NAME: ……

Foundation/Higher GCSE Mathematics Revision Pack

ALGEBRA – CALC

Q1. (a) Simplify

$8e - 3f - e - 3f$

..... (2)

(b) Expand

$2(3c - 2)$.

..... (1)

(c) Factorise

$xy + 3x$

..... (1)

(Total 4 marks)

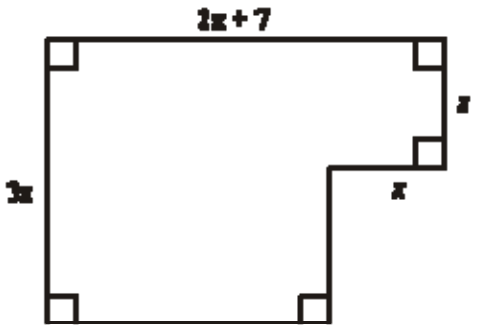
Q2. The equation $x^2 - 5x = 60$ has a solution between 4 and 5.

Find this solution and give your answer correct to 1 decimal place.
You must show **all** your working.

x = ...

(Total 4 marks)

Q3. The perimeter of this shape is 22 cm.

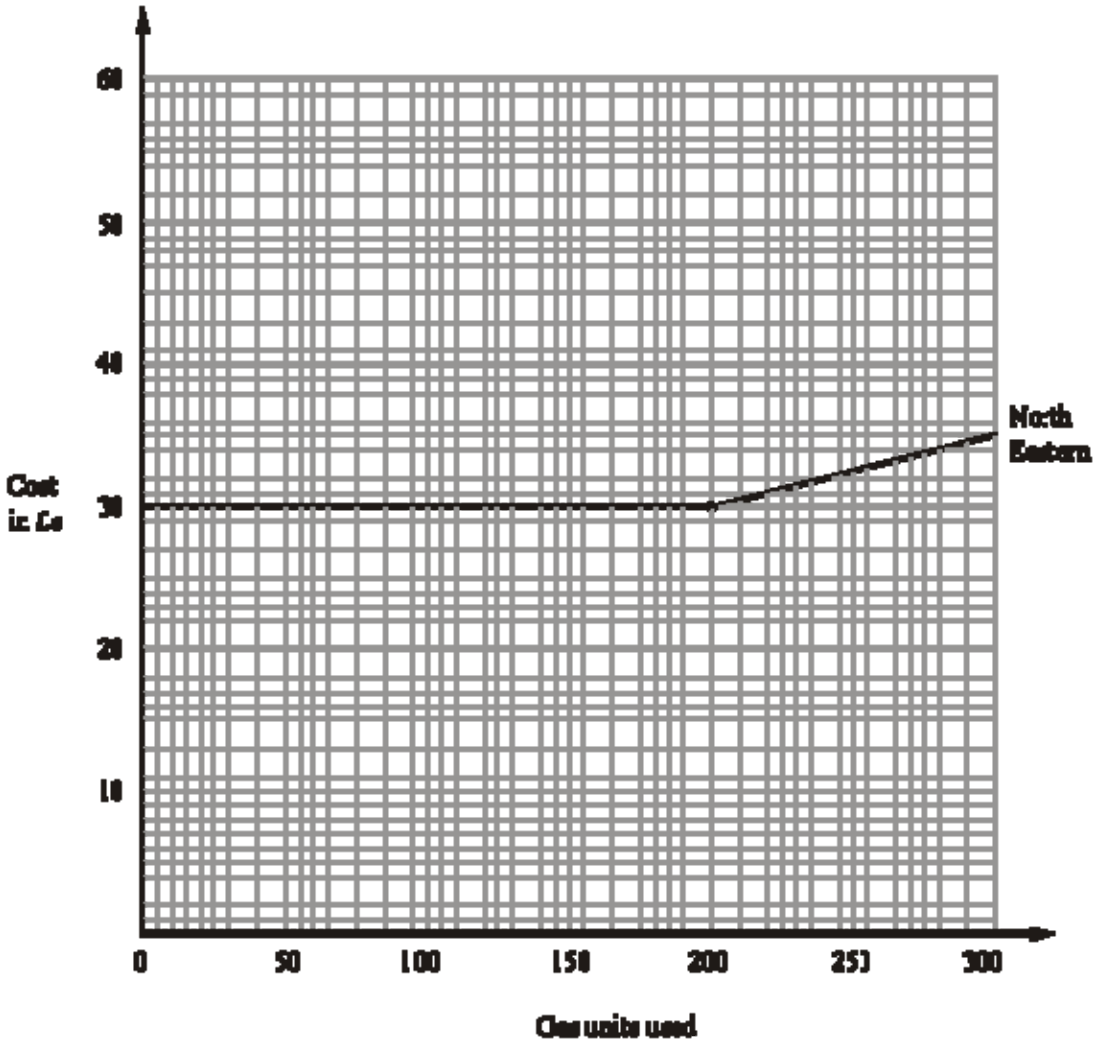


All measurements are in centimetres

Find the area.

..... cm^2 **(Total 5 marks)**

Q4. The graph shows the cost of buying gas from the North Eastern Gas Company.



Here are the costs for buying gas from three Gas Companies.

North Eastern	Basic cost £30	First 200 units free then each unit costs 5p
Pacific	Every unit costs 20p	
East Anglian	Basic cost £10	Every unit costs 10p

Erica uses between 100 and 200 units each month.

Explain which would be the cheapest for her to use. Show clearly how you got your answer.

(Total 5 marks)

Q5. $P = 3a + 2b^2$

(a) Find the value of P when $a = 5$ and $b = -4$

..... **(2)**

(b) Make a the subject of the formula.

..... **(2)**

(Total 4 marks)

Q6. $-3 \leq n < 2$

n is an integer.

(a) Write down all the possible values of n.

..... **(2)**

(b) Write down the inequalities represented on the number line.

..... **(2)**

(Total 4 marks)

Q7. (a) $x < -2$ Show this inequality on the number line.

(2)

(b) Solve $5(y + 2) = 4 - 7y$

$y =$ ..... **(3)**

(Total 5 marks)

Q8. (a) Solve $2(y - 3) = 8$.

$y =$ .....

(2)

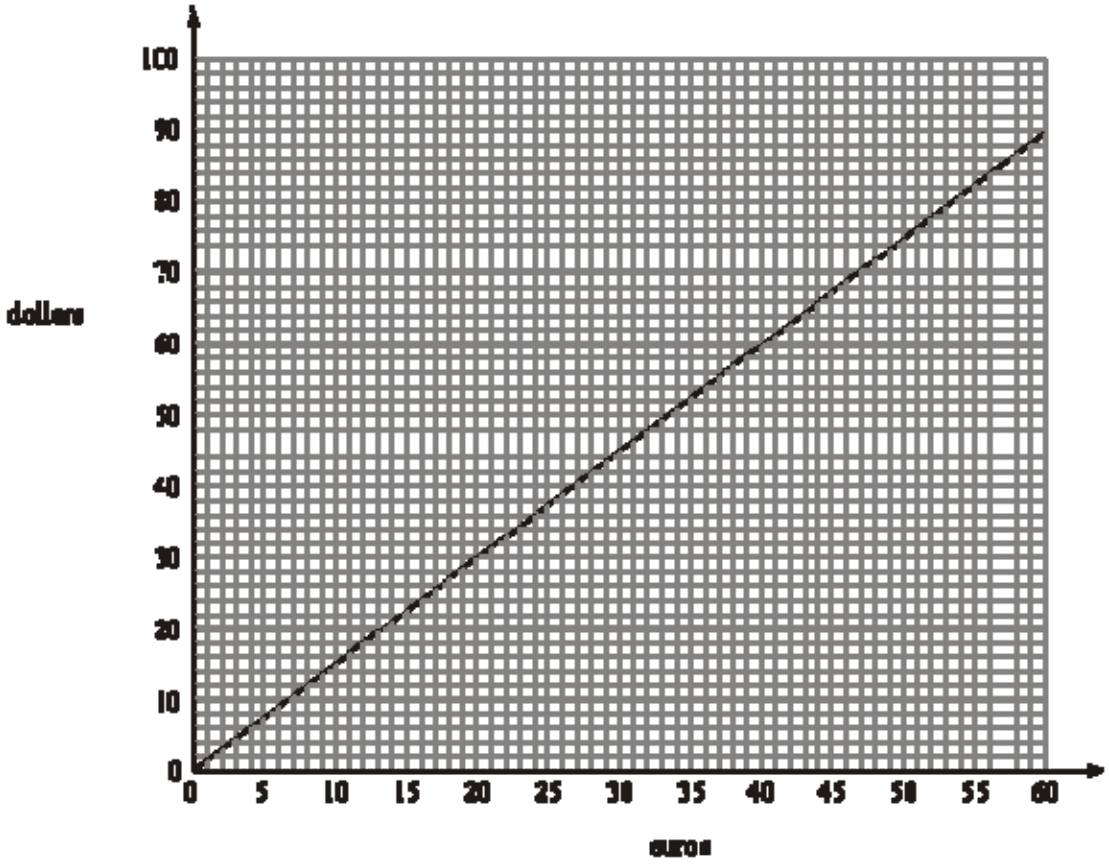
(b) Solve $4x + 1 = 2x + 12$.

$x =$ .....

(2)

(Total 4 marks)

Q9.



The conversion graph can be used to change between euros and dollars.

(a) Use this graph to change 30 euros into dollars.

..... dollars

(1)

(b) Use this graph to change 90 dollars into euros.

..... euros

(1)

Bill changes 100 euros to dollars.

(c) Change 100 euros to dollars.

..... dollars

(2)

(Total 4 marks)

Q10. $2x^2 = 72$.

Find a value of x.

.....

