St. Patrick's High School, Keady

Mathematics Department

GCSE Mathematics Practice Booklet

M7

Topic 5 – Algebra 2 (Using Graphs)

Simultaneous Equations (Graphically)

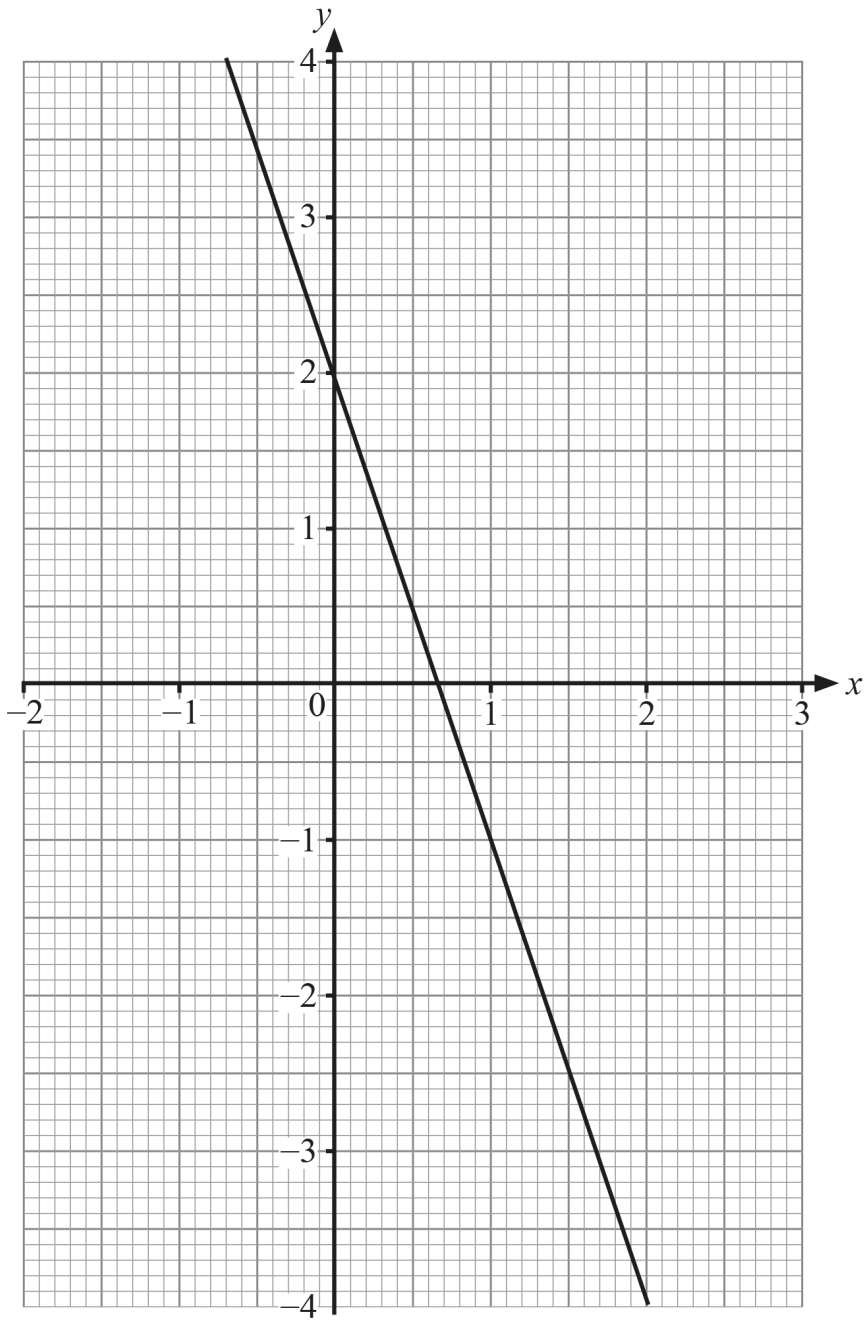
Quadratic Graphs (including intersection with y= mx + c)

Cubic and Reciprocal Graphs

Conversion Graphs

Questions taken from CCEA Past Papers

Q1



By drawing a suitable line on the grid opposite solve the simultaneous equations

$y = 2x - 2$

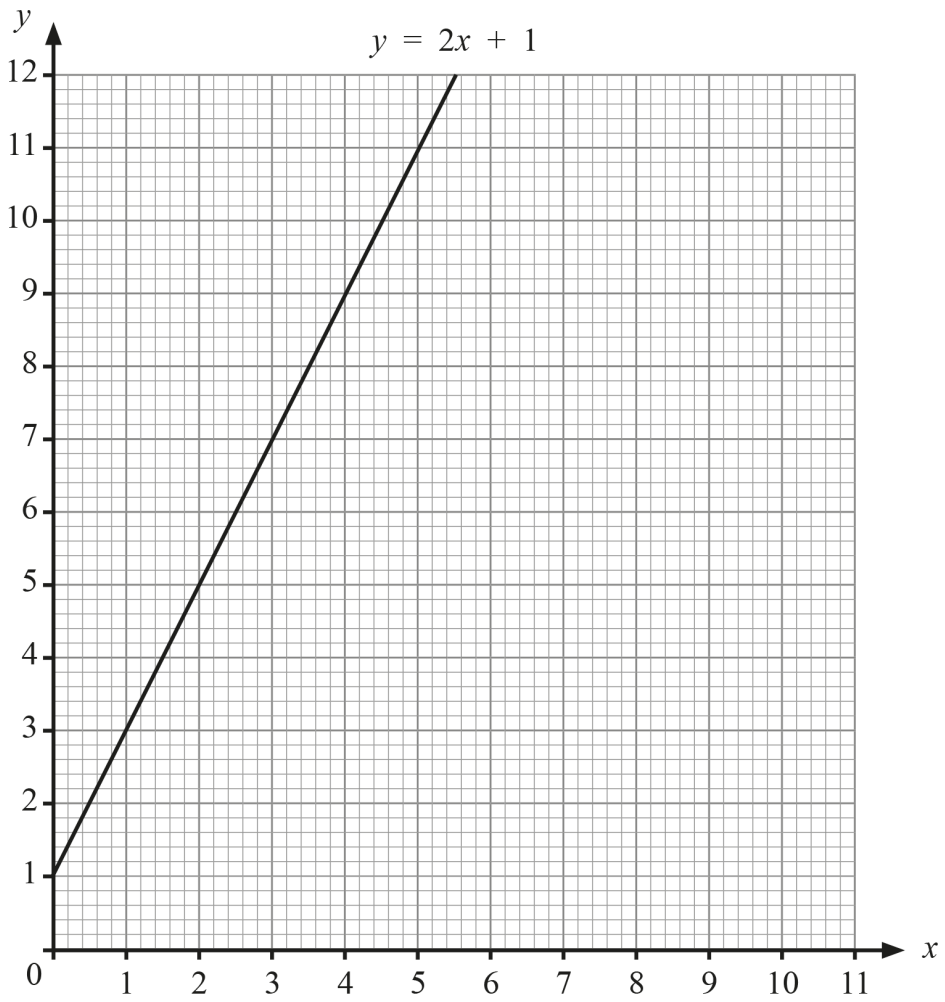
$y = -3x + 2$

Answer $x =$ _____ $y =$ _____ [4]

Q2 Use graphs to solve the simultaneous equations

$$y = 2x + 1 \quad \text{and} \quad y = 10 - x$$

The graph of $y = 2x + 1$ has already been drawn for you.

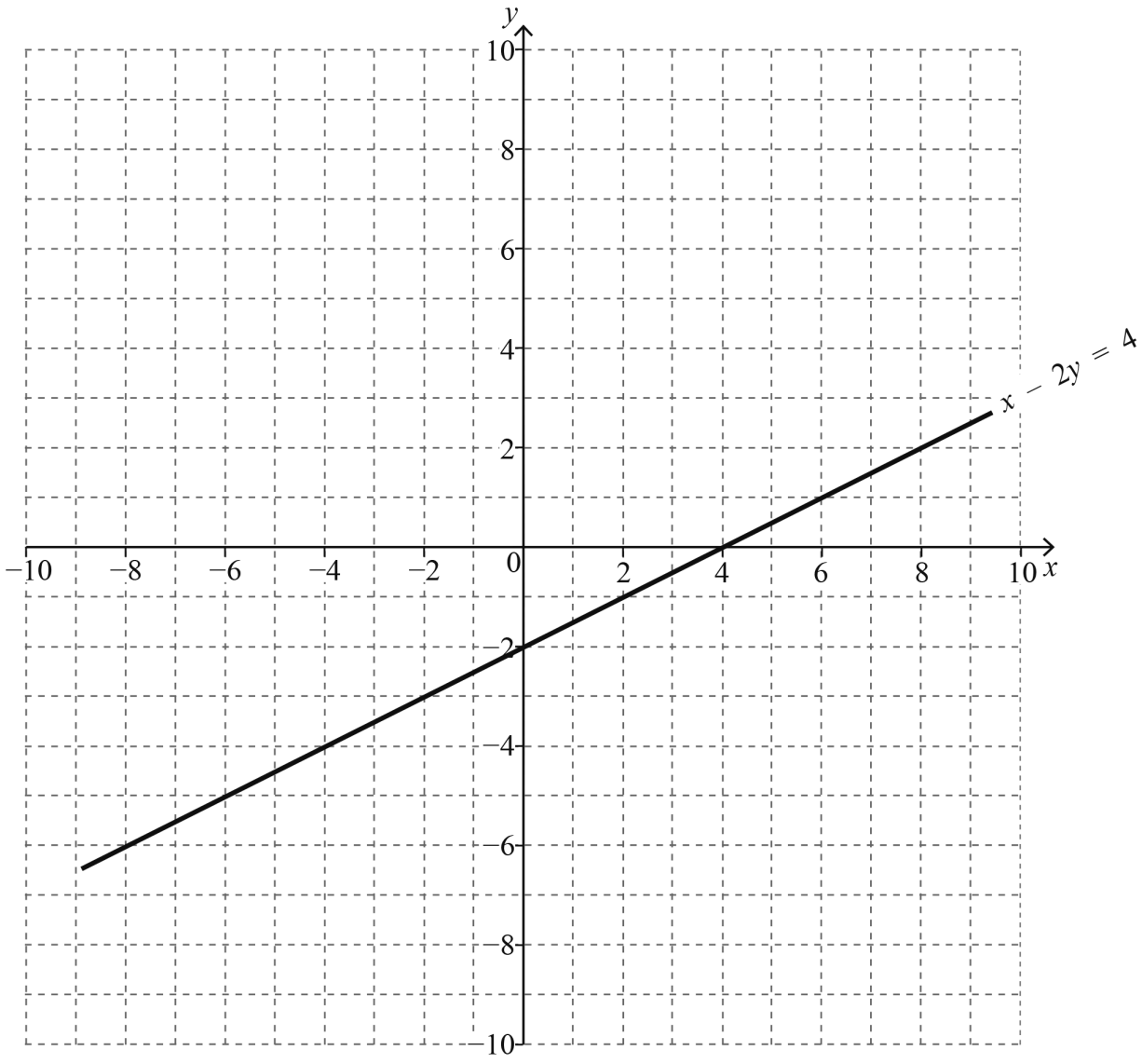


Answer $x =$ _____ and $y =$ _____ [4]

Q3 By drawing a suitable line on the grid, solve the simultaneous equations

$$x - 2y = 4$$

$$y = 3x + 3$$



Answer $x =$ _____ $y =$ _____ [4]

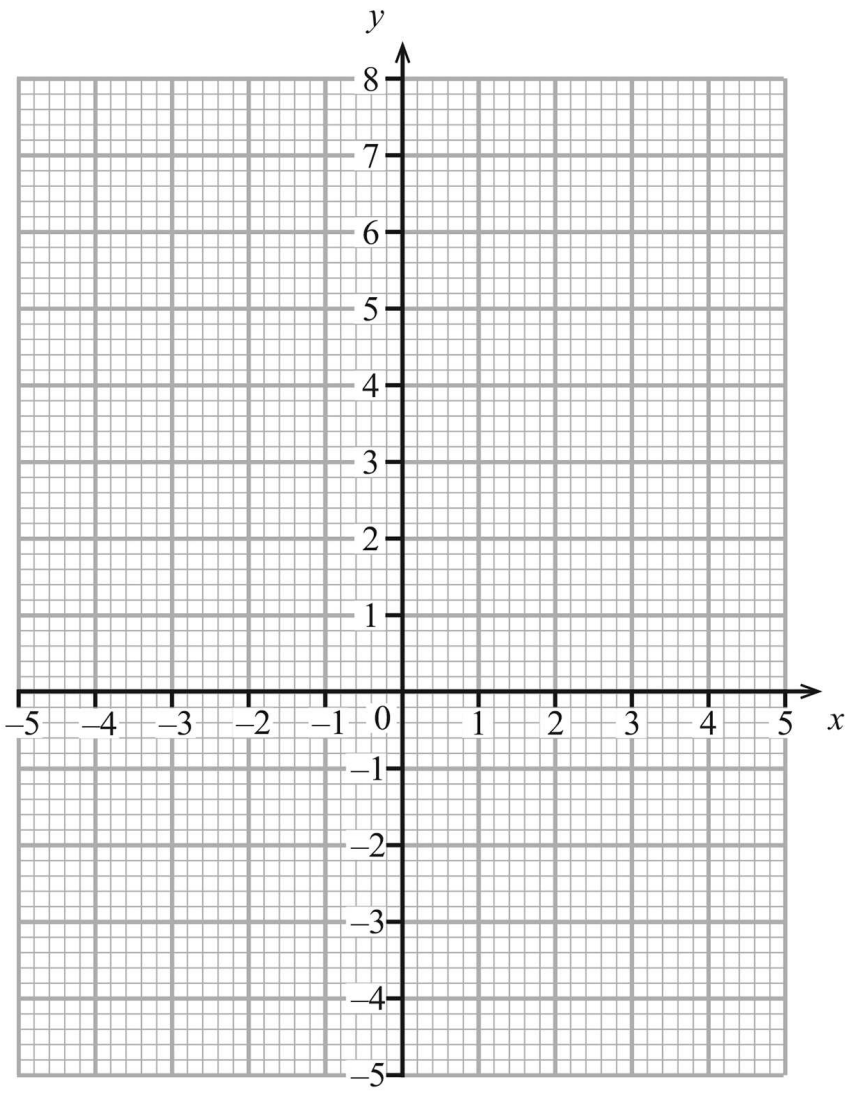
Q4 Part of the table for the graph of $y = x^2 - 2x - 3$ is shown below.

