

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 1a

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]

Question 1b

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 2a

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]

Question 2b

l_1 passes through A and B.

(b) Find the gradient of l_1 .

[2 marks]

Question 2c

(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 3a

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]

Question 3b

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]

Question 3c

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 4a

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]

Question 4b

A job takes the plumber seven hours.

(b) Calculate the total cost of the job.

[2 marks]

Question 4c

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]

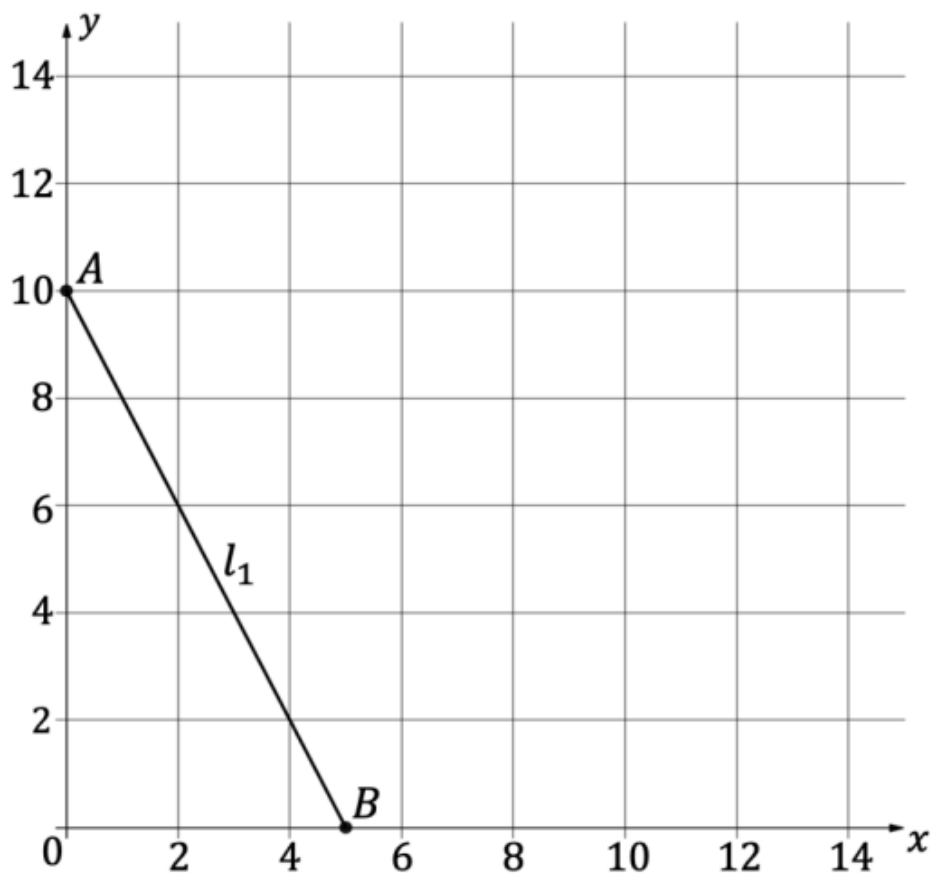
Question 4d

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

[3 marks]

Question 5a

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]

Question 5b

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

[2 marks]

Question 5c

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]

Question 5d

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

[1 mark]

Question 6a

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]

Question 6b

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 7a

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]

Question 7b

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

[4 marks]

Question 8a

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]

Question 8b

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

[2 marks]

Question 8c

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

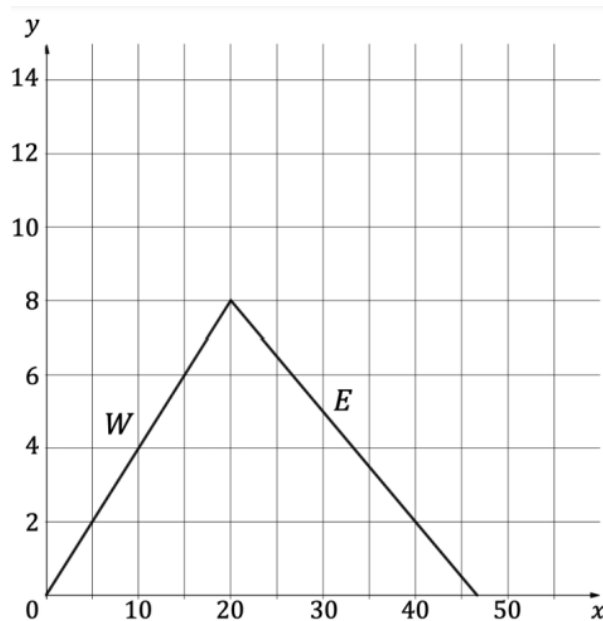
[2 marks]

Question 9a

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]

Question 9b

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]

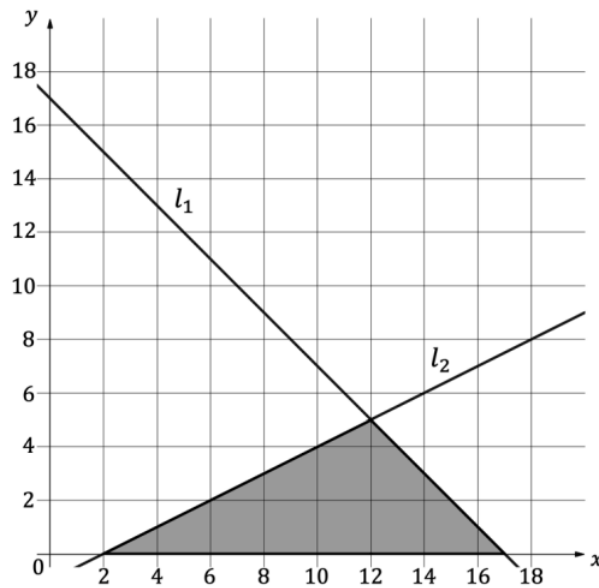
Question 9c

(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 10a

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]

Question 10b

(b) Find the area of the shaded region.

[4 marks]

Question 11a

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]

Question 11b

(b) Find the coordinates of P .

[2 marks]