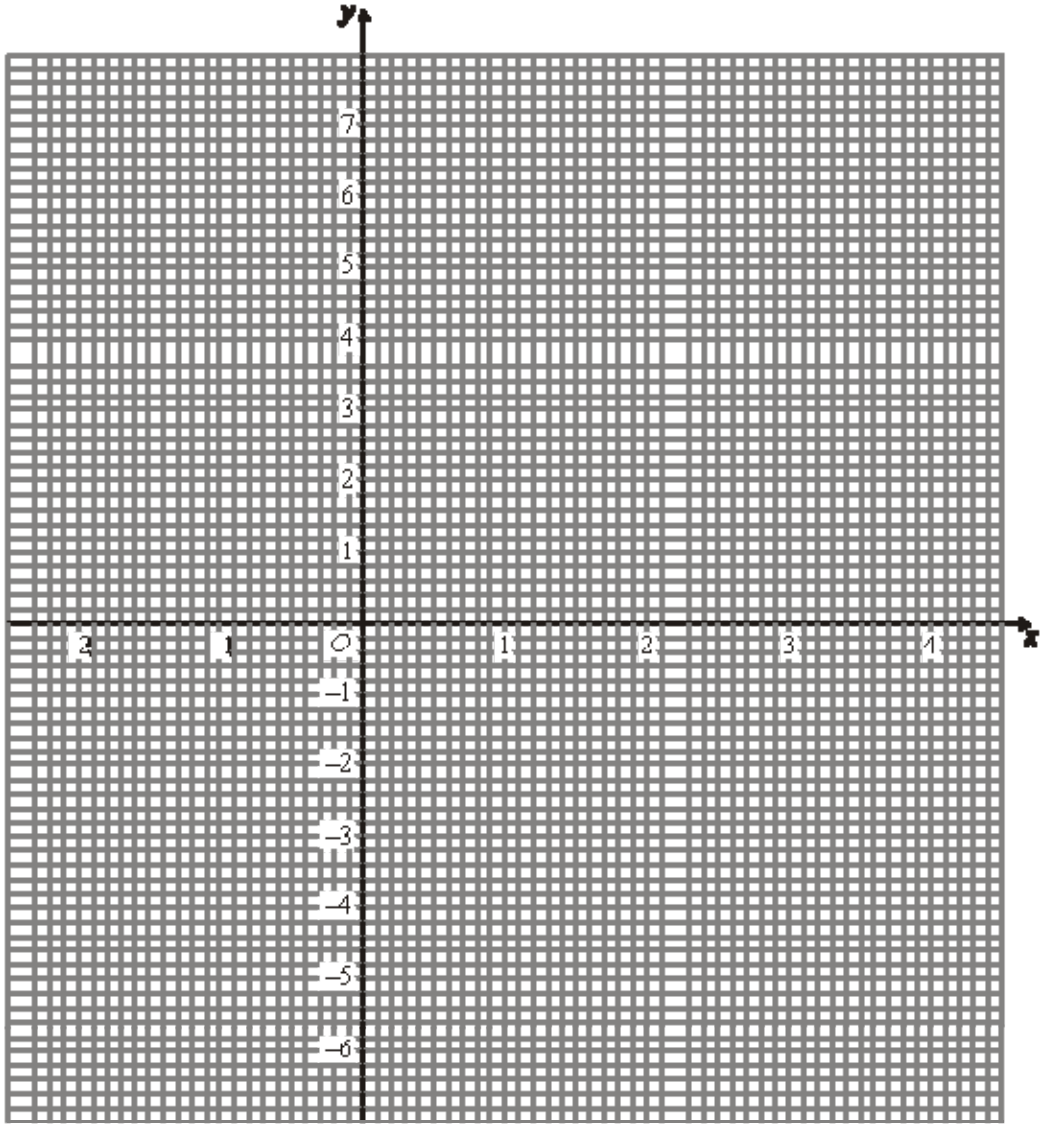
(Total 2 marks)

Q11. (a) Complete the table for $y = x^2 - 2x - 4$.

x	–2	–1	0	1	2	3	4
y	4		–4	–5		–1	

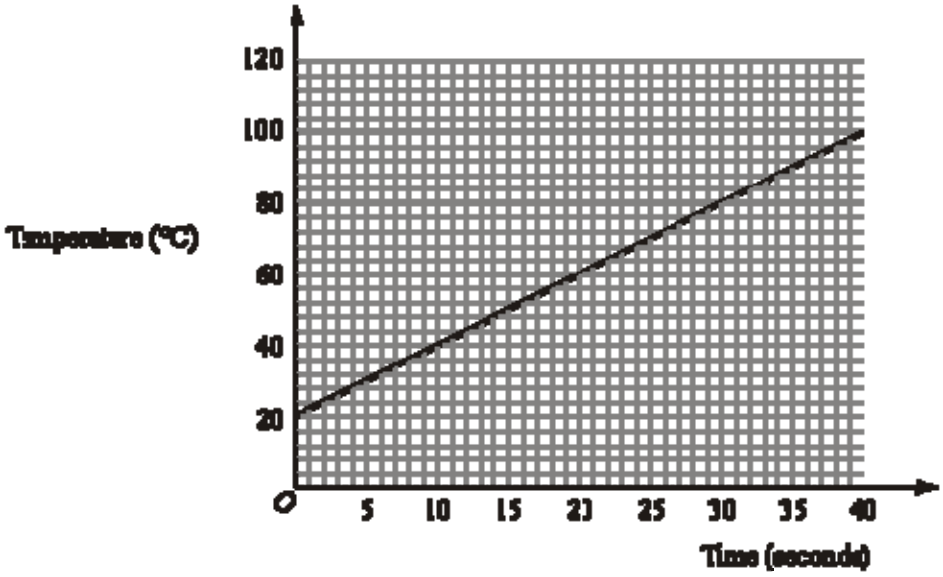
(2)

(b) On the grid, draw the graph of $y = x^2 - 2x - 4$.



(2)
(Total 4 marks)

Q12. Joe heats some water in a kettle.
The graph gives information about the temperature of the water in the kettle and the length of time it has been heated.



(a) Write down the temperature of the water when Joe started to heat the water.

..... °C **(1)**

(b) Use the graph to find how many seconds it took the water to reach a temperature of 70°C.

..... seconds **(1)**

(c) Work out the increase in the temperature of the water from the 10th second to the 35th second.

..... °C

(2)
(Total 4 marks)

Q13. Solve

$4t + 1 = 19$

$t =$ .....

(Total 2 marks)

Q14. The equation $x^2 + 4x = 26$ has a solution between 2 and 3.
Use a trial and improvement method to find this solution.
Give your answer correct to 1 decimal place. You **must** show all your working.

x = ...

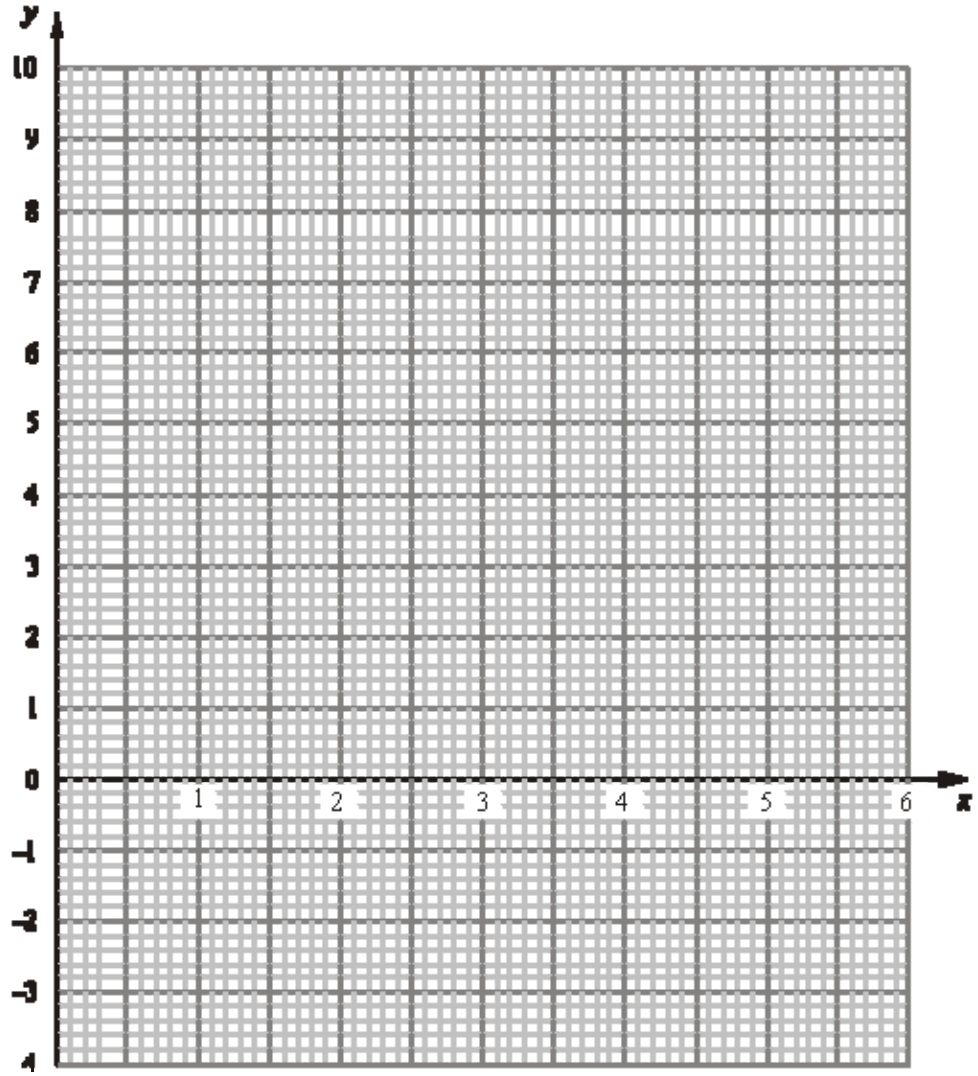
(Total 4 marks)

Q15. (a) Complete the table of values for $y = x(x - 3)$ for values of x from 0 to 5.

x	0	1	2	3	4	5
y	0	−2		0	4	

(1)

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



(2)

The length of a rectangle is 3 m less than the width. The area of the rectangle is 7 m^2

(c) Find an estimate for the width of the rectangle.

..... m

(2)

(Total 5 marks)

Q16. $F = 1.8C + 32$

(a) Work out the value of F when $C = -8$

.....

(2)

(b) Work out the value of C when $F = 68$

.....

(2)

(Total 4 marks)

Q17. (a) Simplify $t^6 \times t^2$

.....

(1)

(b) Simplify 

.....

(1)

(Total 2 marks)

Q18. The nth term of a number sequence is $n^2 + 1$

Write down the first three terms of the sequence.

.....

(Total 2 marks)

Q19. The equation

$$x^2 + 20x = 71$$

has a solution between 2 and 3

Use a trial and improvement method to find this solution.
Give your answer correct to one decimal place.
You must show **ALL** your working.

x = ...

(Total 4 marks)

Q20. (a) Simplify $a \times a \times a$

..... **(1)**

(b) Expand $5(3x - 2)$

..... **(1)**

(c) Expand $3y(y + 4)$

..... **(2)**

(d) Expand and simplify $2(x - 4) + 3(x + 2)$

..... **(2)**

(e) Expand and simplify $(x + 4)(x - 3)$

..... **(2)**
(Total 8 marks)

Q21. (a) Simplify $t^6 \times t^2$

..... **(1)**

(b) Simplify 

..... **(1)**

(c) Simplify $(2x)\ x^2$

..... **(2)**

(d) Simplify $3a^2h \times 4a^5h^4$

..... **(2)**
(Total 6 marks)

Q22. (a) Solve $2x = 10$

x **= .....** **(1)**

(b) Solve $y - 3 = 8$

y **= .....** **(1)**

(c) Solve $4t + 1 = 19$

t **= .....** **(2)**

(d) Solve $4w + 8 = 2w + 7$

w **= .....** **(2)**
(Total 6 marks)

Q23. The n th term of a sequence is $n^2 + 4$

Alex says

"The n th term of the sequence is always a prime number when n is an odd number."