(a) Fill in the blanks in the table.

x	–2	–1	0	1	2	3	4
y	5	0			–3	0	5

[2]

(b) Use the values from the table to draw the graph.



[2]

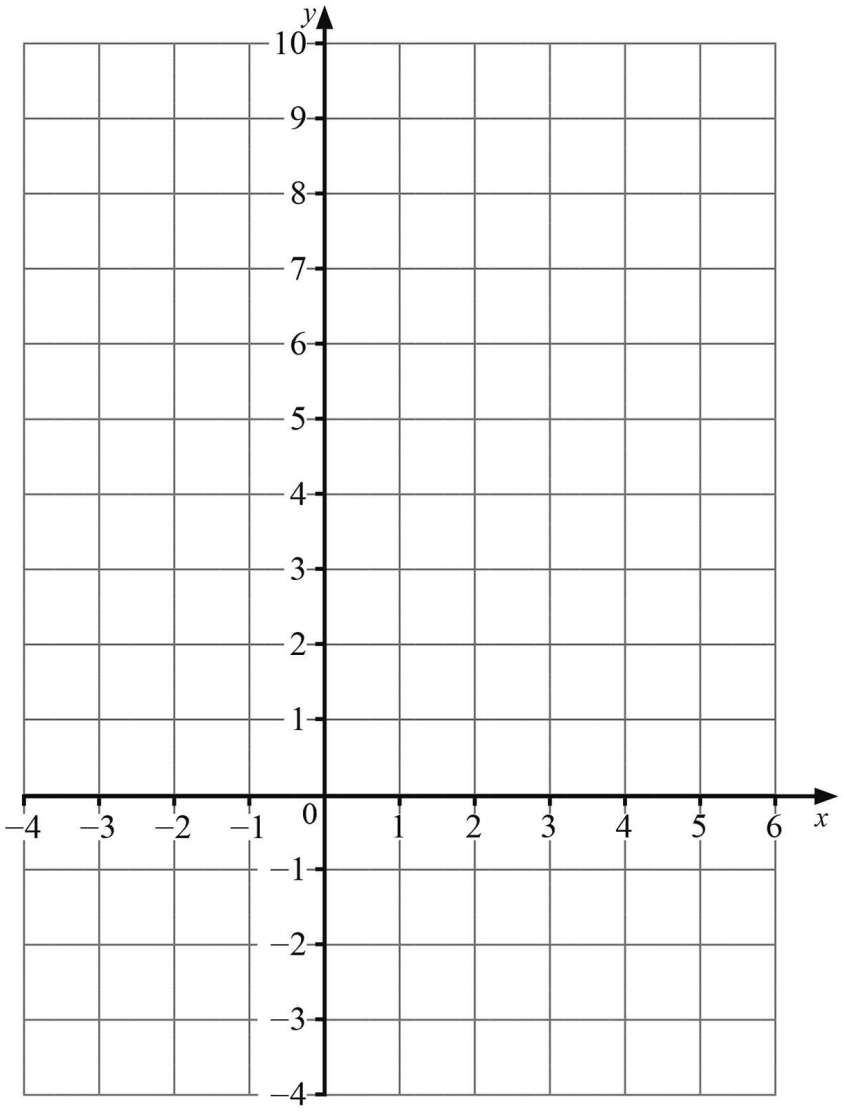
Q5 Part of the table for the graph of $y = x^2 - 2x - 1$ is shown below.

(a) Fill in the blanks in the table.

x	−2	−1	0	1	2	3	4
y	7			−2		2	7

[2]

(b) Use the values from the table to draw the graph of $y = x^2 - 2x - 1$ for $-2 \leqslant x \leqslant 4$

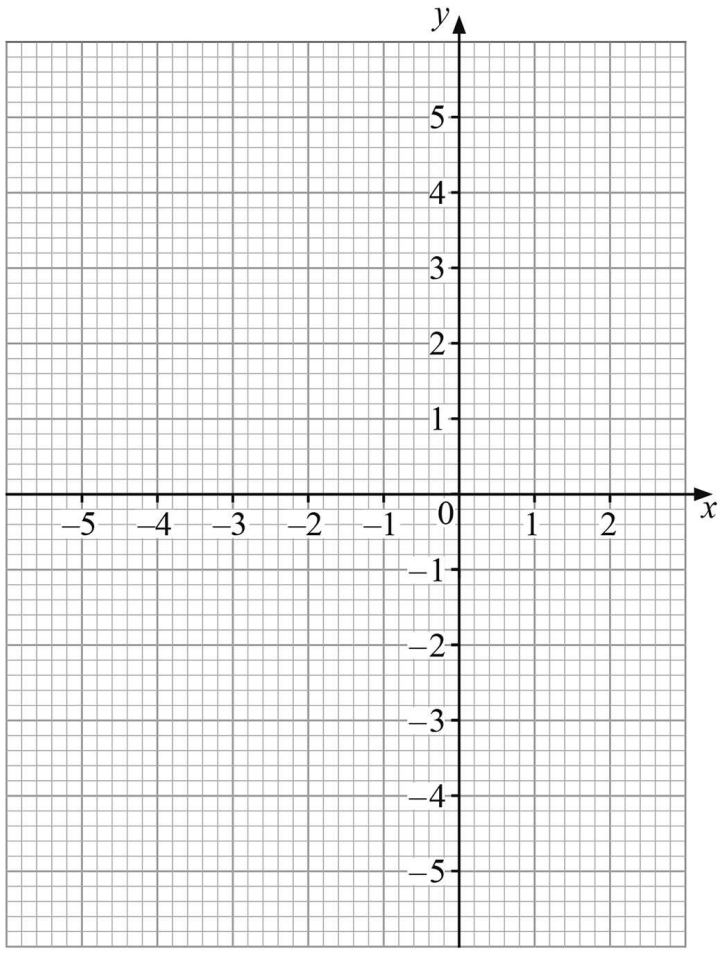


[2]

Q6 Here is a table of values for $y = 1 - 3x - x^2$

x	–4	–3	–2	–1	0	1
y	–3	1	3	3	1	–3

Use the table to draw the graph of $y = 1 - 3x - x^2$ on the grid below for values of x from –4 to 1



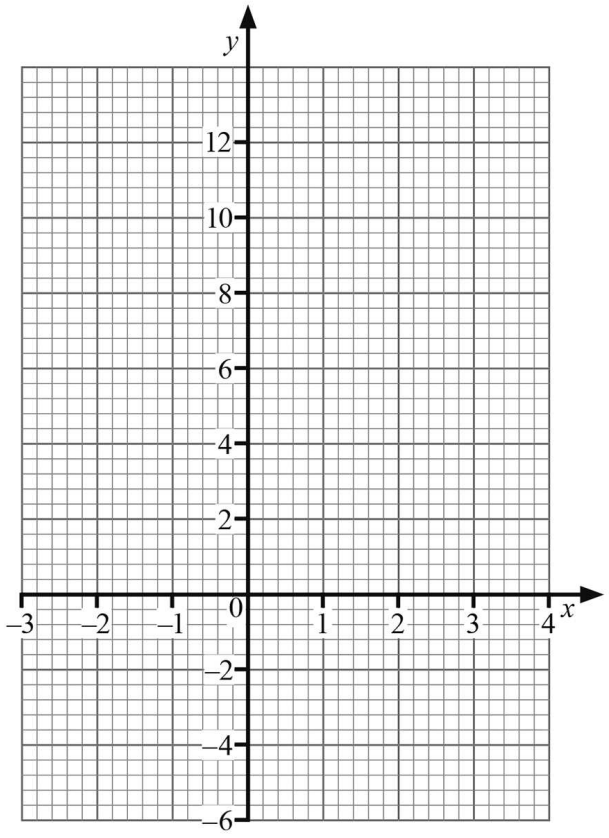
[2]

Q7 **(a)** Complete the table below for $y = 2x^2 - x - 3$

x	–2	–1	0	1	2	3
y		0	–3	–2	3	12

[1]

(b) On the grid draw the graph of $y = 2x^2 - x - 3$ for $x = -2$ to $x = 3$



[2]

Q8

(a) Complete the table for $y = 2x^2 - 4x - 5$

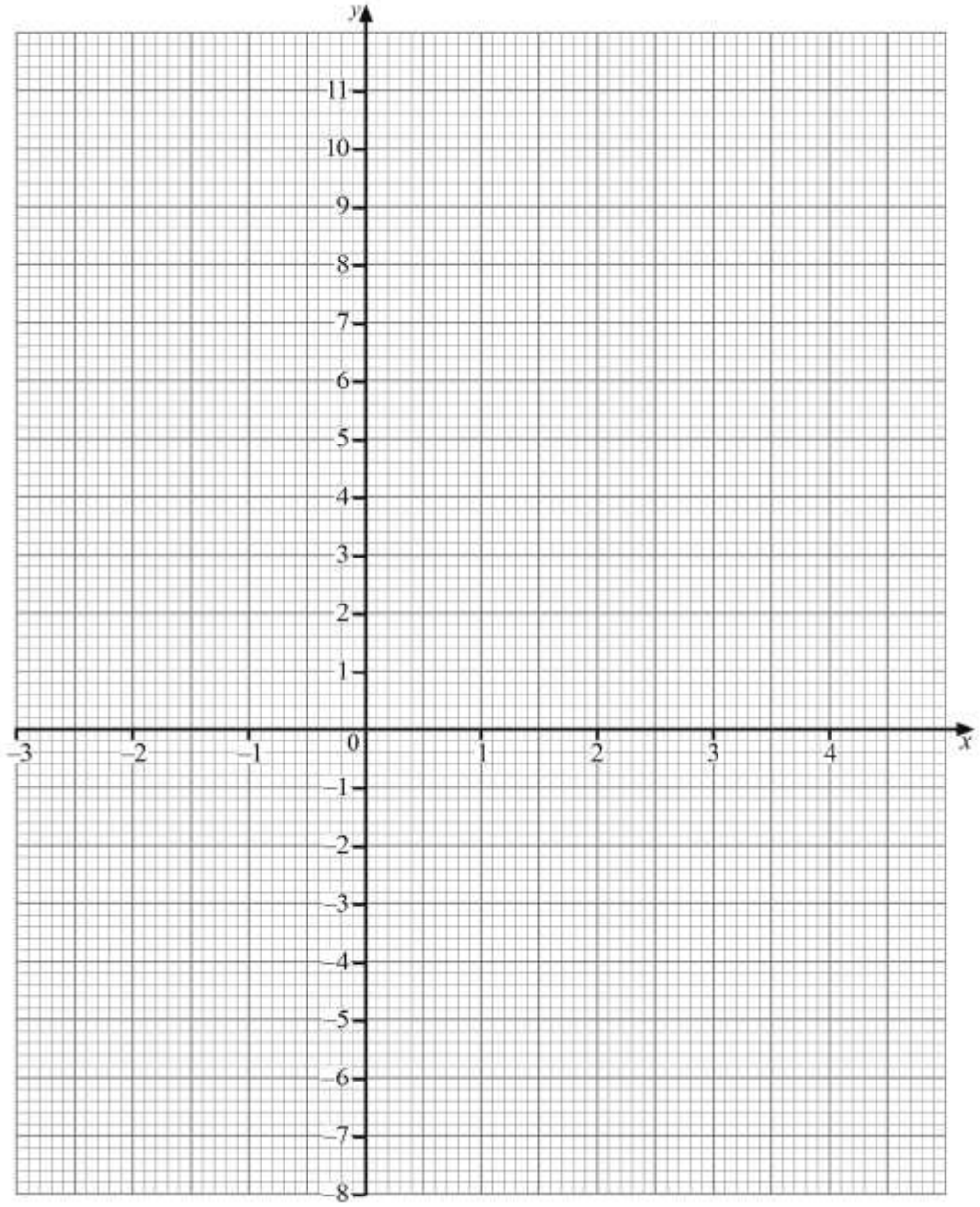
x	–2	–1	0	1	2	3	4
y		1	–5	–7		1	

[2]

(b) Draw the graph of $y = 2x^2 - 4x - 5$ for $x = -2$ to $x = 4$ on the opposite page. [2]

(c) Draw the line $y = -2$ and find the x values of the points of intersection.

