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]

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]

a) i) The y-intercept is when $x = 0$.

$2(0) - y + 6 = 0$

$y = 6$

$\boxed{\therefore \text{ The } y\text{-intercept is at } (0, 6).}$

ii) The x-intercept is when $y = 0$.

$2x - (0) + 6 = 0$

$x = -3$

$\boxed{\therefore \text{ The } x\text{-intercept is at } (-3, 0).}$

ii) Rearrange l_1 into the form $y = mx + c$, where m is the gradient.

$2x - y + 6 = 0$

$y = 2x + 6$

+y and rearrange

$\boxed{\therefore \text{ The gradient of } l_1 \text{ is } 2.}$

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. $\boxed{m_1 = 2}$ [3]

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]

b) i) Perpendicular gradients

$m_2 = -\frac{1}{m_1}$

$\boxed{m_2 = -\frac{1}{2}}$

ii) Point-gradient formula

$y - y_1 = m(x - x_1)$ (in formula booklet)

point $(4, 0)$ and $m_2 = -\frac{1}{2}$

Sub x_1, y_1 and m_2 into $y - y_1 = m(x - x_1)$.

$y - 0 = -\frac{1}{2}(x - 4)$

expand RHS

$y = -\frac{1}{2}x + 2$

$\times 2$

$2y = -x + 4$

rearrange to make a, b and c integers

$\boxed{x + 2y - 4 = 0}$

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]

The line l_1 passes through A and B.

(b) Find the gradient of l_1.

[2]

(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]

a) Midpoint formula

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$ (in formula booklet)

A(2, 8) B(-8, 2)

Sub A and B into formula to find M.

$$M = \left(\frac{2 + (-8)}{2}, \frac{8 + 2}{2}\right)$$

$$M = \left(\frac{-6}{2}, \frac{10}{2}\right)$$

$$\boxed{M = (-3, 5)}$$

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]

The line l_1 passes through A and B.

(b) Find the gradient of l_1.

[2]

(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]

b) Gradient formula

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$ (in formula booklet)

A(2, 8) B(-8, 2)

Sub A and B into formula to find m_1.

$$m_1 = \frac{2 - 8}{-8 - 2}$$

$$m_1 = \frac{-6}{-10}$$

$$\boxed{m_1 = \frac{3}{5}}$$

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]

The line l_1 passes through A and B.

(b) Find the gradient of l_1.

$\boxed{m_1 = \frac{3}{5}}$

[2]

(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]

c) Point - gradient formula

$y - y_1 = m(x - x_1)$ (in formula booklet)

*$A(2, 8)$ $m_1 = \frac{3}{5}$

Sub A and m_1 into $y - y_1 = m(x - x_1)$.

$y - 8 = \frac{3}{5}(x - 2)$

expand RHS

$y - 8 = \frac{3}{5}x - \frac{6}{5}$

$\times 4$

$5y - 40 = 3x - 6$

rearrange to make a, b and c integers

$\boxed{3x - 5y + 34 = 0}$

*N.B. You could also use B.

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]

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]

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]

a) Midpoint formula

$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$ (in formula booklet)

$A(1, 7)$ $B(5, 5)$

Sub A and B into formula to find M.

$M = \left(\frac{1+5}{2}, \frac{7+5}{2}\right)$

$M = \left(\frac{6}{2}, \frac{12}{2}\right)$

$\boxed{M = (3, 6)}$

EXAM PAPERS PRACTICE

Consider $w = \frac{z_1}{z_2}$, where $z_1 = 2 + 2\sqrt{3}i$ and $z_2 = 2 + 2i$.

(c) $w = 4e^{i\frac{\pi}{3}}$

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]

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]

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]

b) Gradient Formula

$m = \frac{y_2 - y_1}{x_2 - x_1}$ (in formula booklet)

$A(1,7)$ $B(5,5)$

Sub A and B into formula to find m_1.

$m_1 = \frac{5-7}{5-1}$ $\therefore m_1 = -\frac{1}{2}$

Sub A and m_1 into $y - y_1 = m(x - x_1)$.