Alex is wrong. Give an example to show that Alex is wrong.

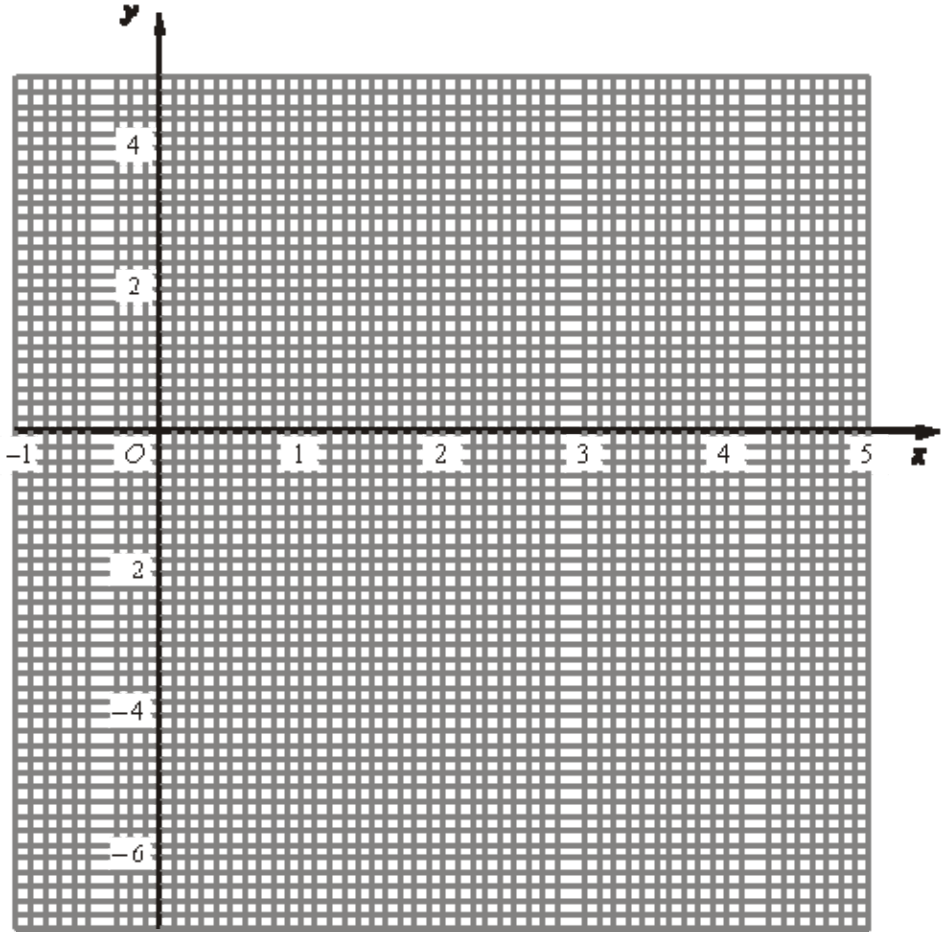
(Total 2 marks)

Q24. (a) Complete the table of values for $y = x^2 - 4x - 2$

x	–1	0	1	2	3	4	5
y		–2	–5			–2	3

(2)

(b) On the grid, draw the graph of $y = x^2 - 4x - 2$



(2)

(c) Use your graph to estimate the values of x when $y = –3$

x = ...

x = ...

(2)
(Total 6 marks)

Q25. (a) Expand $4(x - 3)$

..... **(1)**

(b) Solve $4t + 1 = 19$

t = ... **(2)**
(Total 3 marks)

Q26. (a) Expand and simplify $3(x + 4) + 5(2x + 1)$

..... **(2)**

(b) Simplify $t^4 \times t^6$

..... **(1)**

(c) Simplify $p^8 \div p^5$

..... **(1)**

(d) Simplify $(x^4)^3$

..... **(1)**
(Total 5 marks)

Q27. The nth even number is $2n$.

The next even number after $2n$ is $2n + 2$

(a) Explain why.

(1)

(b) Write down an expression, in terms of n, for the next even number after $2n + 2$

..... **(1)**

(c) Show algebraically that the sum of any 3 consecutive even numbers is always a multiple of 6

(3)
(Total 5 marks)

Q28. Here are the first four terms of an arithmetic sequence.

5 8 11 14

Find an expression, in terms of n, for the nth term of the sequence.

.....

(Total 2 marks)

Q29. (a) Simplify $4a + 3c - 2a + c$

..... **(1)**

(b) $S = \frac{1}{2}at^2$

Find the value of S when $t = 3$ and $a = \frac{1}{4}$

S = ...

(2)

(c) Factorise $x^2 - 5x$

.....

(2)

(d) Solve $7x - 19 = 3(x - 3)$

x = ...

(3)

(Total 8 marks)

Q30. The equation

$$X^2 + 2x = 26$$

has a solution between 2 and 3

Use a trial and improvement method to find this solution.
Give your answer correct to one decimal place.
You must show **all** your working.

x = ...

(Total 4 marks)

Q31.

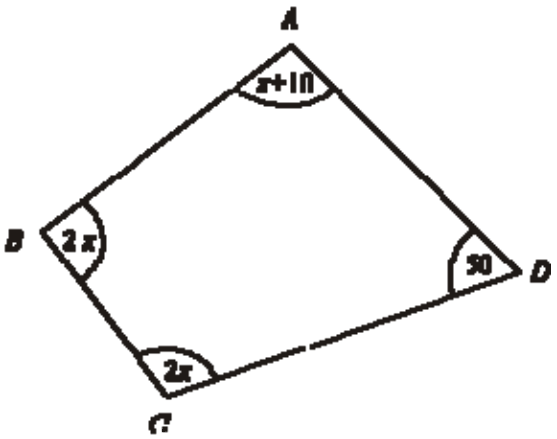


Diagram **NOT** accurately drawn

In this quadrilateral, the sizes of the angles, in degrees, are

x+ 10
2x
2x
50

(a) Use this information to write down an equation in terms of x.

.....

(2)

(b) Work out the value of x.

x = ...

(3)

(Total 5 marks)

Q32. (a) Simplify $4a + 3c - 2a + c$

..... **(1)**

(b) $S = \frac{1}{2}at^2$

Find the value of S when $t = 3$ and $a = \frac{1}{4}$

$S =$ .....

(2)

(c) Factorise $x^2 - 5x$

.....

(2)

(d) Expand and simplify $(x + 3)(x + 4)$

.....

(2)

(e) Factorise $y^2 + 8y + 15$

.....

(2)
(Total 9 marks)

Q33. (a) Expand

$2(3c - 2)$

..... **(1)**

(b) Factorise

$xy + 3x$

..... **(1)**
(Total 2 marks)

Q34. (a) Simplify $t^4 \times t^6$

..... **(1)**

(b) Simplify $(x^4)^3$

..... **(1)**

(Total 2 marks)

Q35. Expand and simplify $(x + 4)(x – 3)$

.....

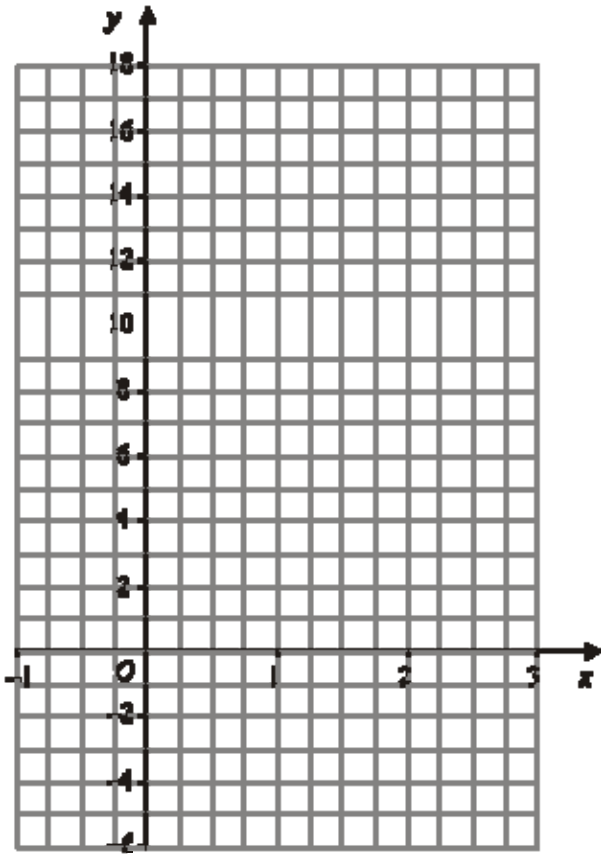
(Total 2 marks)

Q36. (a) Complete the table of values for $y = 5x + 1$

x	−1	0	1	2	3
y		1			16

(2)

(b) On the grid, draw the graph of $y = 5x + 1$



(2)
(Total 4 marks)

Q37. (a) Simplify fully $3x + 5y + 2x - 6y$

.....

(2)

(b) Simplify fully $\frac{2x}{4xy}$

.....

(2)

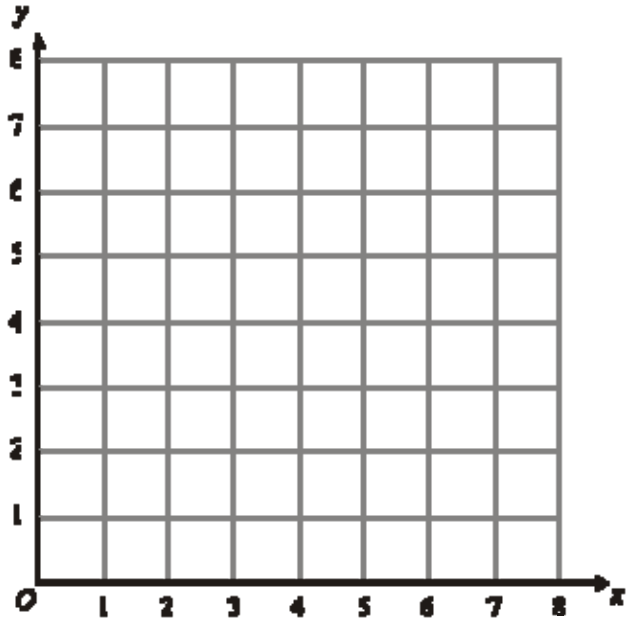
(c) Expand and simplify $\frac{1}{2}(2x - 8)$

.....