Answer _____ [2]

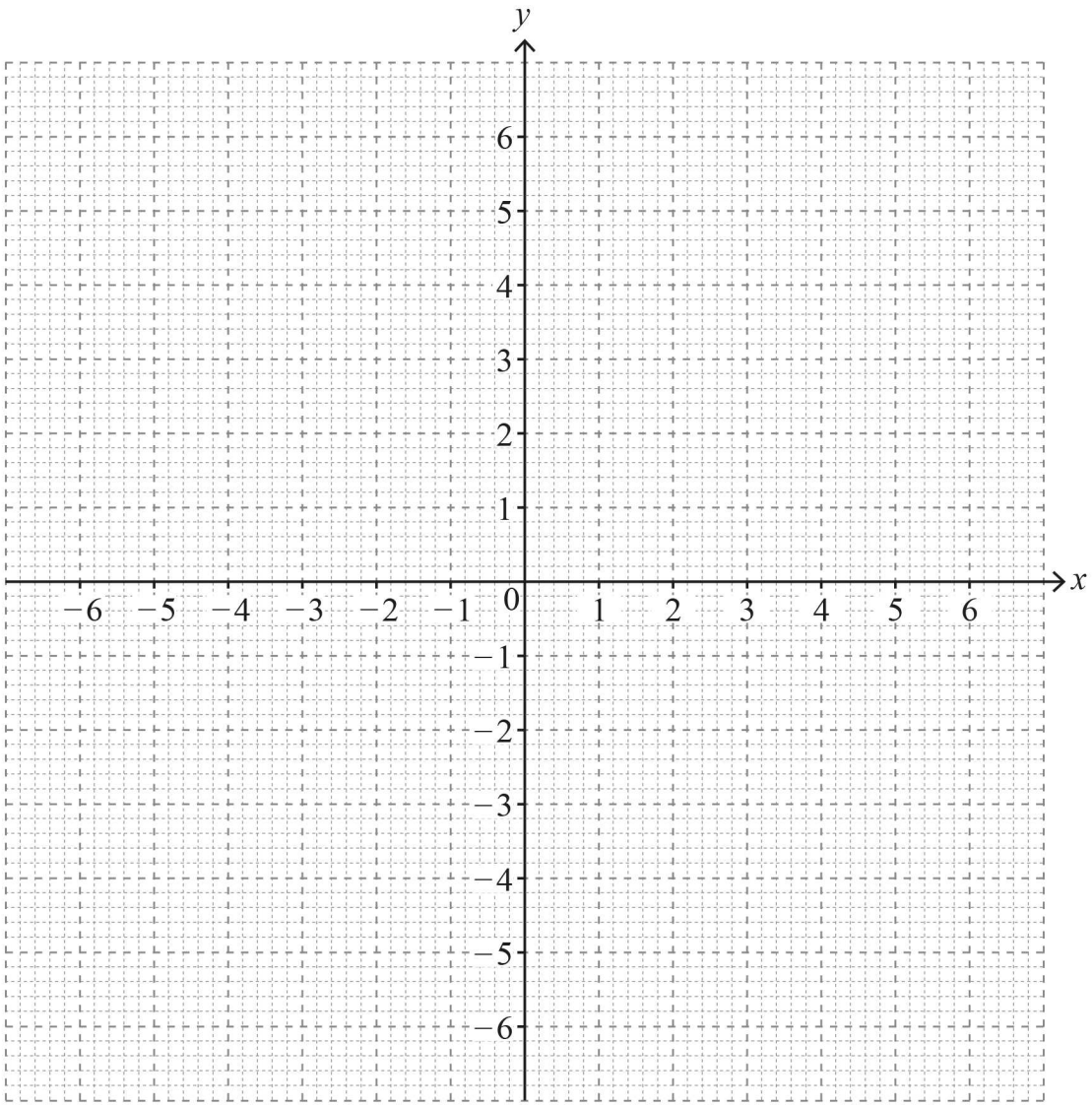

y
x
11
10
9
8
7
6
5
4
3
2
1
0
−1
−2
−3
−4
−5
−6
−7
−8
−3
−2
−1
1
2
3
4

Q9

(a) Draw the graph of $y = 5 - x^2$

Use the table below to help you.

x	−3	−2	−1	0	1	2	3
y	−4				4		



[3]

(b) Use the graph of $y = 5 - x^2$ to solve the equation $5 - x^2 = -2$

Answer $x =$ _____ or $x =$ _____ [1]

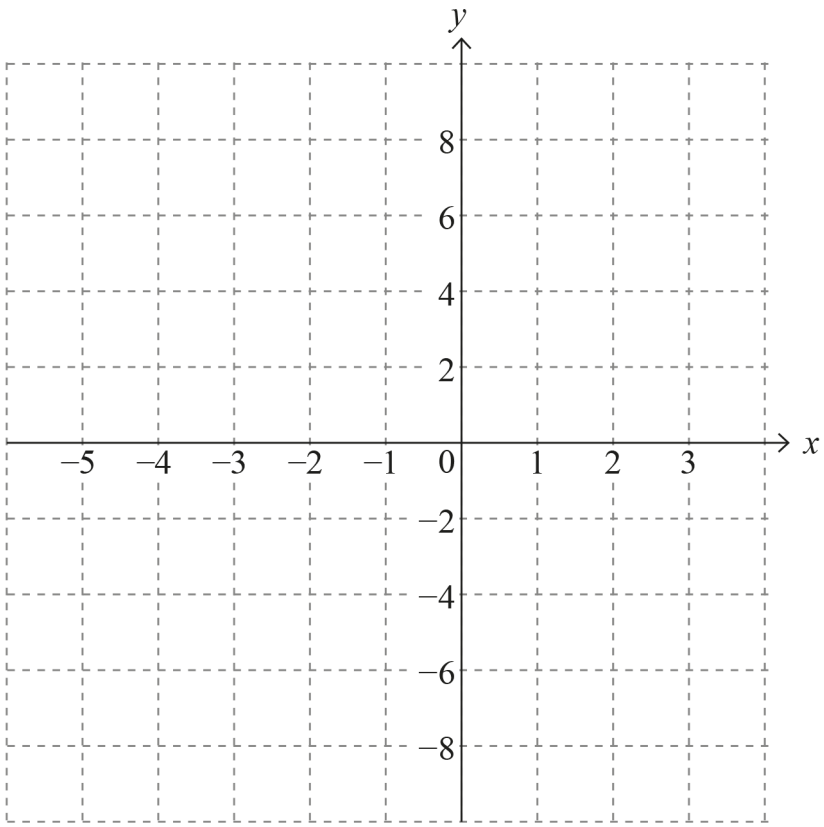
Q10

(a) Complete the table for $y = x^2 + 3x - 3$

x	−4	−3	−2	−1	0	1	2
y	1		−5	−5	−3	1	

[2]

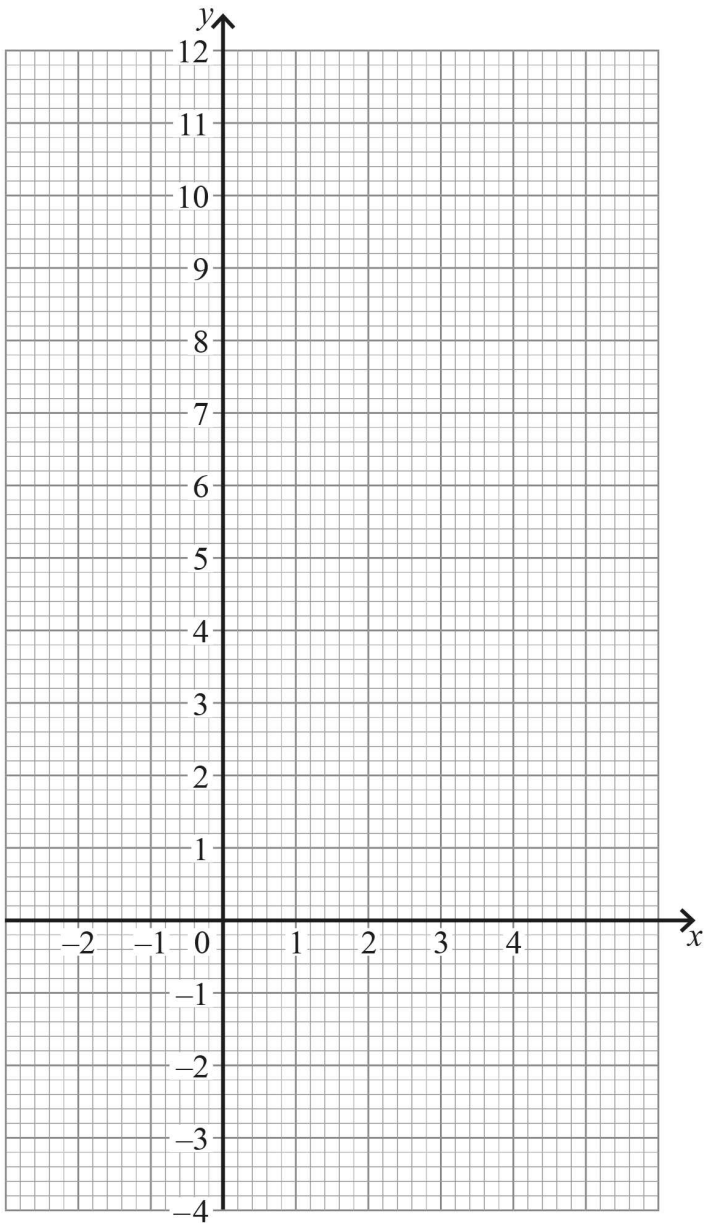
(b) Draw the graph of $y = x^2 + 3x - 3$ from $x = -4$ to $x = 2$ [2]



Q11 The following table gives some values for the quadratic equation $y = x^2 - 3x + 1$

x	–2	–1	0	1	2	3	4
y	11	5	1	–1	–1	1	5

(a) On the grid below, draw the graph of $y = x^2 - 3x + 1$ for values of x between –2 and 4



[2]

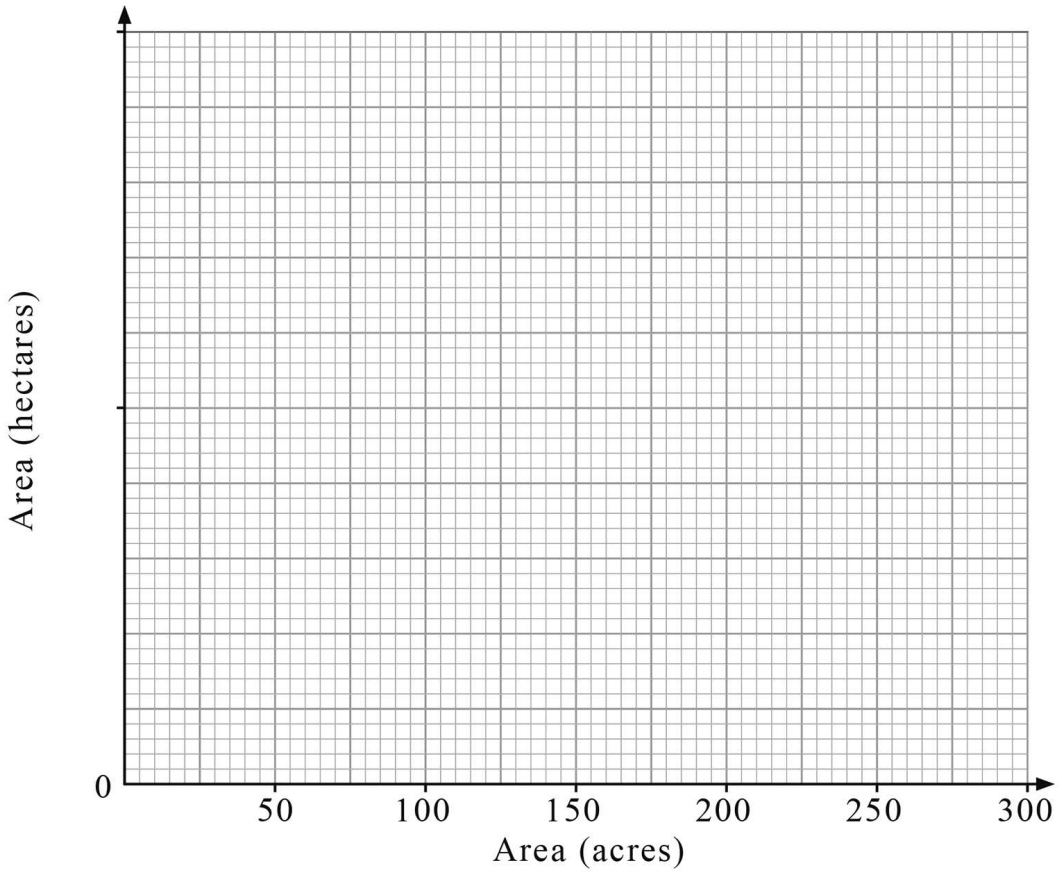
(b) Use your graph to estimate the values of x for which $y = 3$

Answer $x =$ _____ [2]

Q12 Areas of land are measured in either hectares or acres.

(a) Use the values given in the table to draw a conversion graph. [3]

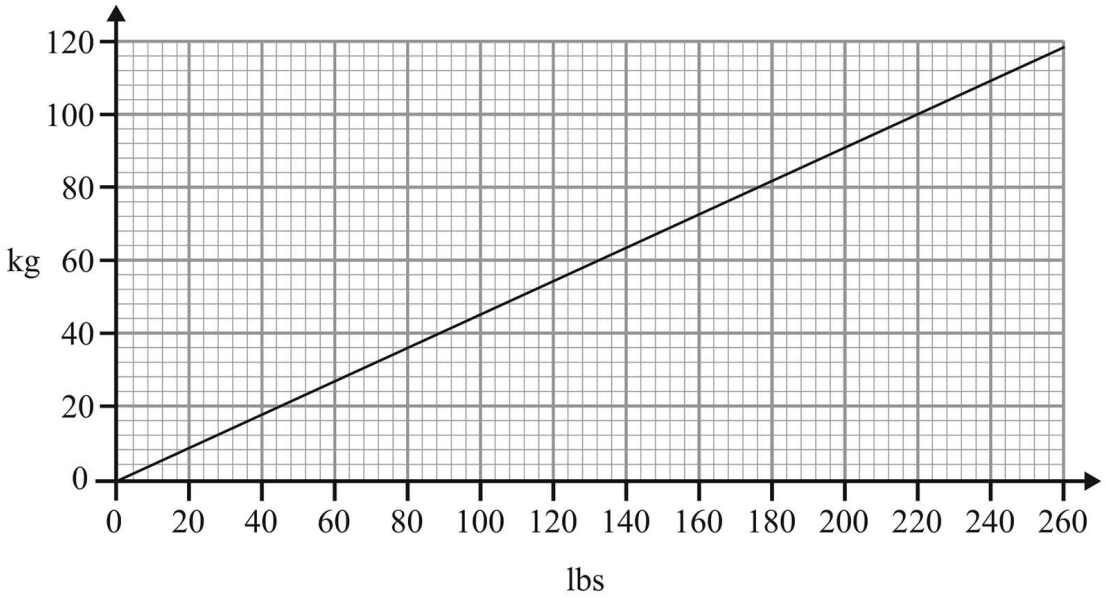
Area (acres)	0	50	200
Area (hectares)	0	20	80



(b) **Use your graph** to find the number of hectares equivalent to 180 acres.

Answer _____ hectares [1]

Q13 This graph can be used to convert pounds (lbs) to kilograms (kg).



(a) The average weight of an American Football player is 248 lbs.

How many kilograms is this?

