersect the  $y$ -axis?

[1 mark]

### Question 6

Photocopy shop A charges \$122 for 115 copies, and \$190 for 200 copies.

(a) Assuming a linear relationship, find

- (i) the price for 180 copies
- (ii) how many copies could be made for \$385.20.

[4 marks]

Photocopy shop B charges \$0.82 per copy and a fixed fee of \$25.50.

(b) State which photocopy shop is cheaper to make 220 copies.

[3 marks]

### Question 7

A family can be supplied with electricity by two companies that have different pricing structures:

Company A: Fixed fee of \$25/month and \$0.2 per kWh consumed.

Company B: Fixed fee of \$10/month and \$0.22 per kWh consumed.

(a) Determine the equation of the cost function for both companies, where the total monthly cost  $y$  is a function of the monthly electricity consumption  $x$  in kWh.

[2 marks]

(b) Calculate the monthly energy consumption that results in the same monthly cost from both companies.

[4 marks]

### Question 8

Ardie's monthly expenditure,  $C(x)$ , is a linear function of his monthly income,  $x$ . Ardie's monthly expenditure is \$1000 when his monthly income is \$1200 and his monthly expenditure increases by \$60 for every \$150 increase in his monthly income.

(a) Write an expression connecting Ardie's monthly expenditure,  $C(x)$ , with his monthly income,  $x$ .

[2 marks]

(b) Calculate Ardie's monthly expenditure when his monthly income is \$1885. Give your answer to the nearest dollar.

[2 marks]

(c) Find Ardie's monthly income when his monthly expenditure is \$1070. Give your answer to the nearest dollar.

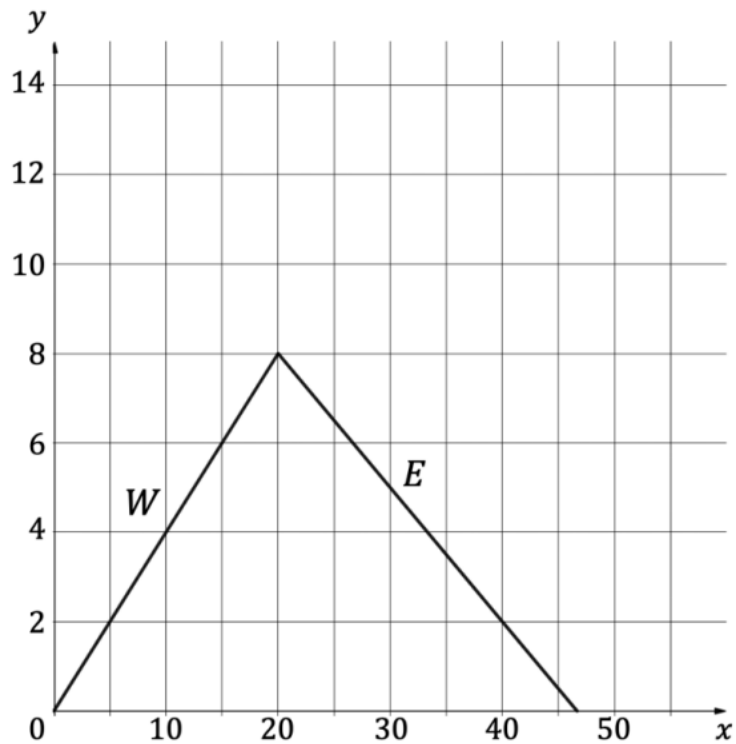
[2 marks]

### Question 9

The diagram below represents a mountain with a west facing slope and an east facing slope labelled  $W$  and  $E$  respectively.

Horizontal scale: 1 unit represents 100 m.

Vertical scale: 1 unit represents 100 m.



(a) Find the gradient of the west facing slope.

[1 mark]

The gradient of the east facing slope in the diagram is  $-\frac{3}{10}$ .

(b) Find the total distance to hike over the mountain in km.

[6 marks]

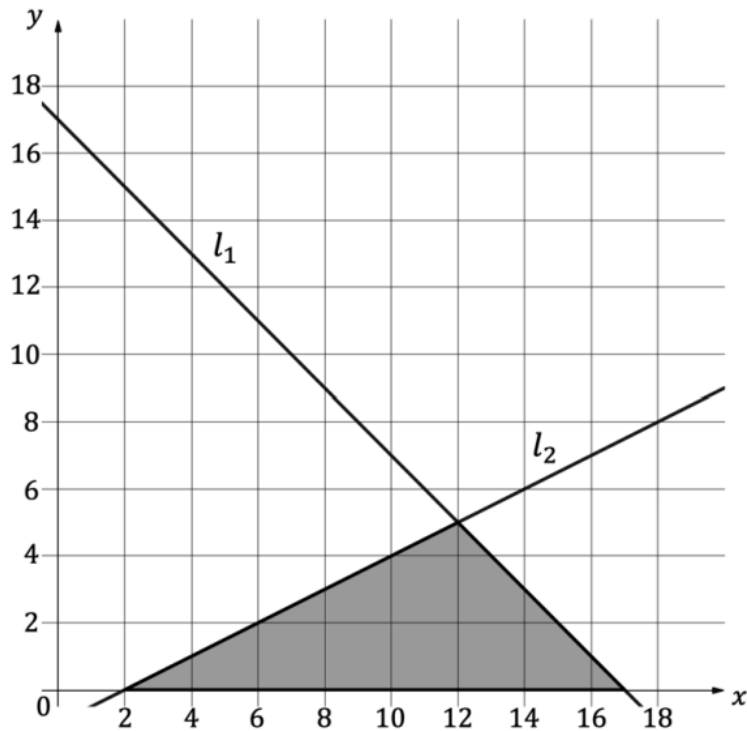


(c) Suggest a reason as to why the actual total distance hiked may be greater than the distance found in part (b).

[1 mark]

### Question 10

The straight lines  $l_1$  and  $l_2$  are shown in the diagram below  $l_1$  intercepts the  $x$ -axis at  $(17, 0)$  and the  $y$ -axis at  $(0, 17)$  and  $l_2$  intercepts the  $x$ -axis at  $(2, 0)$  and the  $y$ -axis at  $(0, -1)$ .



(a) Giving your answer in the form  $y = mx + c$ , find:

- (i) the equation of  $l_1$
- (ii) the equation of  $l_2$ .

[4 marks]

(b) Find the area of the shaded region.

[4 marks]

### Question 11

A line passing through the origin  $O$ , is perpendicular to a line with equation  $x + y = 16$ . The two lines meet at point  $R$ .  $P$  is a point such that  $OP : PR = 3 : 1$ .

(a) Find the equation of the perpendicular line and hence, the co-ordinates of point  $R$ .

[3 marks]

(b) Find the coordinates of  $P$ .

[2 marks]