(1)
(Total 5 marks)

Q38. On the grid, draw the graph of $x + y = 6$

Use values of x from $x = 0$ to $x = 6$



(Total 3 marks)

Q39. The first four terms of an arithmetic sequence are

6 11 16 21

Find an expression, in terms of n, for the nth term of the sequence.

.....

(Total 2 marks)

Q40. (a) Factorise $5x + 10$

.....

(1)

(b) Expand and simplify $(x – 3)(x + 5)$

.....

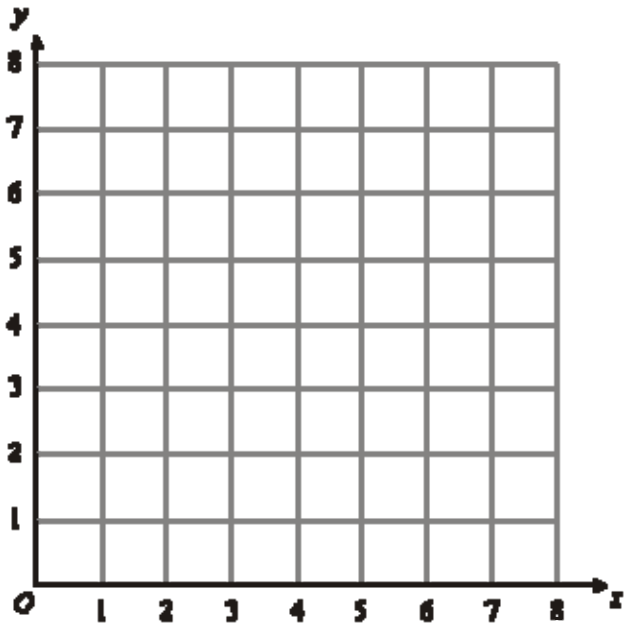
(2)
(Total 3 marks)

Q41. (a) Complete the table of values for $x + y = 6$

x	0	1	2	3	4	5
y		5			2	

(2)

(b) On the grid, draw the graph of $x + y = 6$



(2)
(Total 4 marks)

Q42. (a) Expand and simplify $4(2x + 5) + 2(3x – 2)$.

..... **(2)**

(b) Expand and simplify $(x + 5)(x + 8)$.

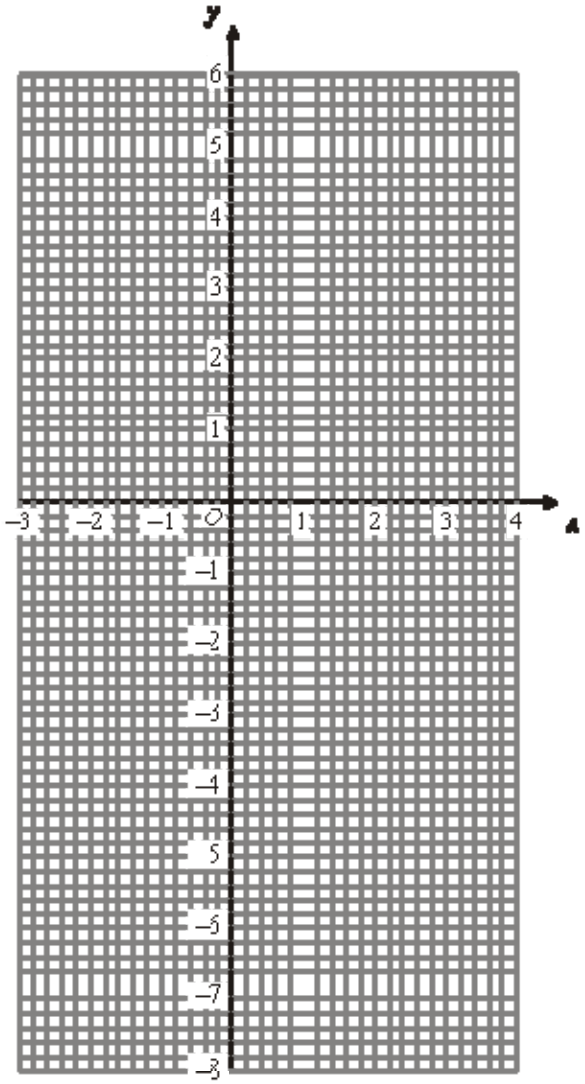
..... **(2)**
(Total 4 marks)

Q43. (a) Complete the table of values for $y = 2x – 3$

x	−2	−1	0	1	2	3
y	−7		−3	−1		3

(2)

(b) On the grid, draw the graph of $y = 2x – 3$



(2)
(Total 4 marks)

Q44. (a) Expand and simplify $4(2x + 5) + 2(3x – 2)$

.....

(2)

(b) Factorise $y^2 – 4y$

.....

(1)
(Total 3 marks)

Q45.

Diagram **NOT** accurately drawn

In the diagram, all measurements are in centimetres.

The lengths of the sides of the triangle are

$x + 6$
$2x - 3$
$3x + 1$

(a) Find an expression, in terms of x, for the perimeter of the triangle.

Give your expression in its simplest form.

.....

(2)

The perimeter of the triangle is 37 cm.

(b) Find the value of x.

x = ...

(2)
(Total 4 marks)

Q46. (a) Expand and simplify $3(2x + 3) + 2(x + 1)$

.....

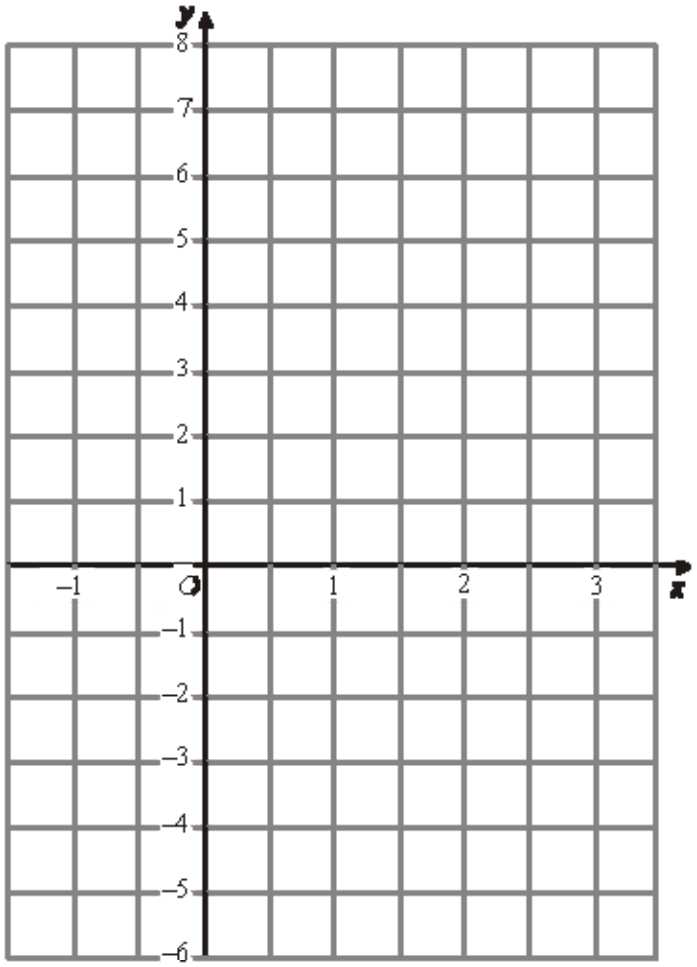
(2)

(b) Expand and simplify $(y - 3)(y + 4)$

.....

(2)
(Total 4 marks)

Q47. Draw the graph of $y = 3x - 2$ for values of x from –1 to 3.



(Total 3 marks)

Q48. (a) Simplify $m + m + m + m + m + m$

..... **(1)**

(b) Simplify $x^7 \times x^5$

..... **(1)**

(c) Factorise $3y^2 + 2y$

..... **(1)**

(Total 3 marks)

Q49. Here are the first four terms of an arithmetic sequence.

5 9 13 17

(a) What is the next term of this sequence?

..... **(1)**

(b) Write down an expression, in terms of n, for the nth term of the sequence.

..... **(2)**

(Total 3 marks)

Q50. You can use this formula to change a temperature C, in °C, to a temperature F, in °F.