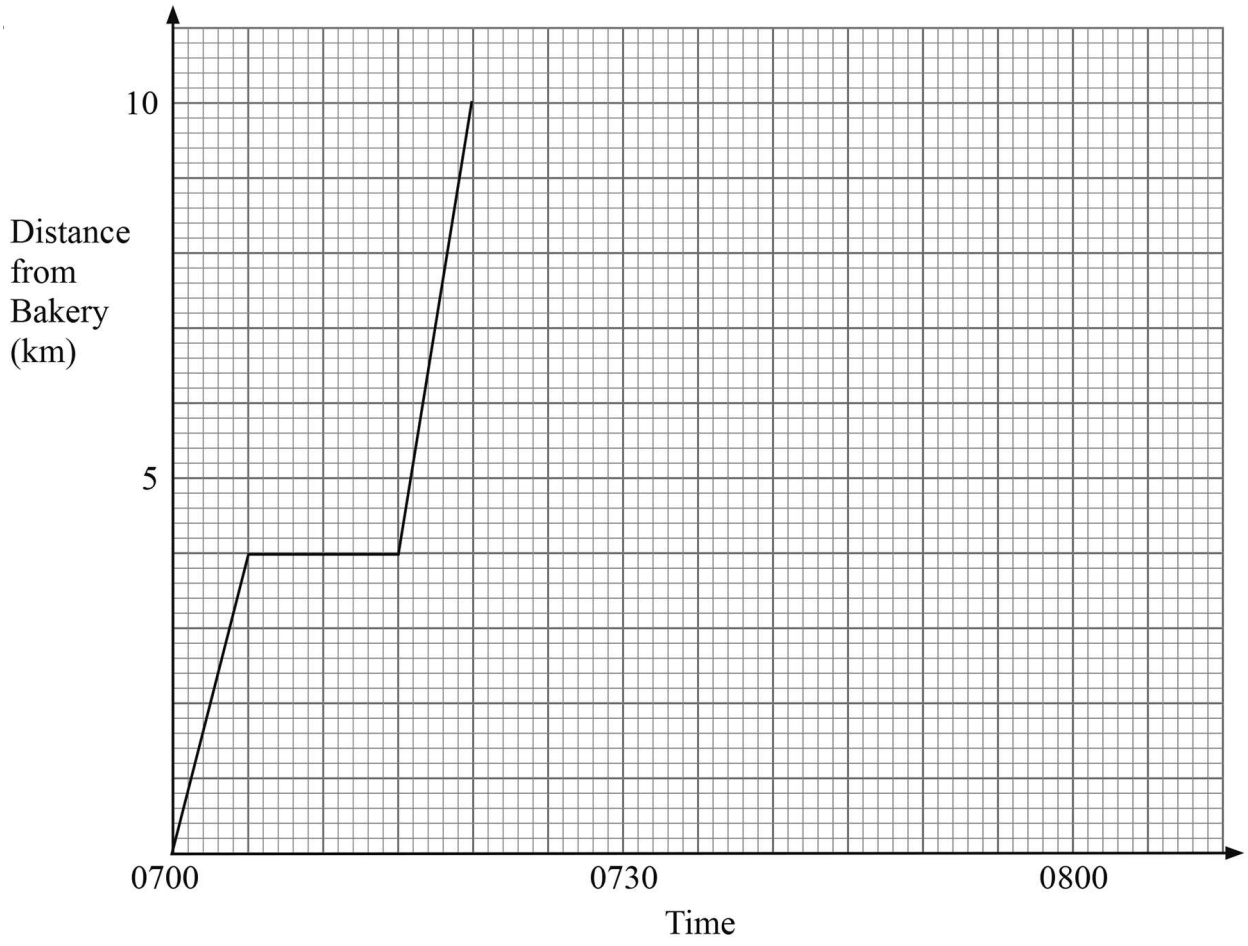
Answer _____ [1]

(b) Justin weighs 72 kg. His American cousin Leroy weighs 165 lbs.
Justin says he weighs more than Leroy.
Is he correct? Explain your answer.

Answer _____ because _____

_____ [2]

Q14



The graph shows the morning deliveries made by a baker.

He leaves the bakery at 0700 and his first delivery is to a hotel.

His second delivery is to a cake shop which is 10 km from the bakery.

He spends 5 minutes at the cake shop and then returns to the bakery at an average speed of 40 km/h.

(a) Use this information to complete the graph for his complete journey. [2]

(b) Work out the baker's average speed from the bakery to the cake shop.

Answer _____ km/h [2]

Q15 Eileen leaves home at 6 pm and goes for a walk.

She walks at an average speed of 4 km/h for 90 minutes.

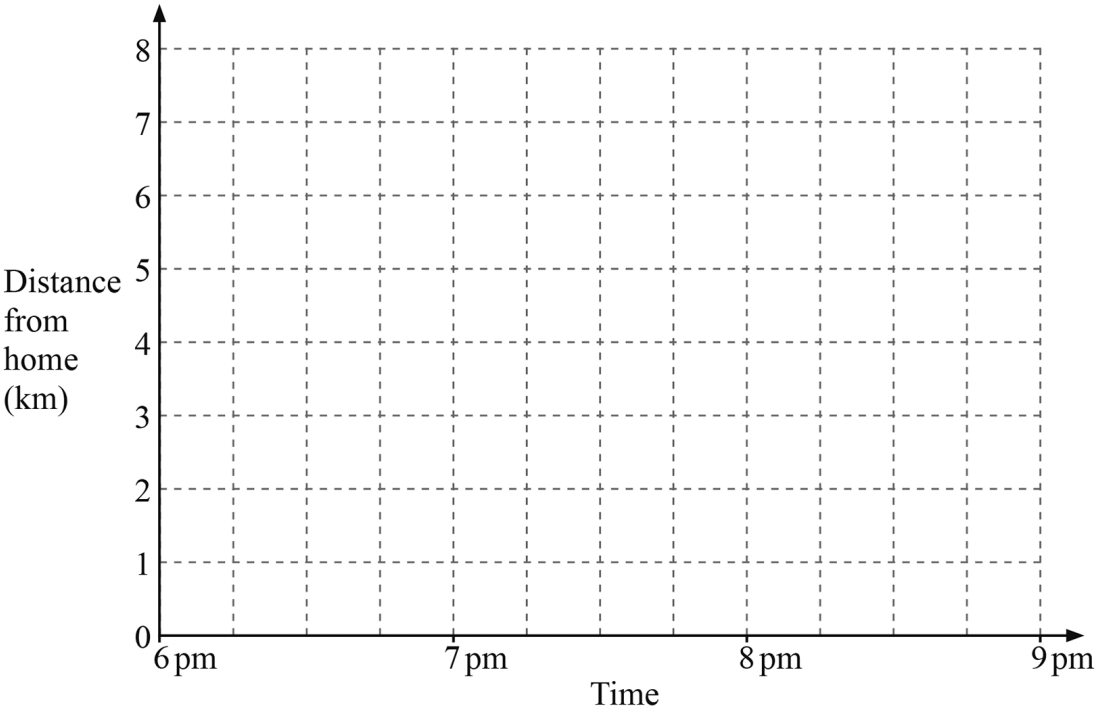
(a) How far has she walked?

Answer _____ km [1]

She stops to rest for 15 minutes.

She then runs back home and arrives home at 8.30 pm.

(b) On the grid below draw a distance-time graph to show Eileen's complete journey.



[3]

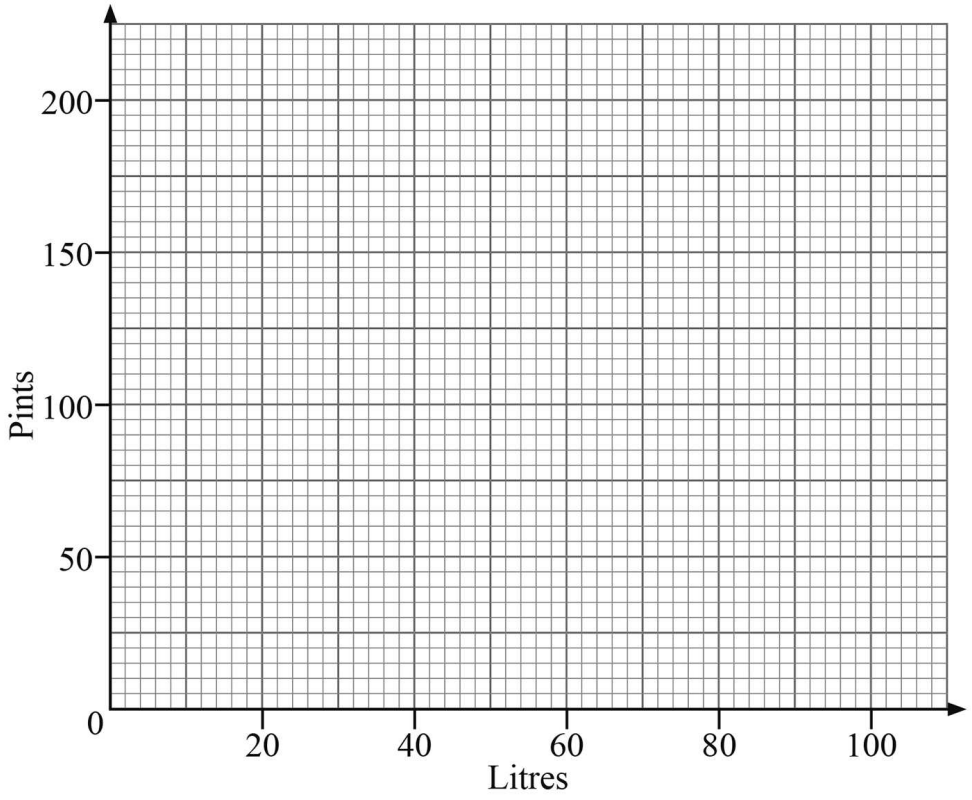
(c) What is Eileen's average speed as she runs back home?

Answer _____ km/h [2]

Q16 Milk is sold in both litres and pints.

Litres	20	60	100
Pints	35	105	175

(a) Use the values in the table to draw the conversion graph on the grid below.



[3]

(b) Explain how to use your graph to convert 240 pints to litres, and write down the answer.

Answer _____ [2]

(c) Alice bought 75 litres of milk and Barbara bought 120 pints of milk.

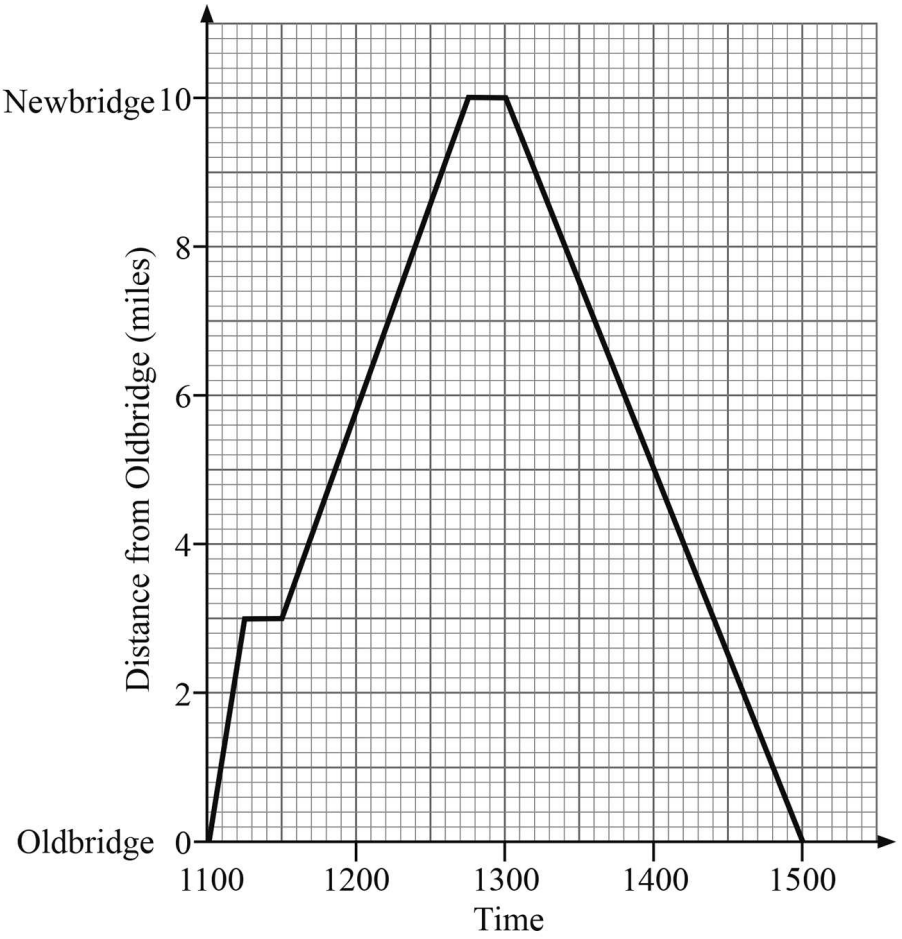
Who bought more milk? Give a reason for your answer.

Answer _____ because _____

_____ [2]

Q17 Harry goes for a run from Oldbridge to Newbridge and back.

His journey is shown on the graph below.



(a) What is Harry's average speed on the return journey from Newbridge to Oldbridge?

Answer _____ mph [2]

(b) Between which times is Harry running at his fastest average speed?

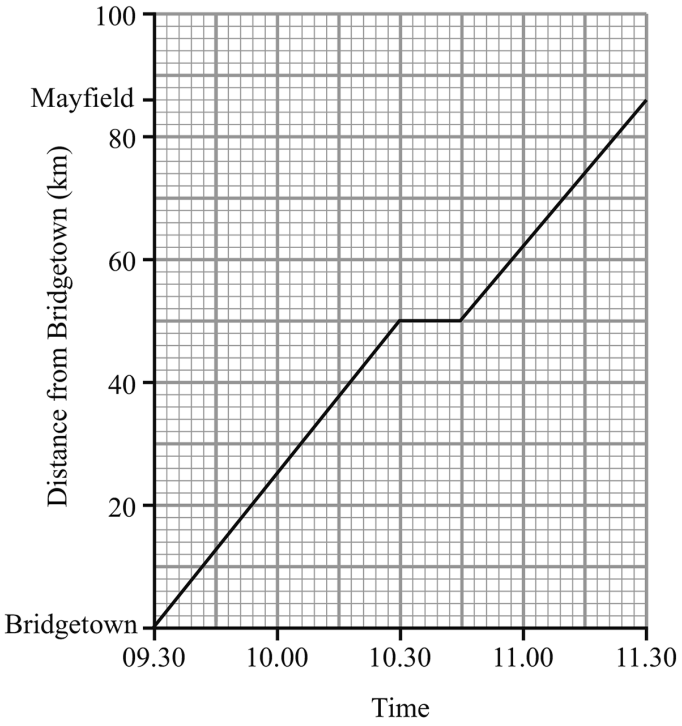
Answer _____ [1]

(c) Richard leaves Newbridge at 1130 and cycles to Oldbridge, at an average speed of 18 mph.