$y - 7 = -\frac{1}{2}(x - 1)$

expand RHS

$y - 7 = -\frac{1}{2}x + \frac{1}{2}$

$+7$

$\boxed{y = -\frac{1}{2}x + \frac{15}{2}}$

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. $\boxed{M = (3, 6)}$

[2]

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 $y = mx + c$.

$\boxed{y = -\frac{1}{2}x + \frac{15}{2}}$

[2]

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]

c) l_2 is perpendicular to l_1 and passes through M.

Perpendicular gradients

$m_2 = -\frac{1}{m_1}$ $m_1 = -\frac{1}{2}$

$\therefore m_2 = 2$

$M(3, 6)$ and $m_2 = 2$

Sub M and m_2 into $y - y_1 = m(x - x_1)$.

$y - 6 = 2(x - 3)$

$y - 6 = 2x - 6$

$\boxed{y = 2x}$

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]

A job takes the plumber seven hours.

(b) Calculate the total cost of the job.

[2]

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]

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

[3]

a) Identify the linear function.

$y = mx + c$

$y = C_A$

$m = \$15/\text{hour}$ (hourly rate)

$x = t$ hours

$c = \$25$ (fixed fee)

$\boxed{C_A = 15t + 25}$

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.

$\boxed{C_A = 15t + 25}$

[2]

A job takes the plumber seven hours.

(b) Calculate the total cost of the job.

[2]

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]

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

[3]

b) Sub $t = 7$ into C_A.

$C_A = 15(7) + 25$

$\boxed{C_A = \$130}$

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]

A job takes the plumber seven hours.

(b) Calculate the total cost of the job.

[2]

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]

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

[3]

c) Identify the linear function.

$y = mx + c$

$y = C_B$

$m = \$16/\text{hour}$ (hourly rate)

$x = t$ hours

$c = \$20$ (fixed fee)

$\boxed{C_B = 16t + 20}$

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.

$\boxed{C_A = 15t + 25}$

[2]

A job takes the plumber seven hours.

(b) Calculate the total cost of the job.

[2]

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.

$\boxed{C_B = 16t + 20}$

[2]

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

[3]

d) Sub $t = 6$ into C_A and C_B.

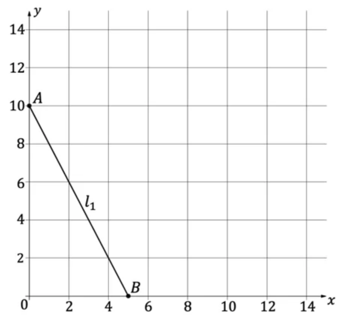
$C_A = 15(6) + 25$ $\qquad$ $C_B = 16(6) + 20$

$C_A = \$115$ $\qquad$ $C_B = \$116$

$\boxed{\therefore \text{Plumber A is cheaper.}}$

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]

(b) Find the length of [AB].

[2]

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]

(d) Find the coordinates where l_2 intersects the y-axis.

[1]

a) Gradient formula

$m = \dfrac{y_2 - y_1}{x_2 - x_1}$ (in formula booklet)

A(0, 10) B(5, 0)

Sub A and B into formula.

$m_1 = \dfrac{0-10}{5-0}$ $\therefore m_1 = -2$

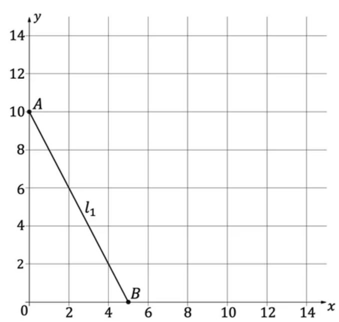
Sub A and m_1 into $y - y_1 = m(x - x_1)$.

$y - 10 = -2(x - 0)$ expand RHS

$y - 10 = -2x$ +10

$\boxed{y = -2x + 10}$

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]

(b) Find the length of [AB].

[2]

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]

(d) Find the coordinates where l_2 intersects the y-axis.