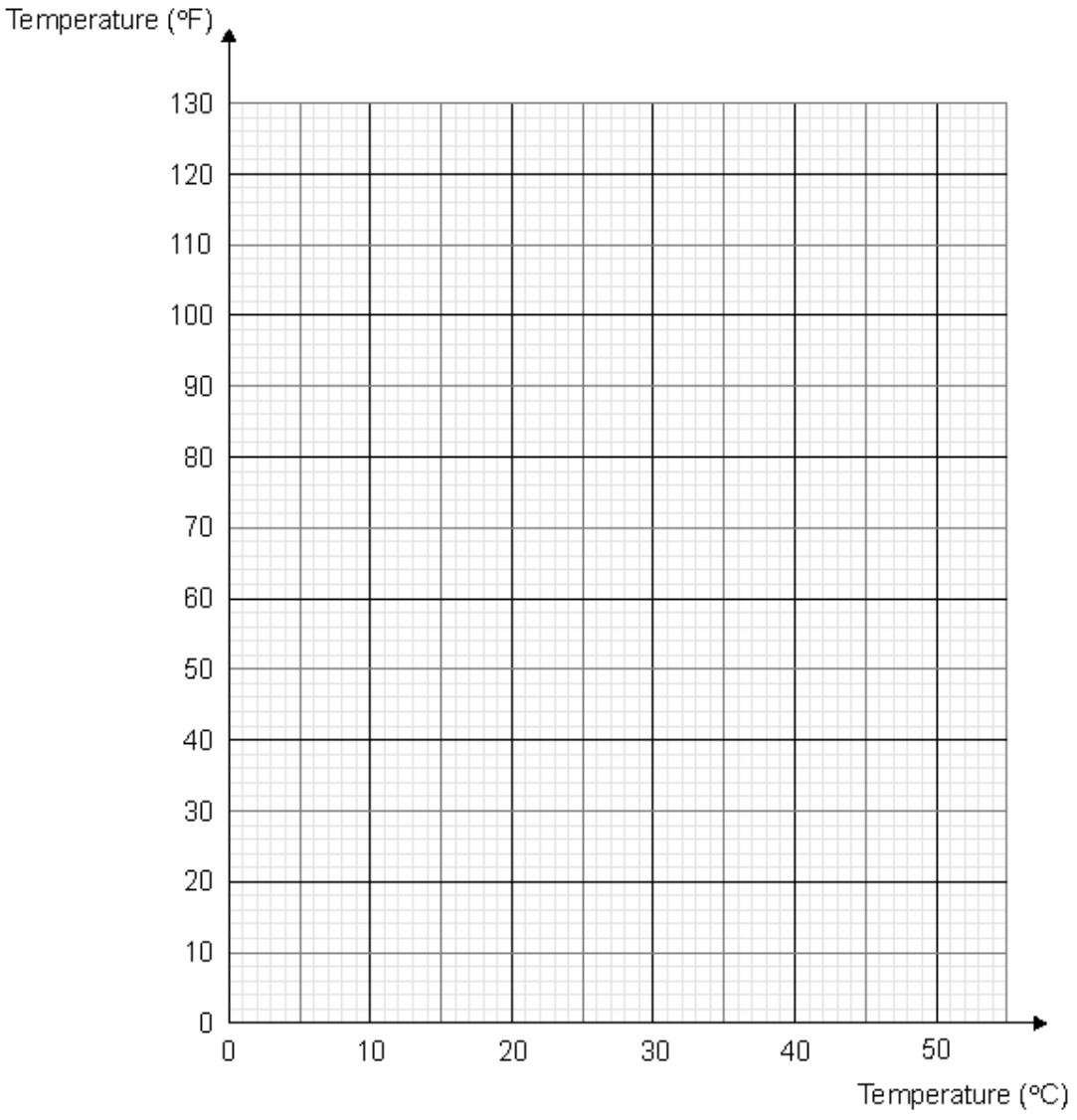
$$F = 1.8C + 32$$

(a) Use the formula to change 20°C into °F.

..... °F

(2)

(b) On the grid below, draw a conversion graph that can be used to change between temperatures in °C and temperatures in °F.



(3)

(c) Use your graph to change 100 °F into °C.

..... °C

(1)

(Total 6 marks)

Q51. Sarah goes to the gym on her way to work.
The table shows what she wants to do before arriving at work.

Activity	**Time (mins)**
Drive from home to gym	10
Exercise at gym	45
Shower and change	20
Drive from gym to work	25

She has to arrive at work at 08 50

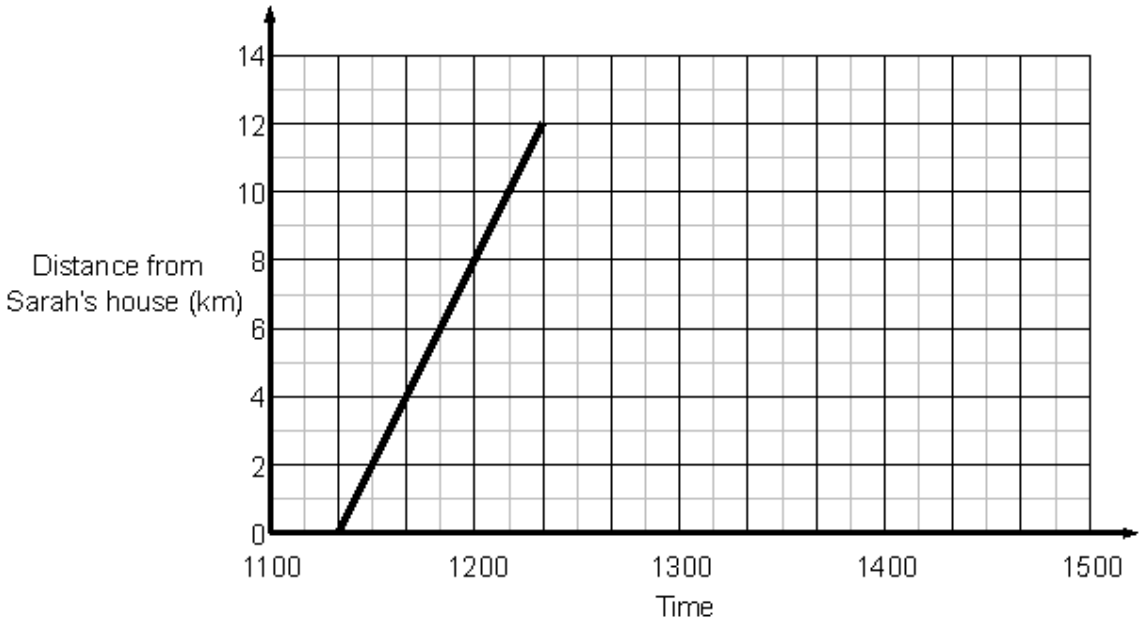
(a) What is the latest time she can leave home?

.....

(3)

Each Saturday, Sarah cycles from her house to the gym.

The travel graph shows Sarah's journey to the gym.



(b) What time does she leave home?

.....

(1)

(c) How far is the gym from Sarah's house?

..... km

(1)

Sarah stays at the gym for $1\frac{1}{2}$ hours. She then cycles back to her house at 18 km/h.

(d) Complete the travel graph.

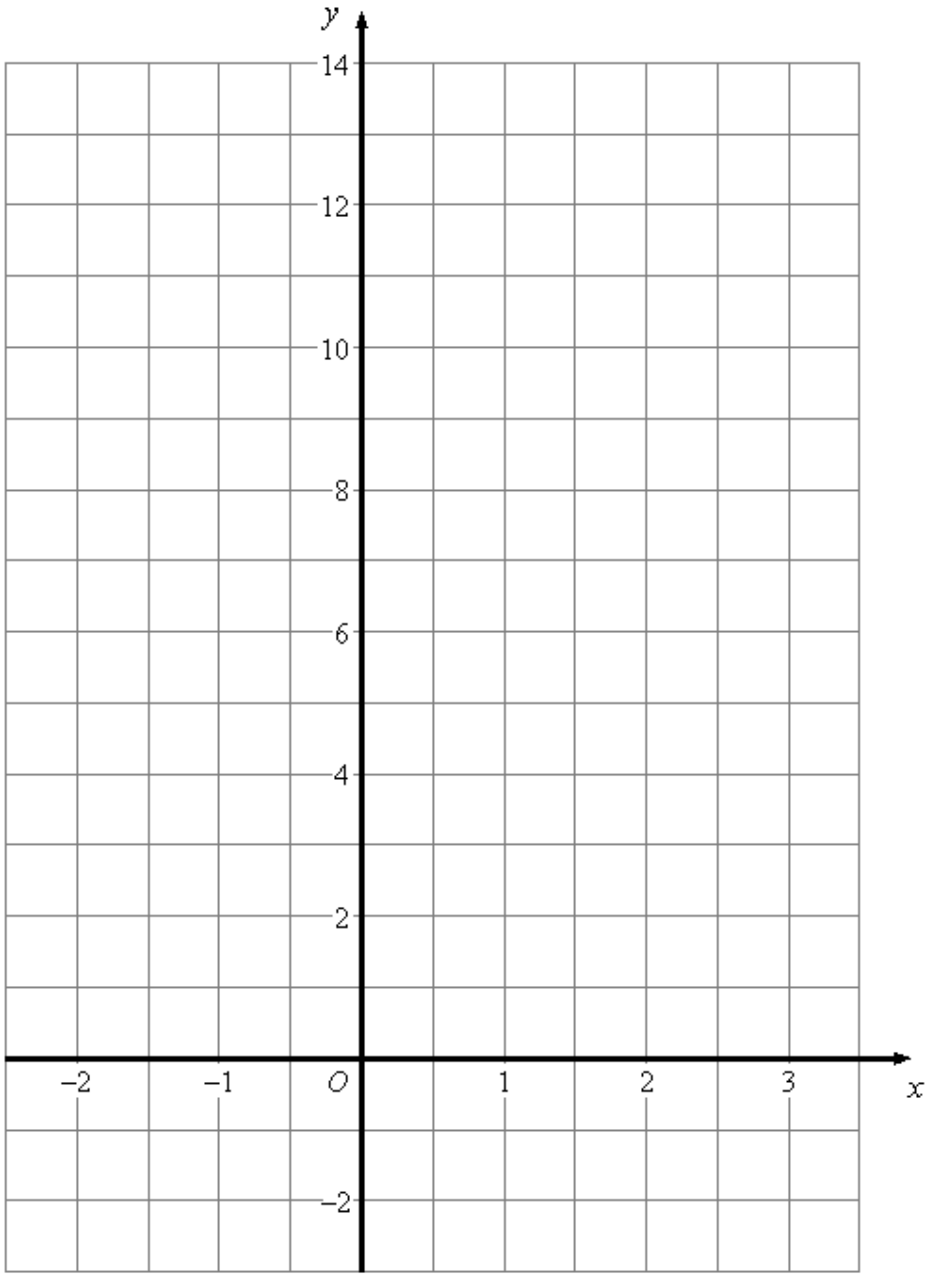
(3)
(Total 8 marks)

Q52. (a) Complete the table of values for $y = 3x + 4$

x	–2	–1	0	1	2	3
y		1				13

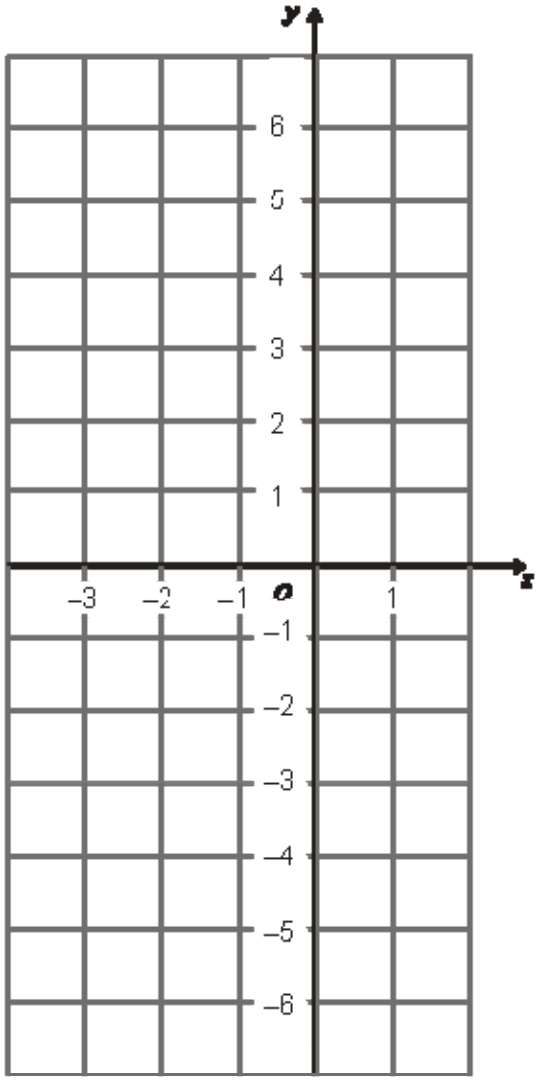
(2)

(b) On the grid, draw the graph of $y = 3x + 4$



(2)
(Total 4 marks)

Q53. On the grid, draw the graph of $y = 2x + 3$ for values of x from $x = -3$ to $x = 1$



(Total 3 marks)

Q54. Here are the first 5 terms of an arithmetic sequence.