Show Richard's journey on the graph opposite and hence find the time when Harry and Richard pass each other.

Answer _____ [4]

Q18 The graph shows a journey by coach from Bridgetown to Mayfield.



(a) Calculate the average speed for the complete journey from Bridgetown to Mayfield.

Answer _____ km/hr [2]

(b) Further on from Mayfield is Kingsrow which is 100 km from Bridgetown.
A coach leaves Kingsrow at 0945 and travels towards Bridgetown at an average speed of 80 km/hr until it reaches Bridgetown.

(i) Draw a graph to represent its complete journey on the grid opposite. [3]

(ii) Estimate the time at which the two coaches pass each other.

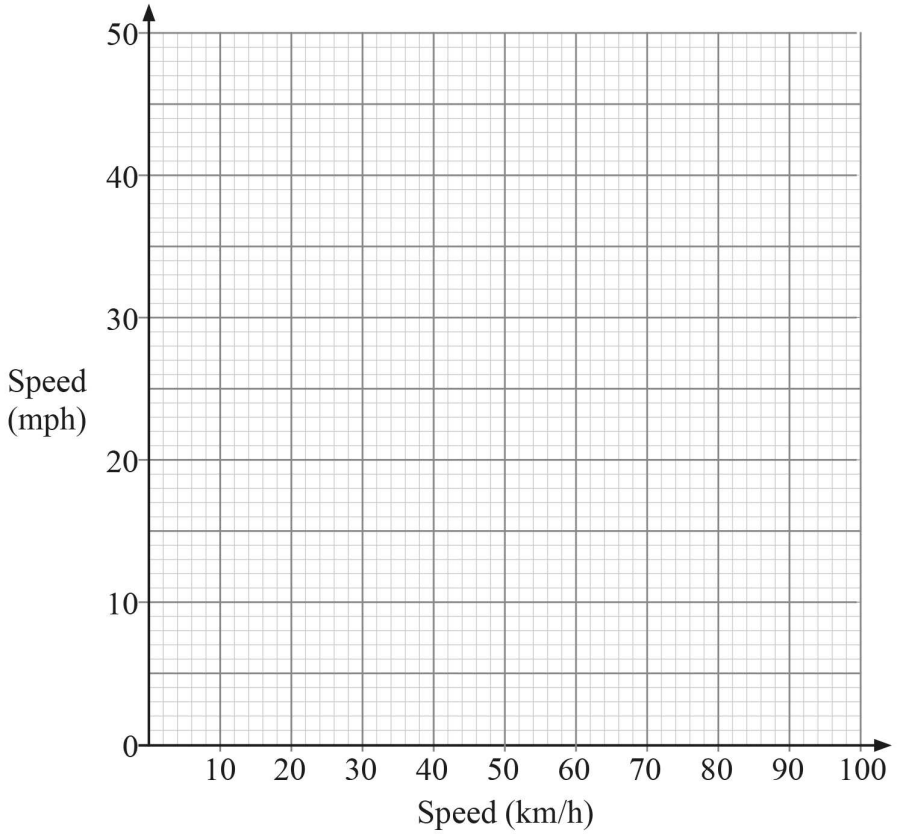
Answer _____ [1]

Q19

Speed can be measured in kilometres per hour (km/h) or miles per hour (mph).

(a) Use the values in the table to draw a conversion graph.

Speed (km/h)	0	40	80
Speed (mph)	0	25	50



[2]

(b) Jonah is travelling at 50 km/h.

Is he breaking the 30 mph speed limit?

You **must use** your graph to help explain your answer clearly.

Answer _____ because _____

_____ [1]

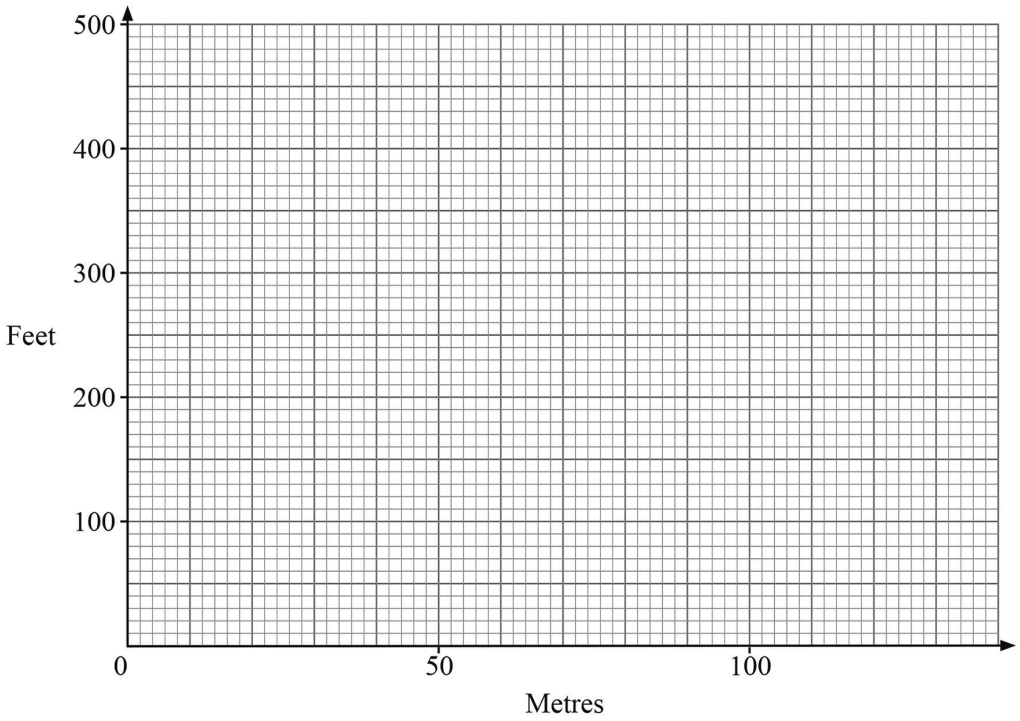
Q20

(a) 1 metre is approximately 3.3 feet. Use this to complete the table below.

Metres	0	50	100
Feet		165	

[1]

(b) Use the values in your table to draw a conversion graph.



[2]

Use your graph to answer the following:

(c) The men's Olympic Hammer Throw record was 85 metres. How many feet was this?

Answer _____ feet [1]

(d) The women's Olympic Shot Put record was 75 feet. How many metres was this?

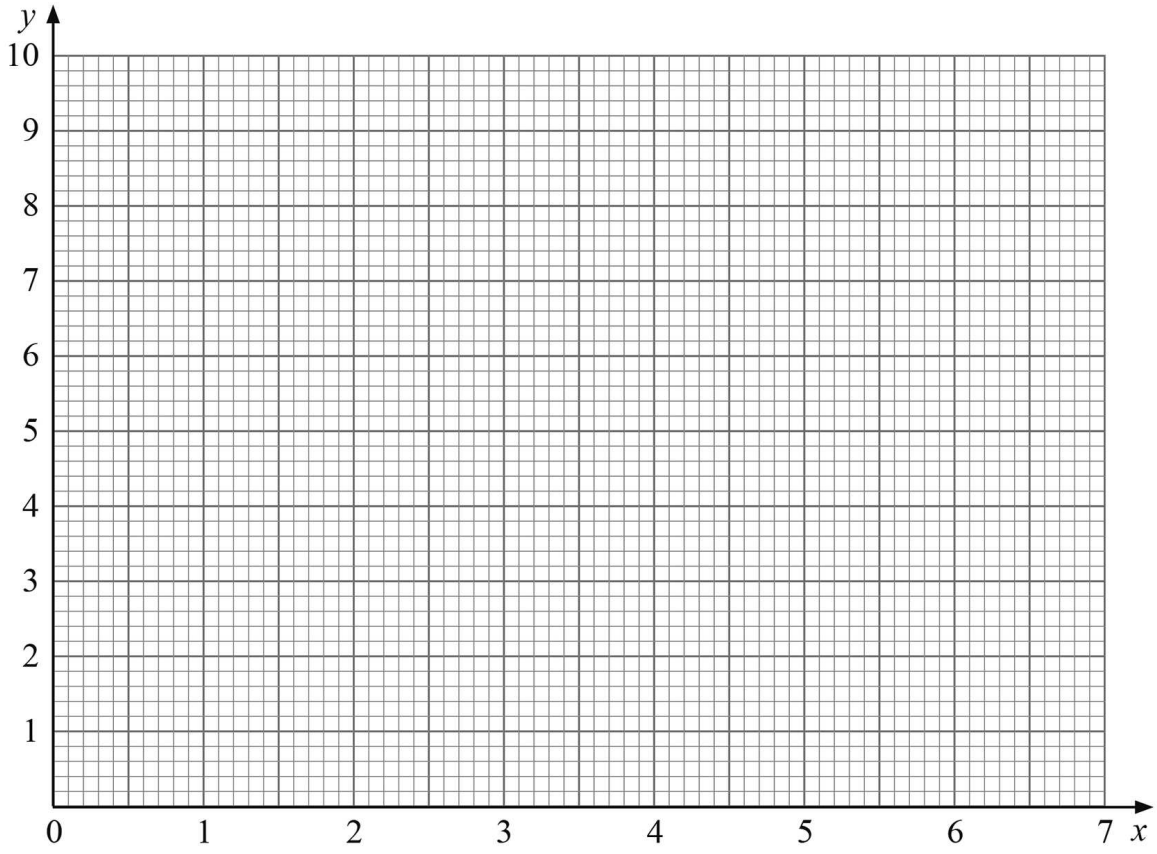
Answer _____ metres [1]

Q21 **(a)** Complete the table of values for $y = \frac{3}{x}$

x	0.5	1	2	3	4	5	6
y		3		1			

[2]

(b) On the grid below, draw the graph of $y = \frac{3}{x}$ for $0.5 \leqslant x \leqslant 6$



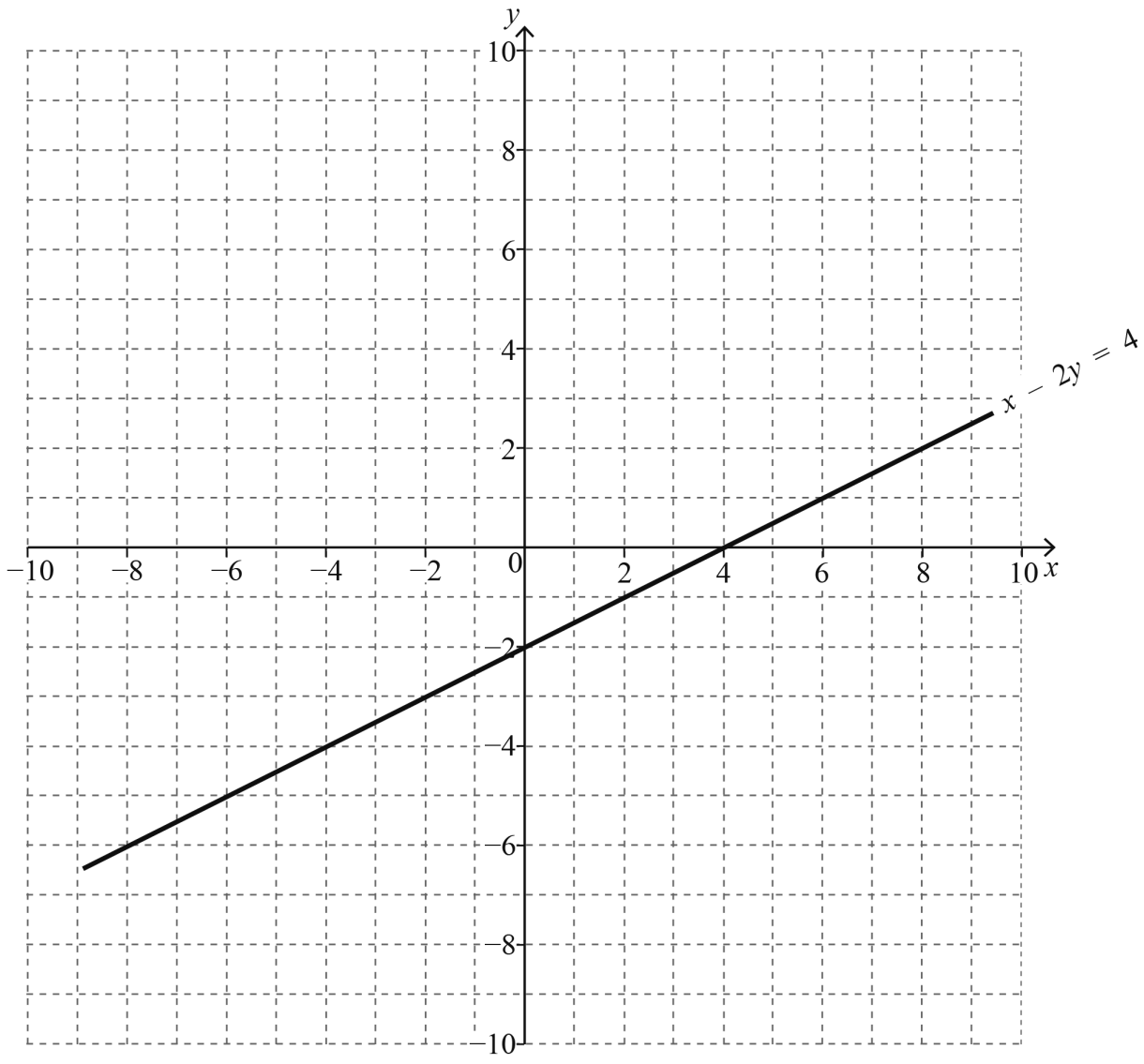
[2]

Q22

By drawing a suitable line on the grid, solve the simultaneous equations

$$x - 2y = 4$$

$$y = 3x + 3$$



Answer $x =$ _____ $y =$ _____ [4]

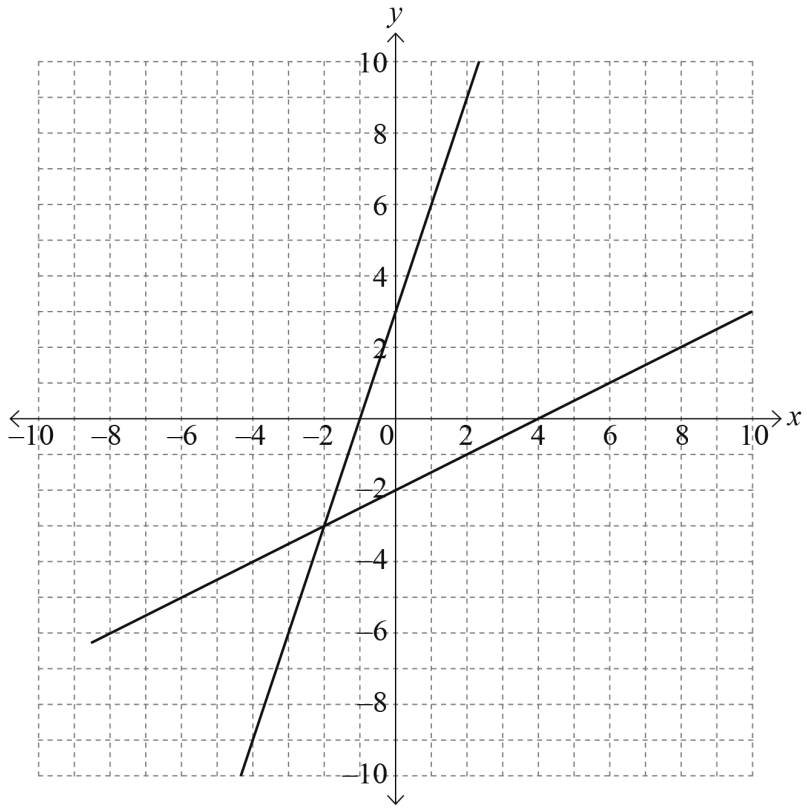
1.