[1]

b) Distance between two points formula

$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$ (in formula booklet)

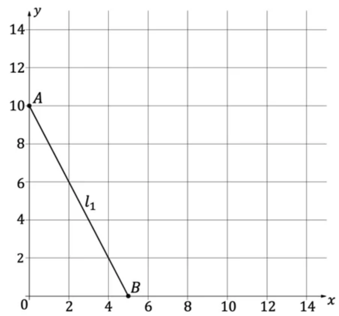
A(0, 10) B(5, 0)

Sub A and B into formula.

$d = \sqrt{(0-5)^2 + (10-0)^2}$

$\boxed{d = 11.2 \text{ units}}$

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 $y = mx + c$.

$\boxed{y = -2x + 10}$

[2]

(b) Find the length of [AB].

[2]

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]

(d) Find the coordinates where l_2 intersects the y-axis.

[1]

c) Parallel lines have the same gradient.

$C(8,0)$ and $m_1 = m_2 = -2$

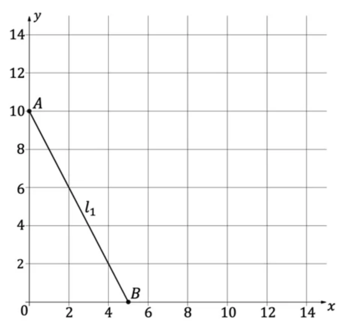
Sub C and m_2 into $y - y_1 = m(x - x_1)$.

$y - 0 = -2(x - 8)$

$y = -2x + 16$

$\boxed{2x + y - 16 = 0}$

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]

(b) Find the length of [AB].

[2]

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.

$\boxed{2x + y - 16 = 0}$

[2]

(d) Find the coordinates where l_2 intersects the y-axis.

[1]

d) y-intersect happens when $x = 0$.

Sub $x = 0$ into l_2.

$2(0) + y - 16 = 0$

$y - 16 = 0$

$y = 16$

$\boxed{\therefore y\text{-intersect at } (0, 16)}$

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]

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]

a) Linear relationship: $y = mx + c$

$122 = m(115) + c \qquad 190 = m(200) + c$

solve simultaneous equations using your GDC.

$m = 0.8$ and $c = 30$

$\therefore y_A = 0.8x + 30$

i) Sub $x = 180$.

$y_A = 0.8(180) + 30$

$\boxed{y_A = \$174}$

ii) Sub $y_A = 385.20$.

$385.20 = 0.8x + 30$

$\boxed{x = 444 \text{ copies}}$

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

(a) Assuming a linear relationship, find

$\boxed{y_A = 0.8x + 30}$

(i) the price for 180 copies

(ii) how many copies could be made for \$385.20.

[4]

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]

b) $y_A = 0.8x + 30 \qquad y_B = 0.82x + 25.50$

Sub $x = 220$ into y_A and y_B.

$y_A = 0.8(220) + 30 \qquad y_B = 0.82(220) + 25.50$

$y_A = \$206 \qquad y_B = \$205.90$

$\boxed{\therefore \text{Photocopy shop B is cheaper.}}$

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]

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

[4]

a) Linear relationship: $y = mx + c$

$$\boxed{\begin{aligned}&\text{Company A: } y = 0.2x + 25\\ &\text{Company B: } y = 0.22x + 10\end{aligned}}$$

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.

Company A: $y = 0.2x + 25$ Company B: $y = 0.22x + 10$ [2]

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

[4]

b) Set both cost functions equal to each other.

Company A = Company B

$0.2x + 25 = 0.22x + 10$

Solve using your GDC.

$x = 750$

$\boxed{\text{Monthly energy consumption} = 750\text{ kWh}}$

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]

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

[2]

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

[2]

a) Linear function: $C(x) = mx + c$

$m = \frac{\text{change in expenditure}}{\text{change in income}} = \frac{\text{change in } C(x)}{\text{change in } x}$

$m = \frac{{}^{*}\Delta C(x)}{\Delta x}$ $\quad {}^{*}\Delta =$ "change in..."