5 8 11 14 17

(a) Write down an expression, in terms of n, for the nth term of this sequence.

..... (2)

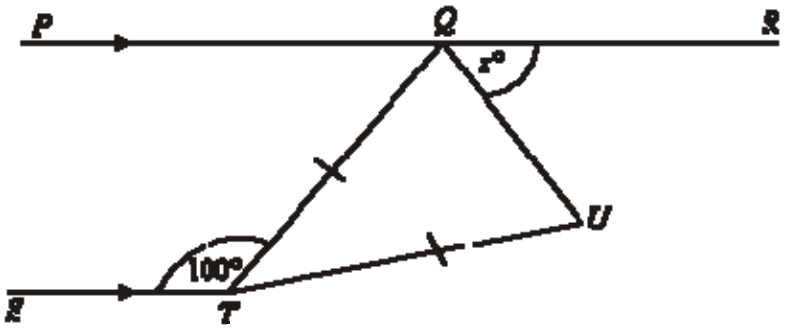
The expression $3n^2 + 2$ is the nth term of another sequence.

(b) Find the 4th term of this sequence.

..... **(2)**

(Total 4 marks)

Q55.



PQR is a straight line parallel to *ST.*
QT = *UT*
Angle *STQ* = 100°.

Prove that angle *QTU* = (2*x* – 20)°.

(Total 5 marks)

Q56. (a) Factorise fully $8p^2q + 12p$

.....

(2)

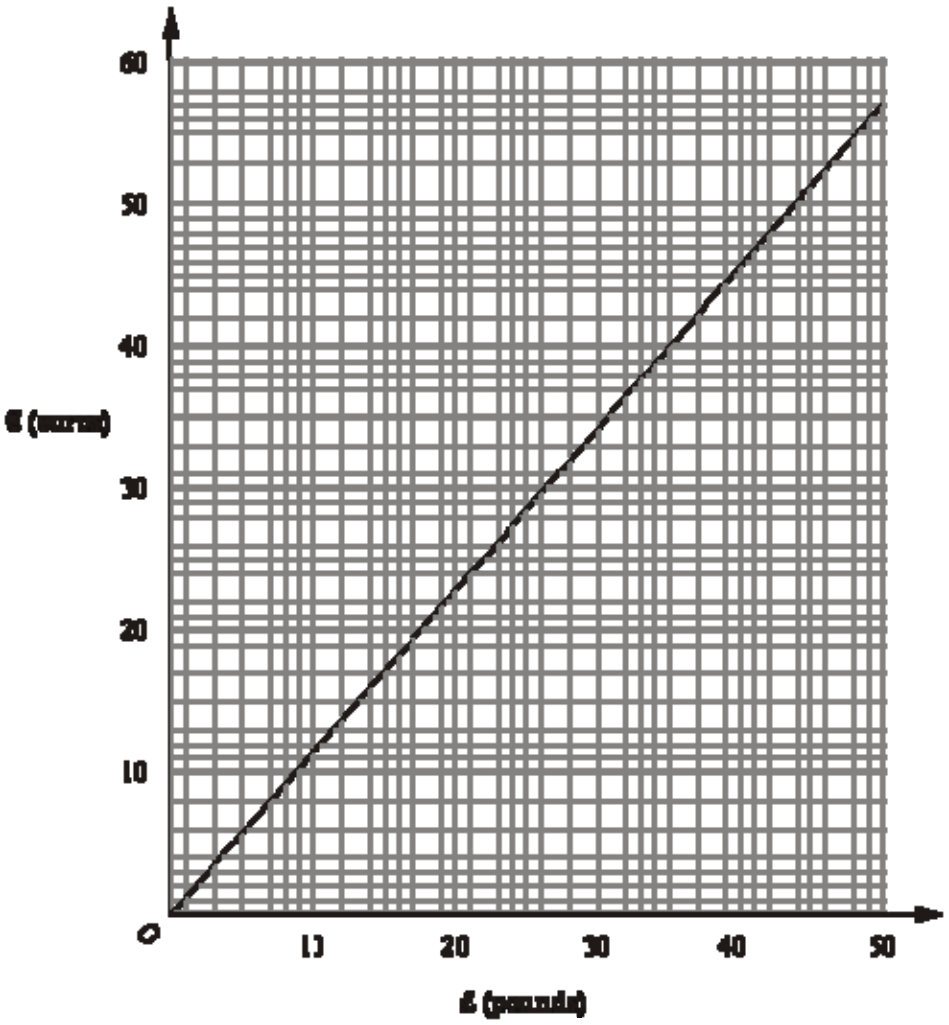
(b) Expand and simplify $5 – 2(m – 3)$

.....

(2)

(Total 4 marks)

Q57. This is a graph that can be used to convert between £ (pounds) and € (euros).



This is part of a clipping from a newspaper showing the exchange rates for some countries.

UK	£1 =
Australia	1.91 dollars
Brazil	3.01 rials
China	11.16 yen
Canada	1.76 dollars
Euro	
Hong Kong	
Japan	

(a) The exchange rate for the euro has been smudged.
Find an estimate for the exchange rate for the euro.

..... **(2)**

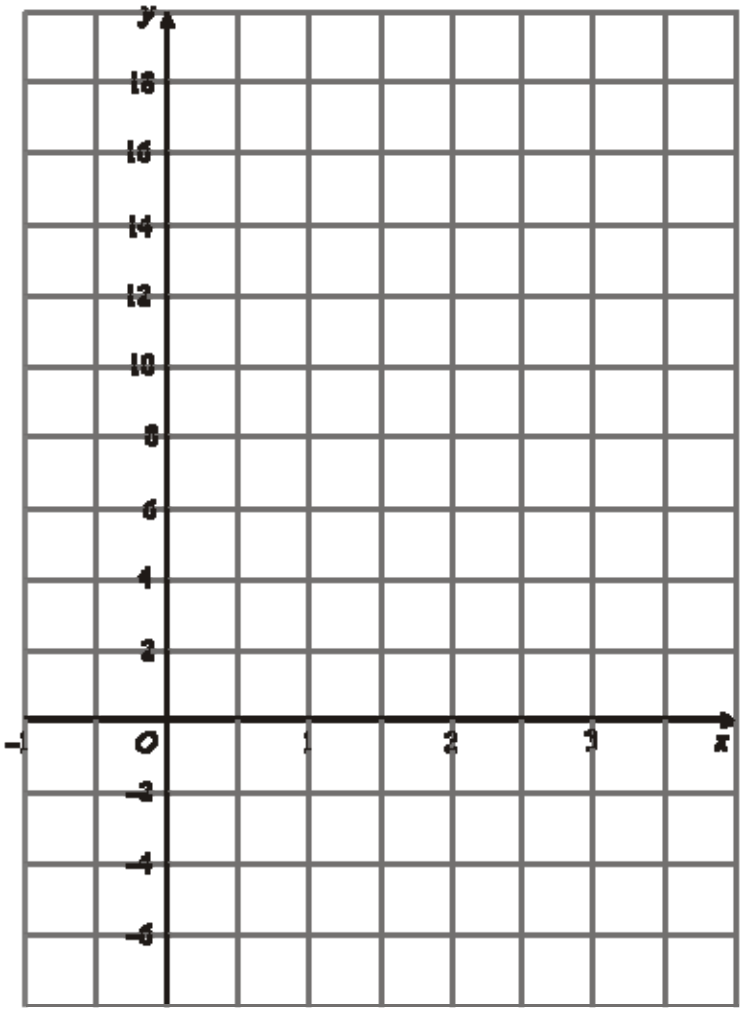
Ali wishes to buy a villa in Spain.
She has a budget of £150 000
In a brochure she sees these three villas.

(b) Which of these three villas can Ali afford to buy?
You must show your working.

.....

(3)
(Total 5 marks)

Q58. On the grid, draw the graph of $y = 5x + 1$ from $x = -1$ to $x = 3$



(Total 3 marks)

M1.

	Answer	Mark	Additional Guidance
(a)	$7e - 6f$	2	**B2** (**B1** for $7e$ or $-6f$ seen)
(b)	$6c - 4$	1	**B1** (accept $6 \times c - 4$, $c6 - 4$ or equivalent expansion)
(c)	$x(y + 3)$	1	**B1**
			Total for Question: 4 marks

M2.

Working		Answer	Mark	Additional Guidance
	f(x) =	4.3	4	**B2** for trial between 4.3 and 4.4 inclusive
x	$x^3 - 5x$			(B1 for trial between 4 and 5 inclusive)
4.00	44.00			**B1** for different trial between 4.33 and 4.37 inclusive
4.10	48.42			**B1** (dep on at least one previous B1) for 4.3 only
4.20	53.09			
4.30	58.01			NB trials where x has 1 d.p should be rounded or truncated to at least
4.40	63.18			
	68.62 or			2 SF; trials where x has 2 d.p. or more should be
4.50	68.63			

4.60 4.70 4.80 4.90 5.00 4.35	74.34 80.32 86.59 93.15 100.00 60.56			rounded or truncated to at least 3 SF
				Total for Question: 4 marks

M3.

Working	Answer	Mark	Additional Guidance
$2(3x + 2x + 7) = 22$ **OR** $3x + 2x + 7 + x + x + 2x + x + 7 = 22$ $10x + 14 = 22$ $10x = 8$ $x = 0.8$ Area = $2.4 \times 8.6 - 1.6 \times 0.8$ **OR** $0.8 \times 08 + 2.4 \times 7.8$	19.36 cm^2	5	**M1** for attempt to find an expression of the perimeter **A1** for $10x + 14 = 22$ **A1** for $x = 0.8$ **M1** for attempt to find area **A1** for 19.36
			Total for Question: 5 marks

M4.

	Working	Answer	Mark	Additional Guidance
QWC (ii, iii) **FE**	For 100 units: N Eastern = £30 Pacific = £20 East Anglian = £20 For 200 units: N Eastern = £30 Pacific = £40 East Anglian = £30 **OR** Graphs plotted correctly	Correct conclusion with justifying working	5	**B1** for calculating 2 correct points for Pacific **M1** for attempt find 2 correct points on East Anglian **A1** for two correct points on East Anglian **M1** for calculating a point that allows a comparison to be made between 100 and 200 units **C1** for correct conclusion **QWC: Decision must be stated, and all comments should be clear and follow through from working out**
				Total for Question: 5 marks

M5.