Correct line drawn	M1 A1
$x = 0.8$ $y = -0.4$	A1 A1
Correct line drawn	M1 A1
$x = 0.8$ $y = -0.4$	A1 A1

2.

Line $x + y = 10$ passes through points (0, 10) and (10, 0)	M1 A1
$x = 3$ and $y = 7$	A1 A1

3.



Correct line drawn, gradient 3, intercept (0,3) MA1 MA1

$x = -2$ $y = -3$ A1 A1

4.

(a) –3 and –4 A1 A1

(b) plot all points correctly and draw a smooth curve A1 A1

5.

(a) 2, –1, –1 A2
(A1 for correct values)

(b) Correct smooth curve drawn from $x = -2$ to $x = 4$ A2
(A1 for all 7 points in the candidates's table plotted correctly)

6.

All six points plotted correctly A1

Smooth curve drawn through all six points A1

7.

(a) 7 A1

(b) points plotted correctly A1
smooth curve through the points A1

8.

(a) 11, –5, 11 A2

(b) correct points A1
smooth curve A1

(c) –0.6 and 2.6 (follow candidate's graph) A1 A1

9.

(a) 1, 4, 5, 1, –4 MA1
Correct curve drawn M1 A1

(b) $x = -2.6$ or 2.6 A1

10.

(a) –3 7 A1 A1

(b) points plotted, smooth curve A1 A1

11.

(a) All seven points plotted correctly A1

Correct smooth curve drawn A1

(b) –0.6, 3.6 A1 A1

12.

(a)	Correct scale on vertical axis	MA1
	Plot points	MA1
	Draw straight line	A1
(b)	72 hectares	A1

13.

(a)	248 lbs ≈ 112 kg	A1
(b)	No because 72 kg ≈ 160 lbs or 165 lbs ≈ 75 kg	A1 MA1

14.

(a)	horizontal line drawn to (0725, 10)	A1
	Line (0725, 10) to (0740, 0)	A1
(b)	10 km in 20 minutes (o.e.)	MA1
	30	A1

15.

(a)	6	A1
(b)	A1 for each stage of graph drawn correctly	A3
(c)	$6 \div \frac{3}{4}$	M1
	8	A1

16.

(a)	correct points, line	A2 A1
(b)	explanation and answer	C2
(c)	Alice 75 litres = 131 pints or 120 pints = 69 litres (allow tolerance)	C2

17.

(a)	$10 \div 2 = 5$ **or** $10 \div 120$	M1 A1
(b)	1100 to 1115	A1
(c)	(1130, 10) plotted	A1
	Line through (1200, 1)	A1
	Line complete	A1
	Correct reading at intersection, 1148	A1

18.

(a) $\frac{86}{2}$ or $\frac{85}{2}$ MA1

$= 43$ or 42.5 A1

(b) **(i)** 1st correct point at (0945, 100) MA1

Correct gradient used to represent speed (1045, 20) MA1

Line drawn to reach Bridgetown at 1100 MA1

(ii) Any reading from 1024–1027 (follow through) A1

19.

(a) Graph drawn M1 A1

(b) Yes because 30 mph = 48 km/h and he is going at 50 km/h

OR

Yes because 50 km/h = 31 mph and the limit is 30 mph MA1

20.

(a) 0 330 A1

(b) points plotted correctly MA1

Straight line drawn A1

(c) approximately 280 feet MA1

(d) approximately 23 metres MA1

21.

(a)

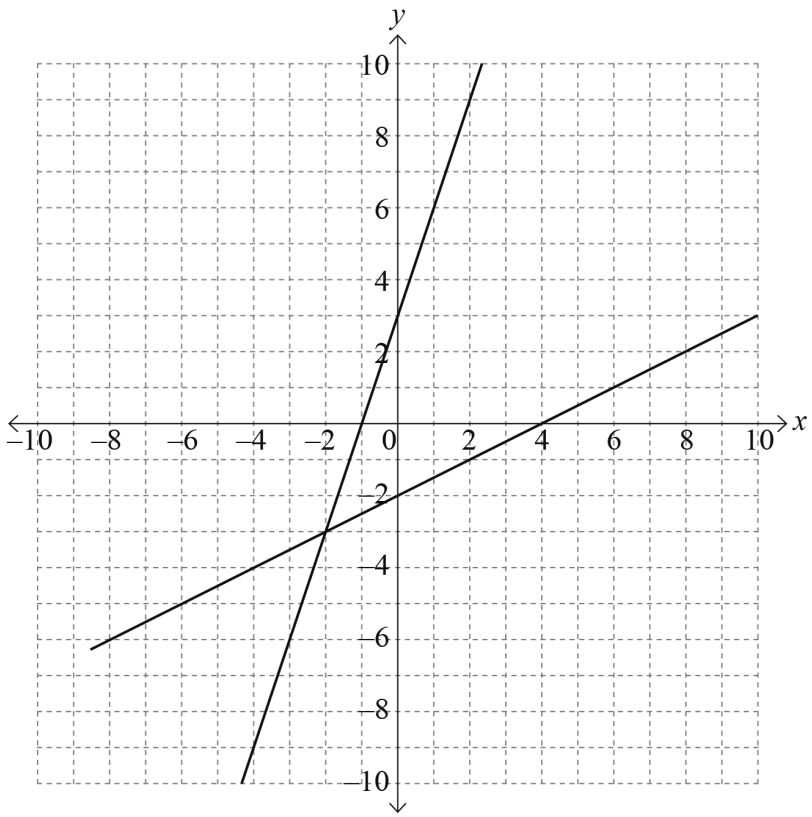
x	0.5	1	2	3	4	5	6
y	**6**	3	**1.5**	1	**0.75**	**0.6**	**0.5**

all 5 values correct A2

(A1 at least 3 correct)

(b) Accurately drawn graph between $x = 0.5$ and $x = 6$ A2
(all 7 points plotted correctly gets A1)

22.



Correct line drawn, gradient 3, intercept (0,3) MA1 MA1

$x = -2$ $y = -3$ A1 A1

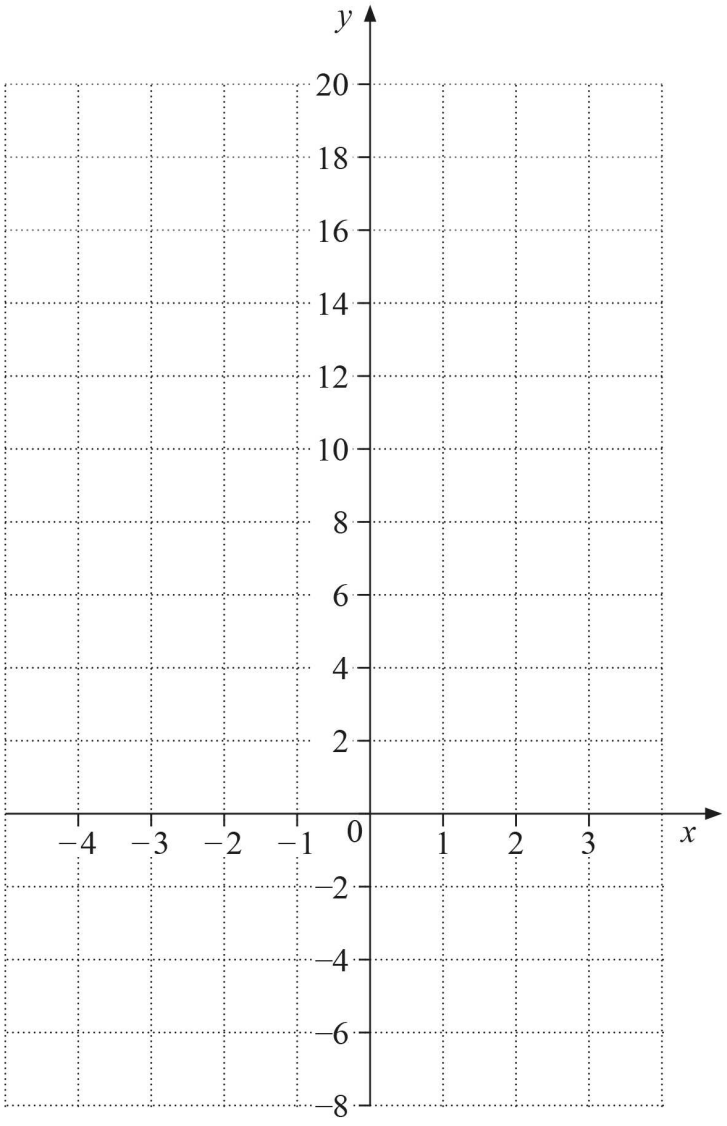
Q1

(a) Complete the table of values for $y = 3x^2 + 6x - 4$

x	-4	-3	-2	-1	0	1	2
y	20	5	-4		-4	5	20

[1]

(b) Hence, draw the graph of $y = 3x^2 + 6x - 4$ on the grid below.

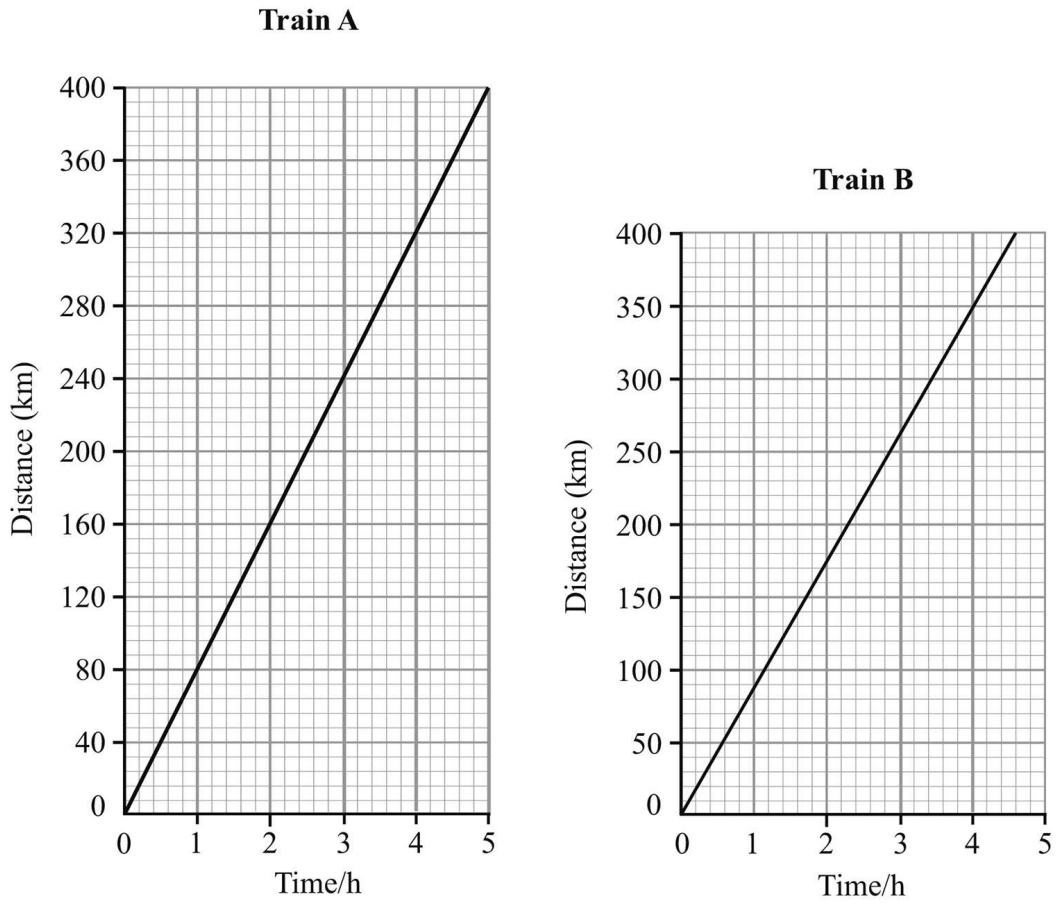


[2]

(c) Draw the line $y = 12$ on the grid.
Write down the x values of the points of intersection with this line.

Answer _____ , _____ [2]

Q2



The graphs show how two trains complete a 400 km journey.

Which of the trains A or B has the greater average speed?

Explain your answer clearly.