$\Delta C(x) = 60 \qquad \Delta x = 150$

Sub $\Delta C(x)$ and Δx into formula.

$m = \frac{60}{150} \qquad \therefore m = 0.4$

$C(x) = 1000 \quad x = 1200 \quad m = 0.4 \quad (C(1200) = 1000)$

Sub $C(x)$, x and m into formula.

$0.4(1200) + c = 1000$

$c = 520$

rearrange for c

$\boxed{C(x) = 0.4x + 520}$

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.

$$\boxed{C(x) = 0.4x + 520}$$

[2]

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

[2]

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

[2]

b) Sub $x = 1885$ into $C(x)$.

$C(1885) = 0.4(1885) + 520$

$$\boxed{C(1885) = \$1274}$$

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.

$$\boxed{C(x) = 0.4x + 520}$$

[2]

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

[2]

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

[2]

c) Sub $C(x) = 1070$ and solve for x.

$0.4x + 520 = 1070$ -520

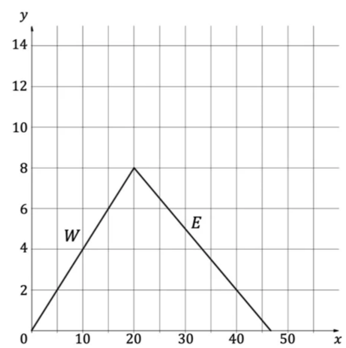
$0.4x = 550$ $\div 0.4$

$x = \frac{550}{0.4}$

$$\boxed{x = \$1375}$$

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]

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]

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

[1]

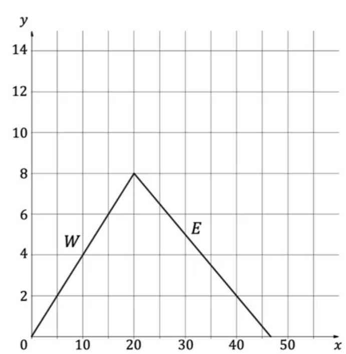
a) Two points on W are (0,0) and (20,8).

Sub points into gradient formula.

$m = \frac{8-0}{20-0}$

$\boxed{m = 0.4}$

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]

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]

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

[1]

b) Find the equation of the east slope.

point $(20,8)$ and $m = -\frac{3}{10}$

$y - 8 = -\frac{3}{10}(x - 20)$) expand RHS and + 8

$y = -\frac{3}{10}x + 14$

Find the x-intersect of the east slope.

$0 = -\frac{3}{10}x + 14$) $+\frac{3}{10}x$

$\frac{3}{10}x = 14$) $\times \frac{10}{3}$

$x = \frac{140}{3}$

x-intersect at $\left(\frac{140}{3}, 0\right)$

Distance between two points formula

$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$ (in formula booklet)

Total distance = west slope + east slope.

West points are (0,0) and (20,8).

East points are (20,8) and $\left(\frac{140}{3}, 0\right)$.

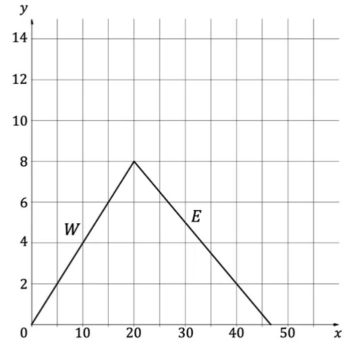
$d = \sqrt{(0-20)^2 + (0-8)^2} + \sqrt{\left(20-\frac{140}{3}\right)^2 + (8-0)^2}$

$d = 49.4$ units

$\boxed{d = 4.94 \text{ km}}$

EXAM PAPERS PRACTICE

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]

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]

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

[1]

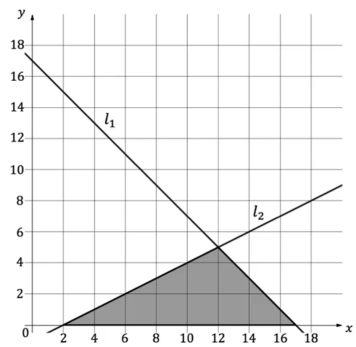
c) Real life vs. mathematical model

Any valid reason with an explanation is needed.