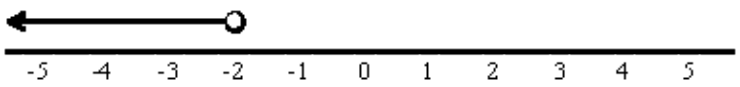
	Working	Answer	Mark	Additional Guidance
(a)	$3 \times 5 + 2 \times (-4)^2$ $15 + 2 \times 16$ $15 + 32$	47	2	**M1** for $3 \times 5 + 2 \times (-4)^2$ **A1** for 47
(b)	$P - 2b^2 = 3a$ $a = (P - 2b^2) \div 3$	$a = \frac{P - 2b^2}{3}$	2	**M1** for $P - 2b^2 = 3a$ **A1** cao
				Total for Question: 4 marks

M6.

	Working	Answer	Mark	Additional Guidance
(a)		–3, –2, –1, 0, 1	2	**B2** for –3, –2,–1, 0, 1 (B1 for –2, –1, 0, 1 or –2, –1, 0, 1, 2)
(b)		$-1 < x \leq 3$	2	**B2** for $-1 < x \leq 3$ (B1 for $-1 \leq x \leq 3$ or $-1 < x < 3$
				Total for Question: 4 marks

M7.

	Working	Answer	Mark	Additional Guidance
(a)		See diagram below	2	**B2** for correct directed line from –2, ±2 mm and an empty circle (**B1** for only one of these correct)
(b)	$5y + 10 = 4 - 7y$ $12y + 10 = 4$ $12y = -6$ $y = -½$	–½	3	**B1** for 5y + 10 **M1** for $5y + 7y = 4 -$ "10" oe **A1** for –½ oe **OR** **M1** for $y + 2 = \frac{4 - 7y}{6}$ oe **M1** for $y + \frac{7y}{6}, -\frac{4}{6}$ – 2 oe **A1** for –½ oe
				Total for Question: 5 marks



M8.

	Working	Answer	Mark	Additional Guidance
(a)		7	2	**M1** for $2y - 6 = 8$ or $y - 3 = \frac{8}{2}$ **A1** cao
(b)	$4x - 2x = 12 - 1$	5.5	2	**M1** $4x - 2x = 12 - 1$ oe **A1** 5.5 oe

	Total for Question: 4 marks

M9.

	Answer	Mark	Additional Guidance
(a)	45	1	**B1** for 44 – 46
(b)	60	1	**B1** cao
(c)	150	2	**M1** for a complete method e.g. reading from graph at 50 euros and doubling (allow ±1mm tolerance in reading from graph) **A1** for 140 – 160 SC: **B2** for 200
			Total for Question: 4 marks

M10.

Working	Answer	Mark	Additional Guidance
$x^2 = 72 \div 2$	6	2	**M1** for 72 ÷ 2 or 36 seen **A1** 6 or –6 or ± 6
			Total for Question: 2 marks

M11.

	Answer	Mark	Additional Guidance
(a)	–1, –4, 4	2	**B2** for all 3 values correct (**B1** for 1 or 2 values correct)
(b)		2	**B1** ft for all 7 of their points correctly plotted **B1** ft (dep on at least **B1** in (a)) for smooth curve through all 7 of their points
			Total for Question: 4 marks

M12.

	Working	Answer	Mark	Additional Guidance
(a)		20	1	**B1** cao
(b)		25	1	**B1** accept answer in range $24 \leq t \leq 26$
(c)	90 - 40	50	2	**M1** picks 10th and 35th seconds ft ± 1 square, can be implied by sight of 90 ± 2 **or** 40 ± 2, or marks on the graph at (10, 40) **and** (35, 90) **A1** (48 to 52 inclusive)
				Total for Question: 4 marks

M13.

Working	Answer	Mark	Additional Guidance

$4t = 18$	4.5	2	**M1** for subtracting 1 from both sides (or dividing by 4) **A1** for 4.5 oe
			Total for Question: 2 marks

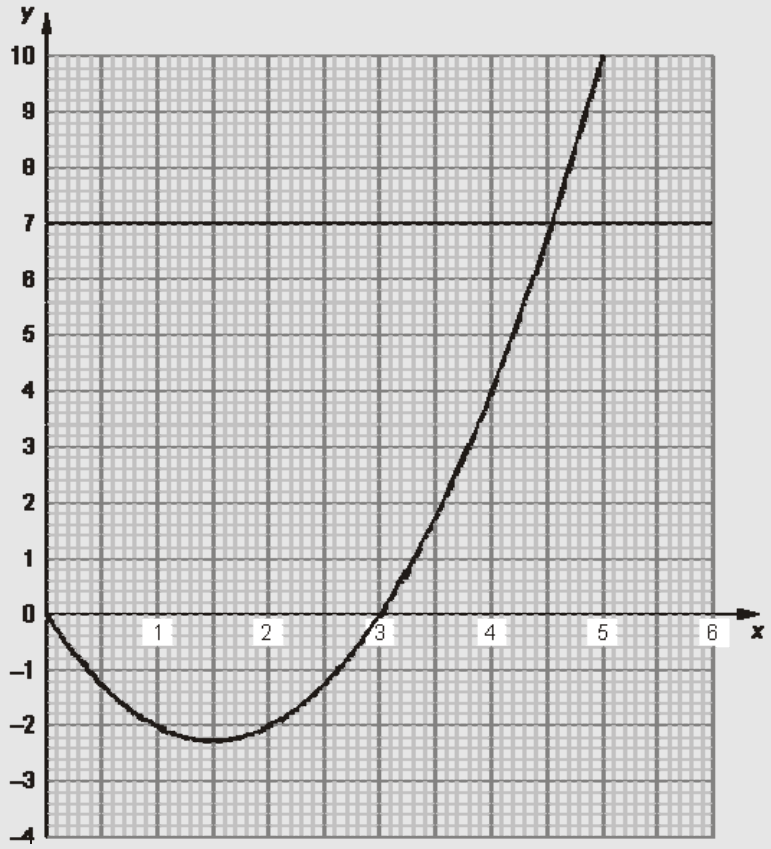
M14.

Working	Answer	Mark	Additional Guidance
2 → 16 3 → 39 2.1 → 17.(661) 2.2 → 19.(448) 2.3 → 21.(367) 2.4 → 23.(424) 2.51 → 25.8(53) 2.52 → 26.0(83) 2.53 → 26.3(14) 2.5 → 25.(625) 2.6 → 27.(976) 2.7 → 30.(483) 2.8 → 33.(152) 2.9 → 35.(989) 2.54 → 26.5(47) 2.55 → 26.7(813)	2.5	4	**B2** for trial between 2.5 and 2.6 inclusive (**B1** for a trial between 2 and 3 inclusive) **B1** for a different trial between 2.51 and 2.55 inclusive **B1** (dep on at least one previous **B1**) for 2.5 only NB trials where x has 1 d.p. should be rounded or truncated to at least 2SF; trials where x has 2 d.p. should be rounded or truncated to at least 3SF
			Total for Question: 4 marks

M15.

	Working	Answer	Mark	Additional Guidance
(a)	0, –2, –2, 0, 4, 10	–2, 10	1	**B1**, B1 for each cao
(b)		Smooth curve	2	**B1** correct plot of their values **B1** smooth curve through their points providing at least 1 mark earned in (a)
(c)	Draws $y = 7$ **OR** T&I	4.5	2	**M1** draw $y = 7$ **A1** 4.5 – 4.6 ft from graph **OR** Uses T&I **B2** 4.5 with $x^2 – 3x$ evaluated correctly at 4.5 and 4.6 (B1 Locates 'root' between 4 and 5 at least 2 evaluations or refers to table)

Width 4	Area 4
4.1	4.51
4.2	6.34
4.3	6.59
4.4	6.16
4.5	6.76
4.6	7.36
4.7	7.39
4.8	6.34
4.9	6.31
6	10
4.66	7.0625



Total for Question: 5 marks

M16.

	Working	Answer	Mark	Additional Guidance
(a)	1.8 × –8 + 32	17.6	2	**M1** for 1.8 × –8 or –14.4 or $\frac{-72}{6}$ seen or 32 – '1.8 × 8' or 1.8 × –8 + 32 seen **A1** for 17.6 or $\frac{88}{5}$ or 17.60 oe
(b)	68 = 1.8C + 32 1.8C = 68 – 32	20	2	**M1** for 68 – 32 or 36 or 68 = 1.8C + 32 seen; condone replacement of C by another letter.

	C = 36 – 1.8			**A1** for 20 cao NB Trial and improvement score 0 or 2
				Total for Question: 4 marks

M17.

	Working	Answer	Mark	Additional Guidance
(a)	t^{6+2}	t^8	1	**B1** for t^8 or for t^{6+2}
(b)	m^{8-3}	m^5	1	**B1** for m^5 or for m^{8-3}
				Total for Question: 2 marks

M18.

Working	Answer	Mark	Additional Guidance
$1^2 + 1$ $2^2 + 1$ $3^2 + 1$	2, 5, 10	2	**M1** for $1^2 + 1$ or $2^2 + 1$ or $3^2 + 1$ (but not $1^2 + 1$, $2^2 + 2$, $3^2 + 3$) **A1** for 2, 5, 10 SC: **B1** for 1, 2, 5 with or without working
			Total for Question: 2 marks

M19.

Working		Answer	Mark	Additional Guidance
2	48	2.6	4	**B2** for trial $2.6 \leq x \leq 2.7$ evaluated
3	87			(**B1** for trial $2 \leq x \leq 3$ evaluated)
2.5	65.(625)			
2.6	69.(576)			**B1** for different trial $2.6 < x \leq 2.65$
2.7	73.(683)			
2.65	71.6(09)			**B1**(dep on at least one previous **B1**) for 2.6
2.61	69.9(79)			
2.62	70.3(84)			Values evaluated can be rounded or truncated, but
2.63	70.7(91)			to at least 2sf when x has 1dp and 3sf when x has
2.64	71.1(99)			2dp
2.66	72.(021)			
2.67	72.4(34)			**NB** Allow 72 for evaluation using $x = 2.66$
2.68	72.8(48)			
2.69	73.2(65)			**NB** No working scores no marks even if answer is correct
				Total for Question: 4 marks

M20.