Train ____ because _____

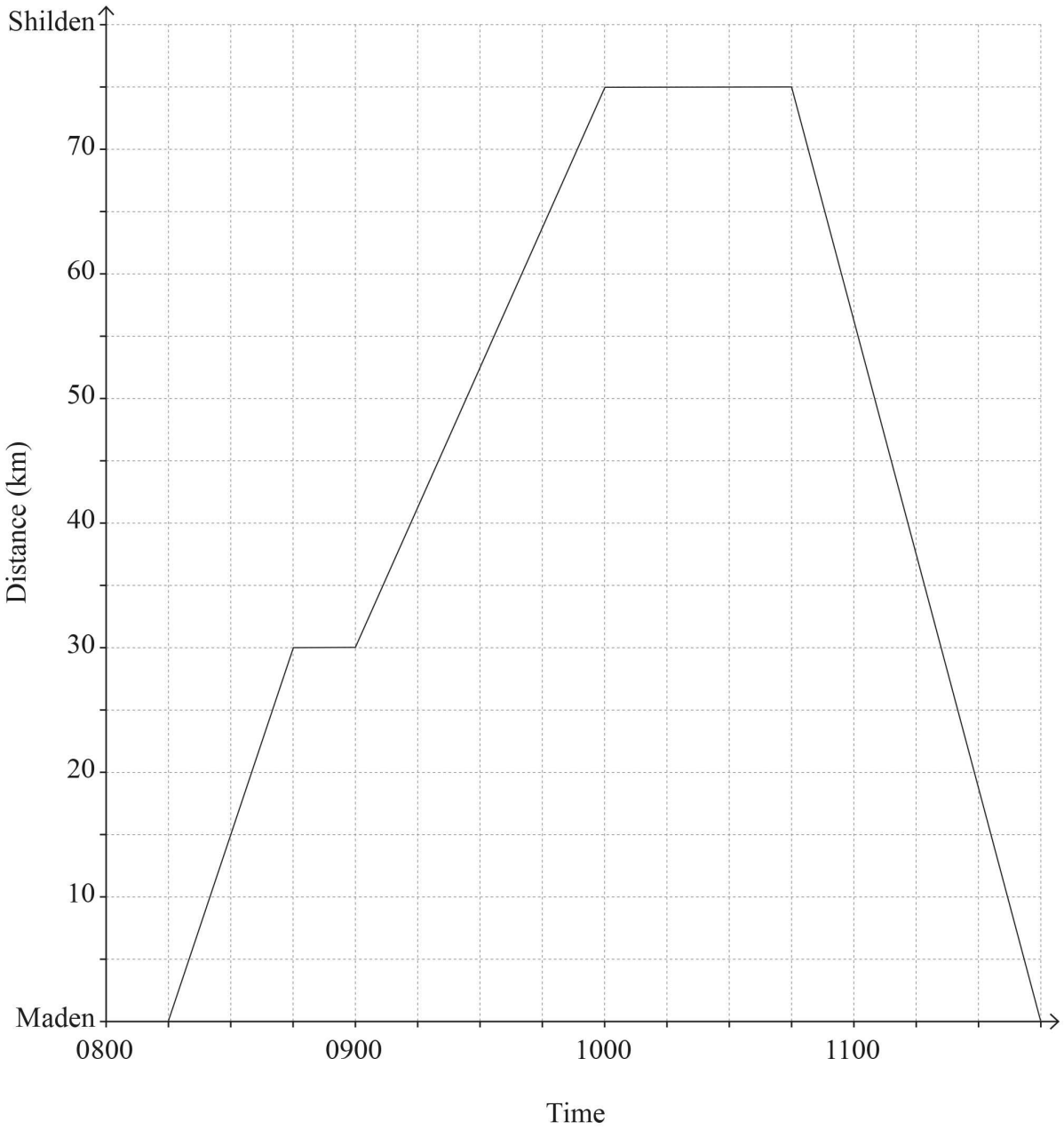
_____

_____

[3]

Q3

The graph shows Ryan's journey from Maden to Shilden and back to Maden.



(a) During the total journey, for how long was Ryan not moving?

Answer _____ minutes [1]

(b) How far is Ryan from Maden at 0930?

Answer _____ km [1]

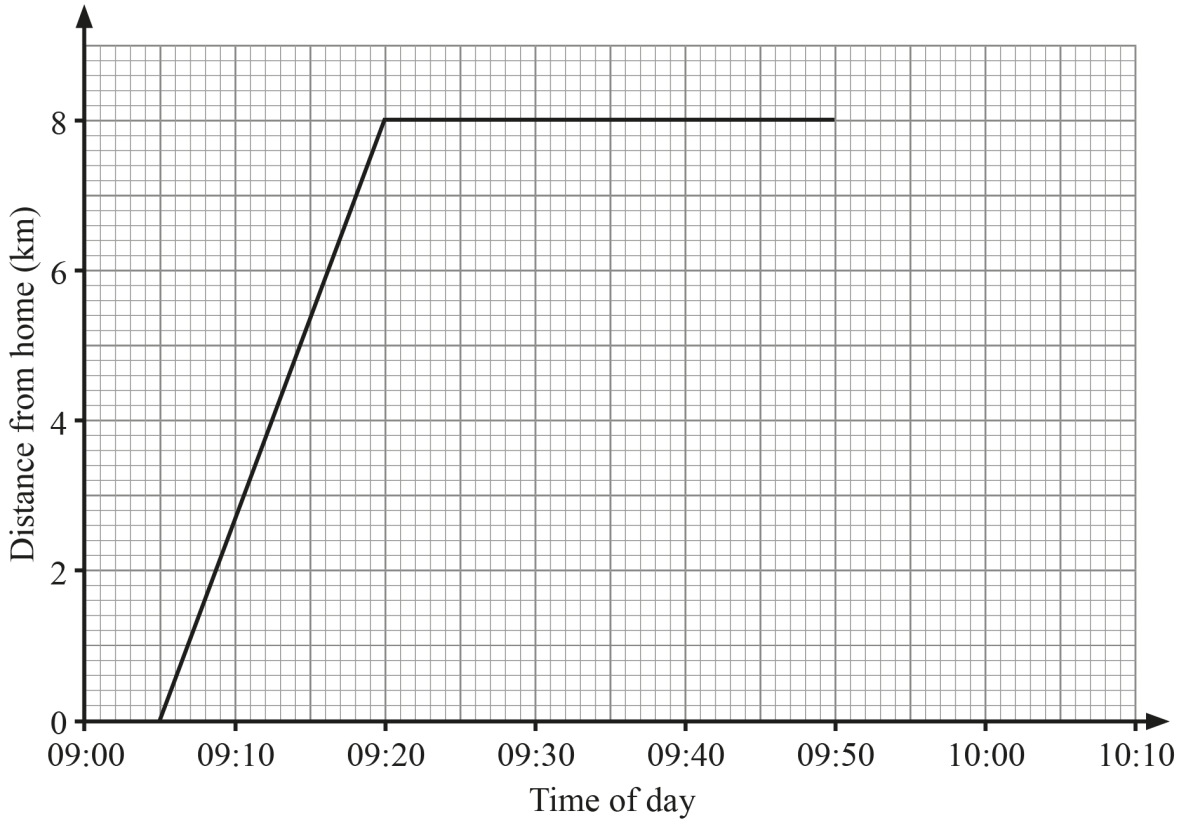
(c) Calculate the average speed for the whole journey.

State the units of your answer.

Answer _____ [3]

Q4 Seb cycles from his home to his piano teacher's house on Saturday morning.

He stays there for 30 minutes and then returns directly home.



(a) At what time did Seb leave his home?

Answer _____ [1]

(b) How long did Seb take to get to his teacher's house?

Answer _____ minutes [1]

Seb arrived home at 10:03

(c) Complete the distance–time graph. [1]

(d) What distance did Seb travel in total?

Answer _____ km [1]

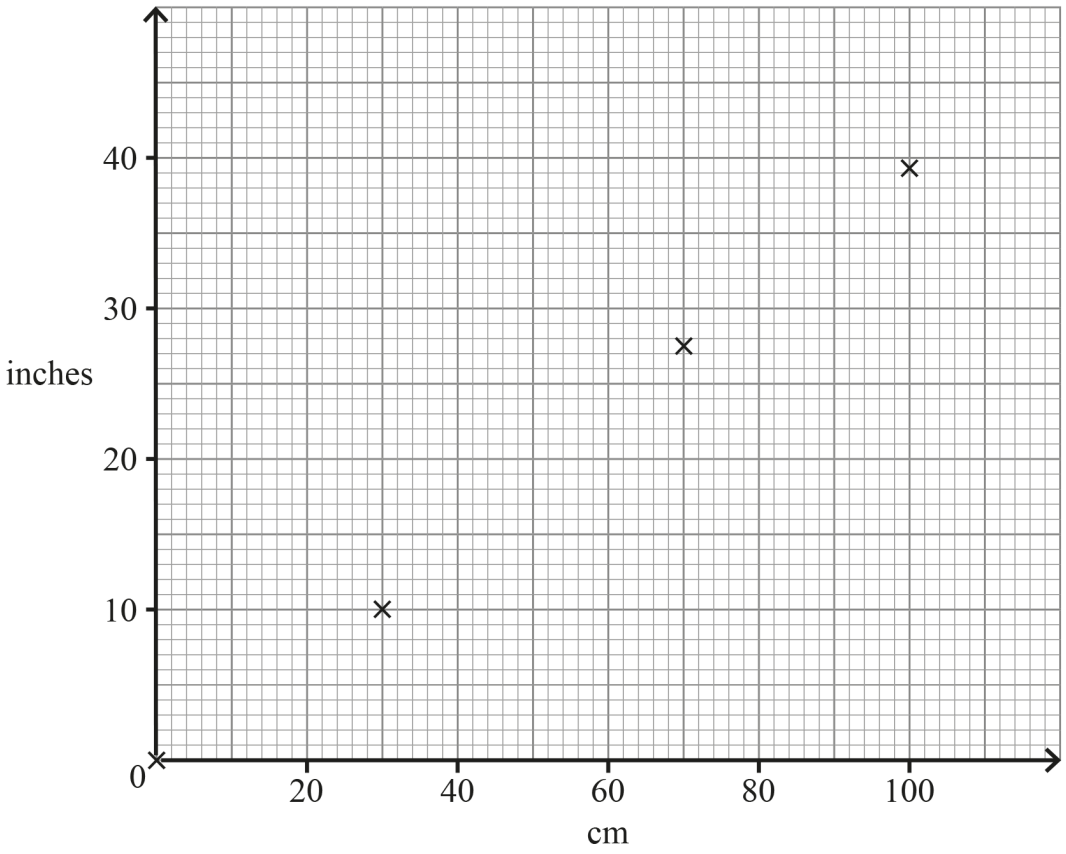
(e) Did Seb travel home at a faster or slower speed?

Explain your answer clearly.

Answer _____ because _____

_____ [1]

Q5 Pat plotted four points to make a conversion graph from centimetres to inches.



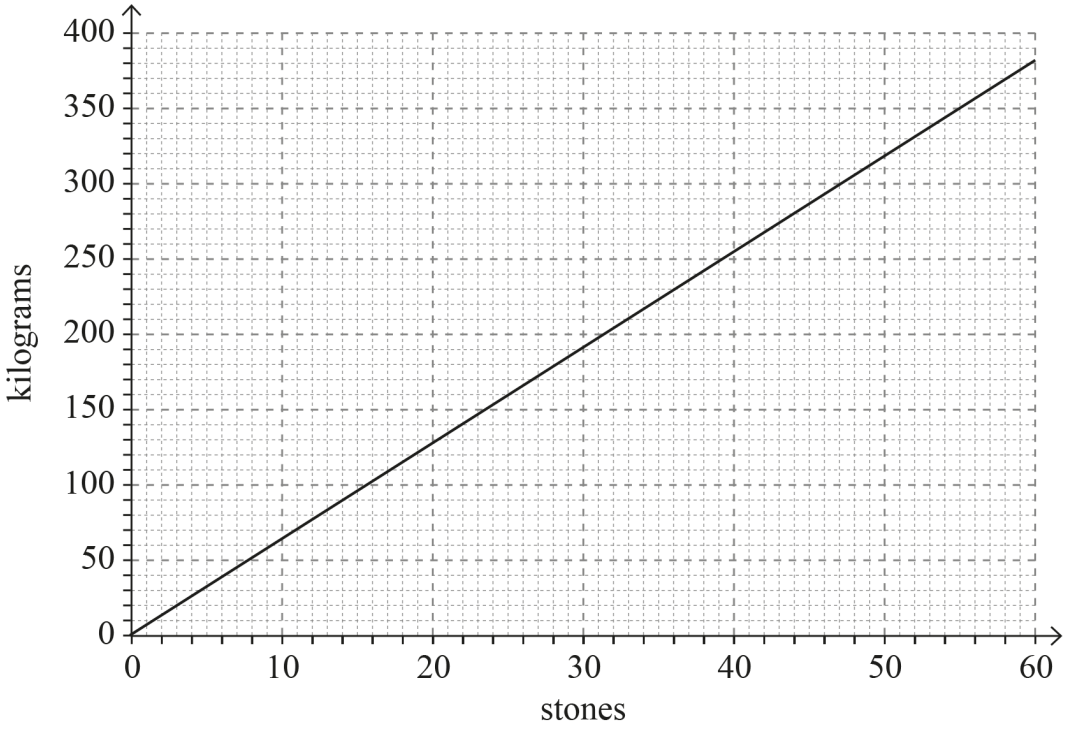
(a) One point is wrong. Circle the wrong point. [1]

(b) Draw the conversion graph. [1]

(c) Use the graph to convert 88 cm to inches.

Answer _____ inches [1]

Q6 You can use this graph to change between stones and kilograms.



(a) Use the graph to change 30 stones into kilograms.

Answer _____ kilograms [1]

(b) Nick orders 900 kilograms of topsoil.

Use the graph to change 900 kilograms into stones.

Show clearly how you used the graph.