The actual total distance hiked may be greater than the answer in part (b) because the slope of a mountain is not constant.

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]

(b) Find the area of the shaded region.

[4]

a) i) Sub $(17, 0)$ and $(0, 17)$ into gradient formula.

$m_1 = \frac{17-0}{0-17}$ $\therefore m_1 = -1$

Sub $(17, 0)$ and m_1 into $y - y_1 = m(x - x_1)$.

$y - 0 = -1(x - 17)$

$\boxed{y = -x + 17}$

ii) Sub $(2, 0)$ and $(0, -1)$ into gradient formula.

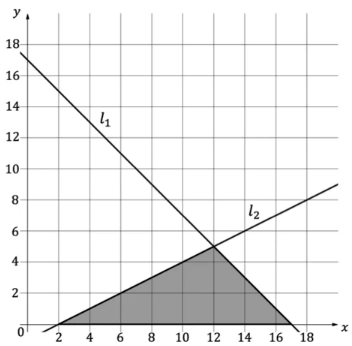
$m_2 = \frac{-1-0}{0-2}$ $\therefore m_2 = \frac{1}{2}$

Sub $(2, 0)$ and m_2 into $y - y_1 = m(x - x_1)$.

$y - 0 = \frac{1}{2}(x - 2)$

$\boxed{y = \frac{1}{2}x - 1}$

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 $\boxed{y = -x + 17}$

(ii) the equation of l_2. $\boxed{y = \frac{1}{2}x - 1}$

[4]

(b) Find the area of the shaded region.

[4]

b) Shaded region forms a triangle.

Area of a triangle formula

$A = \frac{1}{2}bh$ (in formula booklet)

b is the base, h is the perpendicular height

b is formed by the x-intercepts of l_1 and l_2,

$(17, 0)$ and $(2, 0)$ respectively.

$b = 17 - 2$ $\therefore b = 15$ units

h is the y-coordinate where l_1 and l_2 intersect

Find where l_1 and l_2 intersect.

Intersection $= (12, 5)$ $\therefore h = 5$

Sub b and h into formula.

$A = \frac{1}{2}(15)(5)$

$\boxed{A = 37.5 \text{ units}^2}$

Question 11

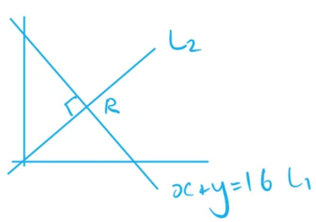
A line passing through the origin O, is perpendicular to a line with equation $x + y = 16$. The two lines meet at point R. P is a point such that $OP : PR = 3 : 1$.

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

[3]

(b) Find the coordinates of P.

[2]



a) PERPENDICULAR GRADIENT

$m_1 \times m_2 = -1$

$L_1 = x + y = 16$

$y = -x + 16$

$m_1 = -1$

$y = mx + c$

↑

GRADIENT

$m = 1$

$y - y_1 = m(x - x_1)$ $(0, 0)$ $m = 1$

L_2 $y = 1x$

$\boxed{y = x}$

POINT R $L_1 = L_2$

SUB L_2 INTO L_1 $x + x = 16$

$2x = 16$

$x = 8$

$\boxed{R = (8, 8)}$

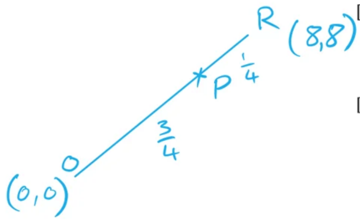
A line passing through the origin O, is perpendicular to a line with equation $x + y = 16$. The two lines meet at point R. P is a point such that $OP : PR = 3 : 1$.

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

[3]

(b) Find the coordinates of P.

[2]



b) $(8,8)$ IN THE RATIO $3:1$

$6:2$

$\boxed{P = (6,6)}$