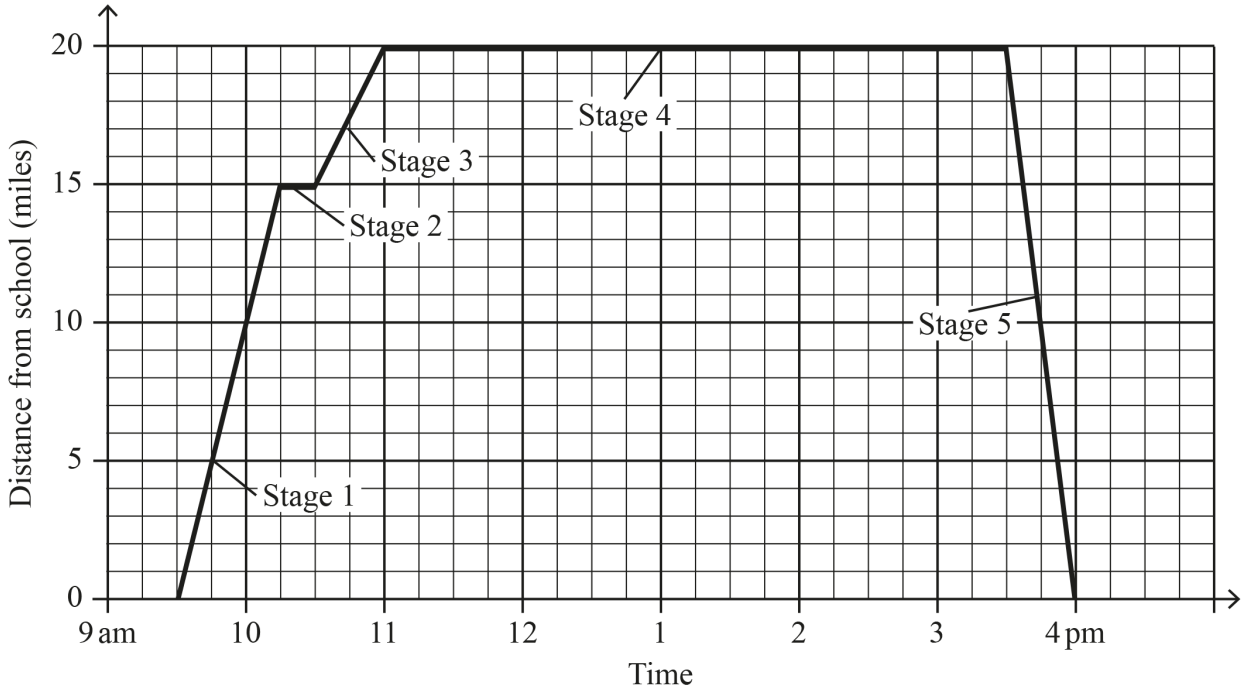
Answer _____ stones [2]

Q7

11 A group of students visit a theme park on a school trip.

The graph below shows their journey.

They leave school at 9.30 am and arrive back at 4 pm.



(a) Which was the fastest stage on the journey **to** the theme park?

Answer _____ [1]

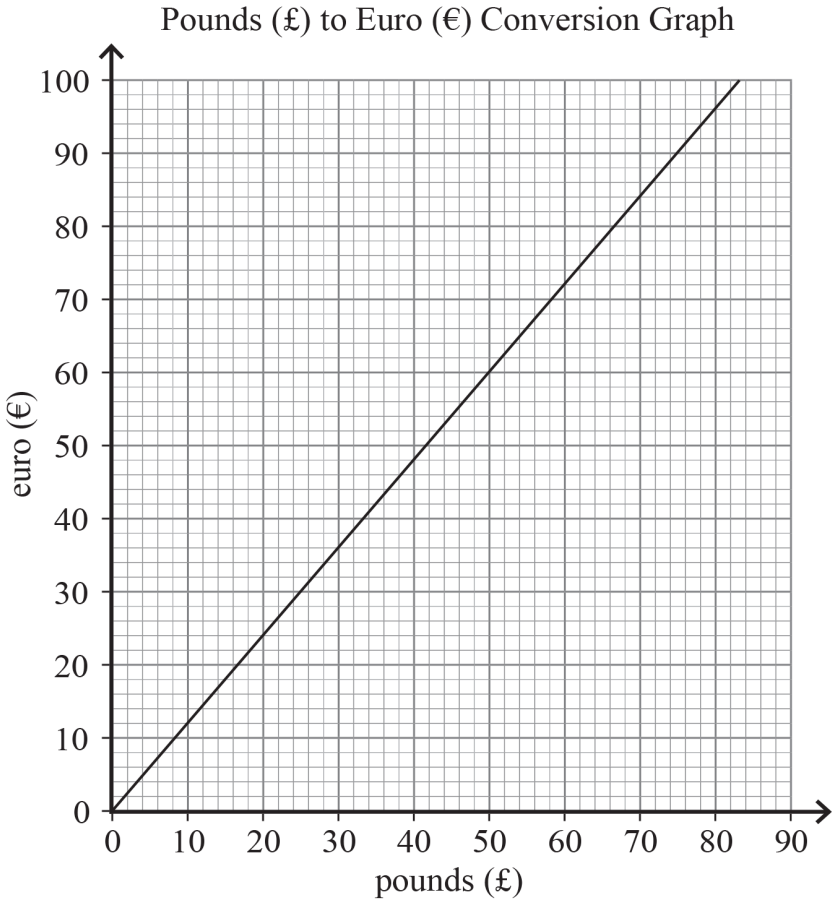
(b) How long did the students stay in the theme park?

Answer _____ [1]

(c) Calculate the average speed of the journey back to school.

Answer _____ mph [2]

Q8 You can use the graph below to change between pounds (£) and euro (€).



Change £70 into euro (€).

Answer € _____ [1]

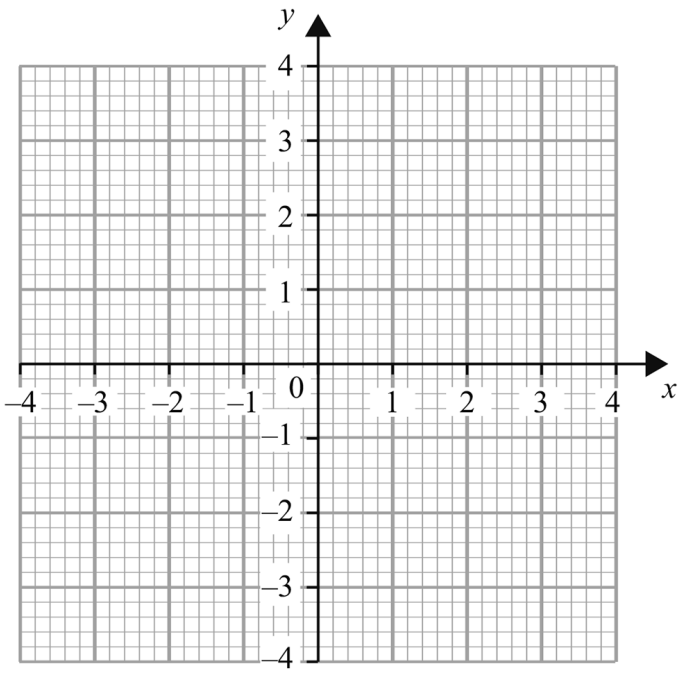
Bev buys a laptop for €420

How much is this in pounds (£)?

Show your method clearly.

Answer £ _____ [2]

Q9 **(a)** Draw the graph of $y = x^2 - x - 2$ for values of x from –2 to 3 [2]



(b) **(i)** Write down the equation of the line of symmetry of the curve.

Answer _____ [1]

(ii) Hence **calculate** the minimum value of the curve.

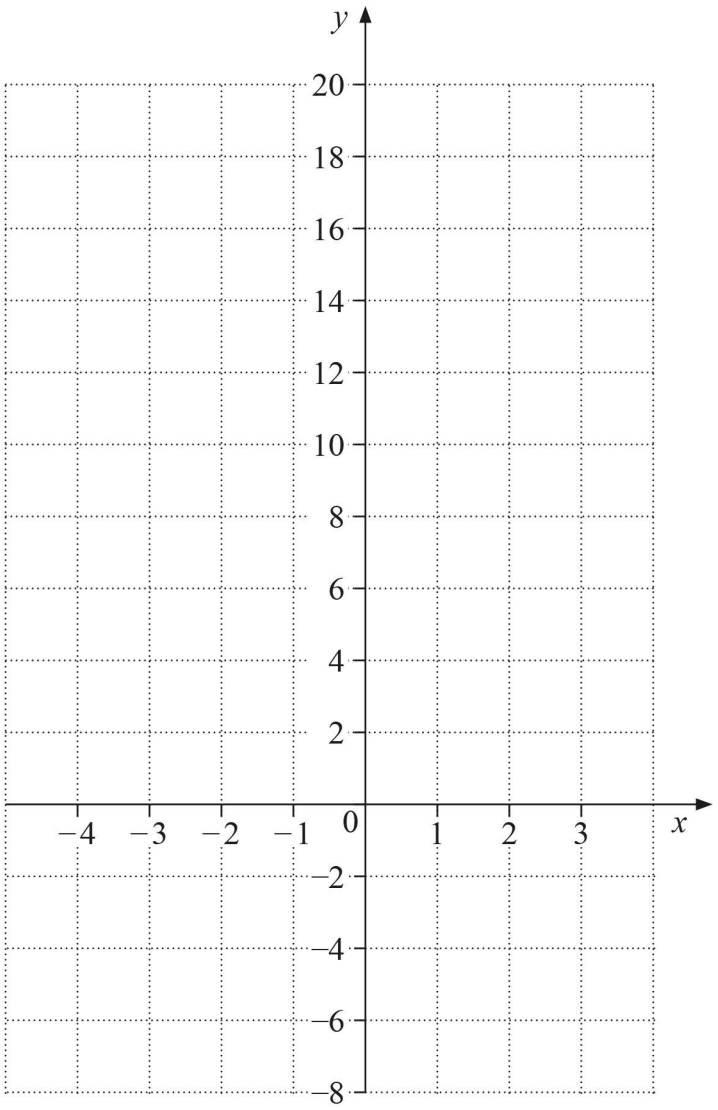
Answer _____ [1]

Q10 **(a)** Complete the table of values for $y = 3x^2 + 6x - 4$

x	−4	−3	−2	−1	0	1	2
y	20	5	−4		−4	5	20

[1]

(b) Hence, draw the graph of $y = 3x^2 + 6x - 4$ on the grid below.

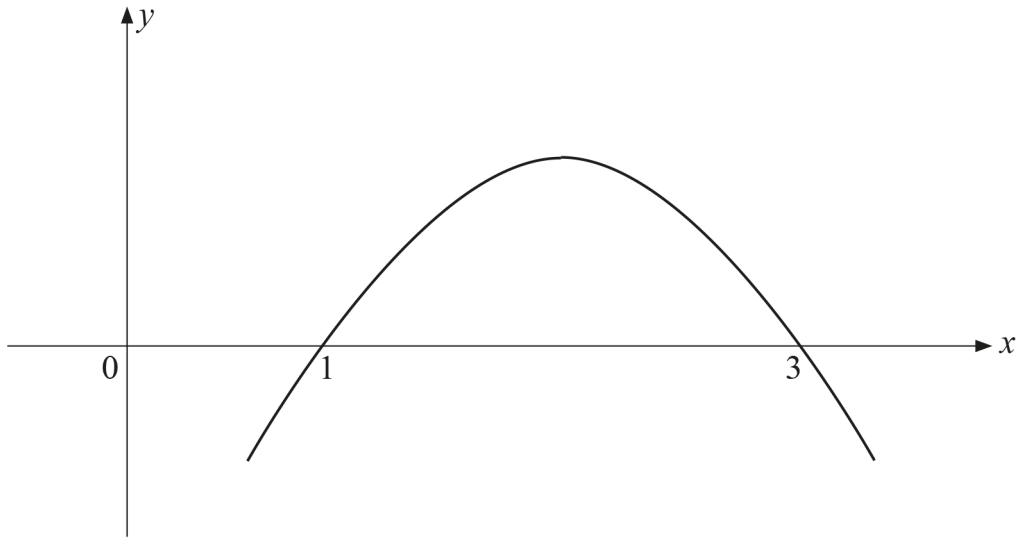


[2]

(c) Draw the line $y = 12$ on the grid.
Write down the x values of the points of intersection with this line.

Answer _____ , _____ [2]

Q11



The sketch above shows part of the graph of the quadratic function $y = -x^2 + 4x - 3$

(a) Write down the coordinates of the point where the graph will cross the y-axis.

Answer _____ [1]

(b) Work out the coordinates of the highest point on the graph.

Answer _____ [1]

1.

(a) -7 A1

(b) Points plotted correctly A1

Smooth curve A1

(c) Readings from graph (allow reasonable tolerance) A1 A1

2.

Train B because it has an average speed of 86.96 km/h and train A has an average speed of 80 km/h thus making train B faster C3

or

Train A and Train B both complete the same distance of 400 km. Train B completes it in a shorter time than Train A. Therefore Train B has the greater average speed. C3

3.

(a) 60 A1

(b) 52.5 km A1

(c) $150 \div 3.5 = 43$ (42.9) (42.86) km/hr M1 A1 A1(units)

4.

(a)	09:05	A1
(b)	15	A1
(c)	A straight line drawn from (09:50, 8) to (10:03, 0)	A1
(d)	16	A1
(e)	At a faster speed because he took 13 minutes to return and 15 minutes to get there **or** faster because line is steeper	A1

5.

(a)	Point at (30, 10) circled	A1
(b)	Line drawn	A1
(c)	34 or 35	A1

6.

(a)	190 or 191	A1
(b)	140 or 141 or 142 or acceptable use of the graph.	M1 A1

7.

(a) stage 1 A1

(b) 4 hours 30 minutes **or** $4\frac{1}{2}$ hours A1

(c) 20 in $\frac{1}{2}$ hour MA1

40 A1

8.

(a) 84 A1

(b) €60 × 7 = £50 × 7 = £350 M1 A1
(or 420 ÷ 84 = 5, 5 × 70 = 350)

9.

(a) A completely correct quadratic graph drawn A2
(apply [–1] for each error, e.g. incomplete graph, or a wrong point, no proper minimum point, not a smooth curve, etc.)

(b) **(i)** $x = \frac{1}{2}$ A1

(ii) $-2\frac{1}{4}$ A1

10.

(a) -7 A1

(b) Points plotted correctly A1
Smooth curve A1

(c) Readings from graph A1 A1

11.

(a) $(0, -3)$ A1

(b) $(2, 1)$ A1