	Working	Answer	Mark	Additional Guidance
(a)		a^3	1	**B1** for a^3 cao
(b)	$5 \times 3x - 5 \times 2$	$15x - 10$	1	**B1** for $15x - 10$ cao
(c)	$3y \times y + 3y \times 4$	$3y^2 + 12y$	2	**M1** for $3y \times y + 3y \times 4$ or $3y^2 + a$ or $3y^2 + ay$ or $b + 12y$ or $by^2 + 12y$ where a, b are integers, and can be zero

				A1 for $3y^2 + 12y$ or $3 \times y^2 + 12 \times y$ NB: If more than 2 terms in expansion M0A0
(d)	$2x - 8 + 3x + 6$	$5x - 2$	2	**M1** for $2 \times x - 2 \times 4$ or $2x - 8$ or $3 \times x + 3 \times 2$ or $3x + 6$ **A1** for $5x - 2$ cao
(e)	$x^2 + 4x - 3x - 12$	$x^2 + x - 12$	2	**M1** for 4 terms correct with or without signs, or 3 out of no more than 4 terms, with correct signs (the terms may be in an expression or table) or $x(x - 3) + 4(x - 3)$ or $x(x + 4) - 3(x + 4)$ **A1** for $x^2 + x - 12$ cao
				Total for Question: 8 marks

M21.

	Working	Answer	Mark	Additional Guidance
(a)	t^{6+2}	t^8	1	**B1** for t^8 or for t^{6+2}
(b)	m^{8-3}	m^5	1	**B1** for m^5 or for m^{8-3}
(c)	$2^3 \times x^3$	$8x^3$	2	**B2** for $8x^3$ cao (**B1** for ax^3, $a \neq 8$ or $2x \times 2x \times 2x$ or $8x^n$ $n \neq 0,3$)
(d)	$3 \times 4 \times a^{2+5} \times h^{1+4}$	$12a^7h^5$	2	**B2** for $12a^7h^5$ (**B1** for $12a^7h^n$, $n \neq 0$, 5 or $12a^mh^5$, $m \neq 0$, 7 or ka^7h^5, or $3 \times 4 \times a^{2+5} \times h^{1+4}$)
				Total for Question: 6 marks

M22.

	Working	Answer	Mark	Additional Guidance
(a)		5	1	**B1** cao
(b)		11	1	**B1** cao
(c)	$4t = 18$	4.5	2	**M1** for subtracting 1 from both sides (or dividing by 4) **A1** for 4.5 oe
(d)	$2w + 8 = 7$	$-\frac{1}{2}$	2	**M1** for an intention to take $2w$ from both sides or take 8 from both sides **A1** for $-\frac{1}{2}$ oe
				Total for Question: 6 marks

M23.

Working	Answer	Mark	Additional Guidance

5, 13, 29, 53, **85, 125**	**(85)**	2	**M1** for correct evaluation of at least 3 odd cases **OR** sequence of 5, (8), 13, (20), 29… seen **OR** the expression with n = 9 or 11 or 19 or 21 or substituted but not evaluated **A1** for 85 or 125 or 365 or 445 or … identified
			Total for Question: 2 marks

M24.

	Working								Answer	Mark	Additional Guidance
(a)	x	–1	0	1	2	3	4	5	3, –6, –5	2	**B2** cao for all 3
	y	**3**	–2	–5	**–6**	**–5**	–2	3			(**B1** for any 1 or 2 correct)
(b)									Quadratic graph	2	**B2** for a fully correct graph **OR** **B1** for all 7 points ft on (a) plotted correctly ± 1 sq **B1** for a smooth curve through all 7 of their plotted points depending on at least **B1** in (a)
(c)	Draw y = –3								0.3, 3.7	2	**B1** for 0.2 – 0.4 or ft from graph ± 1 square **B1** for 3.6 – 3.8 or ft from graph ± 1square (SC: If no marks earned then **B1** for line y = –3 drawn)
											Total for Question: 6 marks

M25.

	Working	Answer	Mark	Additional Guidance
(a)		$4x$ – 12	1	**B1** cao
(b)	$4t$ = 18	4.5	2	**M1** for subtracting 1 from both sides seen or implied or division of all 3 terms by 4 **A1** 4.5 oe
				Total for Question: 3 marks

M26.

	Answer	Mark	Additional Guidance

(a)	$13x + 17$	2	**M1** for $3 \times x + 3 \times 4$ **OR** $5 \times 2x + 5 \times 1$ **A1** cao
(b)	t^{10}	1	**B1** cao
(c)	p^3	1	**B1** cao
(d)	x^{12}	1	**B1** cao
			Total for Question: 5 marks

M27.

	Working	Answer	Mark	Additional Guidance
(a)		Add on 2	1	**B1** 'even numbers go up in twos' or 'even numbers are 2 apart' oe
(b)		$2n + 4$	1	**B1** $2n + 4$ oe
(c)	$2n + 2n + 2 + 2n + 4 = 6n + 6 = 6(n + 1)$		3	**M1** for $2n$ (+) $2n + 2$ (+) '$2n + 4$' or any 3 consecutive even numbers written as expressions; any variable may be used **A1** for "$6n + 6$" **A1** for "$6(n + 1)$" or stating there is a factor of 6 oe SC: **B1** for $n + n + 2 + n + 4$
				Total for Question: 5 marks

M28.

Answer	Mark	Additional Guidance
$3n + 2$	2	**B2** for $3n + 2$ (oe, including un-simplified) (**B1** for $3n + k$, $k \neq 2$)
		Total for Question: 2 marks

M29.

	Working	Answer	Mark	Additional Guidance
(a)		$2a + 4c$	1	**B1** cao Accept $2(a + 2c)$
(b)	$\frac{1}{2} \times \frac{1}{4} \times (3)^2 = \frac{1}{2} \times \frac{1}{4} \times 9 = 1.125$	1.125	2	**M1** for substitution: $\frac{1}{2} \times \frac{1}{4} \times 3^2$ oe **A1** 1.125, $1\frac{1}{8}$ oe
(c)		$x(x - 5)$	2	**B2** Accept $x(x + -5)$ (**B1** for x(linear expression in x) or $x - 5$ seen)
(d)	$7x - 19 = 3x - 9$ $7x - 3x = -9 + 19$ $4x = 10$	2.5	3	**M1** for expansion of brackets: $3x - 9$ **M1** for rearrangement of their two terms eg $7x - 3x = -9 + 19$ or an indication of how this should be done for both variable and number term.

				A1 for 2.5 Accept $\frac{6}{2}\cdot\frac{10}{4}$ oe
				Total for Question: 8 marks

M30.

Working	Answer	Mark	Additional Guidance
2 → 12 3 → 33 2.5 → 20.(625) 2.1 → 13.(461) 2.6 → 22.(776) 2.2 → 15.(048) 2.7 → 25.(083) 2.3 → 16.(767) 2.8 → 27.(5(52) 2.4 → 18.(624) 2.9 → 30.(189) 2.73 → 25.8(06) **2.74 → 26.0(508) or 26** ← 2.75 → 26.2(96) 2.76 → 26.5(45)	2.7	4	**B2** for trial between 2.7 and 2.8 inclusive (**B1** for trial between 2 and 3 inclusive) **B1** for different trial between 2.73 and 2.75 inclusive **B1** (dep on at least one previous **B1**) for 2.7 only NB trials where x has 1 d.p should be rounded or truncated to at least 2SF; trials where x has 2 d.p. or more should be rounded or truncated to at least 3SF
			Total for Question: 4 marks

M31.

	Working	Answer	Mark	Additional Guidance
(a)	$2x + 2x + x + 10 + 50 = 360$	$5x + 60 = 360$	2	**M1** 3 or 4 out of $2x$, $2x$, $x + 10$, 50 added together **A1** $2x + 2x + x + 10 + 50 = 360$ oe including $x = 60$
(b)	$5x + 60 = 360$ $5x = 300$	60	3	**M1** for isolating their terms in x **M1** for dividing their numerical term by the coefficient of their x term **A1** cao All the marks in (b) may be given for work done in answering (a) providing there is no contradiction Candidates can score full marks in (b) independent of their answer in (a) (e. g. by starting again)
				Total for Question: 5 marks

M32.

	Working	Answer	Mark	Additional Guidance
(a)		$2a + 4c$	1	**B1** $2a + 4c$ or $2(a + 2c)$
(b)	$\frac{1}{2}x \times \frac{1}{4} \times (3)^2 = \frac{1}{2} \times \frac{1}{4} \times 9 = 1.125$	1.125	2	**M1** for substitution: $\frac{1}{2} \times \frac{1}{4} \times 3^2$ oe **A1** 1.125, $1\frac{1}{8}$, $\frac{9}{8}$ oe

(c)		$x(x - 5)$	2	**B2** , accept $x(x + -5)$ (**B1** for x(linear expression in x) or $x - 5$ seen)
(d)	$x^2 + 3x + 4x + 12$	$x^2 + 7x + 12$	2	**B2** for fully correct (**B1** for 3 out of 4 terms correct in working including signs, **OR** 4 terms correct, with incorrect signs).
(e)		$(y + 3) \times (y + 5)$	2	**B2** for fully correct (**B1** for $(y + a)(y + b)$ with one of $ab = 15$, $a + b = 8$)
				Total for Question: 9 marks

M33.

	Answer	Mark	Additional Guidance
(a)	$6c - 4$	1	**B1** oe
(b)	$x(y + 3)$	1	**B1** for $x(y + 3)$ oe or $(x + 0)(y + 3)$ oe
			Total for Question: 2 marks

M34.

	Answer	Mark	Additional Guidance
(a)	t^{10}	1	**B1** cao
(b)	x^{12}	1	**B1** cao
			Total for Question: 2 marks

M35.

Working	Answer	Mark	Additional Guidance
$x^2 - 3x + 4x - 12$	$x^2 + x - 12$	2	**M1** for any three of x^2, $-3x$, $4x$, -12 **A1** for $x^2 + x - 12$ cao
			Total for Question: 2 marks

M36.

	Answer	Mark	Additional Guidance
(a)	–4, (1), 6, 11, (16)	2	**B2** (**B1** for 1 correct entry)
(b)	Straight line	2	**M1** for plotting at least 4 of 'their points' correctly **A1** for correct straight line for $-1 \leq x \leq 3$ S.C. **B1** for line of gradient 5 or y-intercept 1 on y axis if M0 above
			Total for Question: 4 marks

M37.

	Answer	Mark	Additional Guidance
(a)	$5x - y$	2	**B2** for $5x - y$ cao (**B1** for $5x + ny$ or for $nx - y$)
(b)	$\frac{1}{2y}$	2	**B2** for $\frac{1}{2y}$ cao (**B1** for $\frac{2}{4y}$ or for $\frac{x}{2xy}$)
(c)	$x - 3$	1	**B1** for $x - 3$ cao
			Total for Question: 5 marks

M38.

Working	Answer	Mark	Additional Guidance
(0, 6), (1, 5), (2, 4), (3, 3), (4, 2), (5, 1), (6, 0)	Line	3	**M1** for plotting at least two correct points (may be implied by correct answer) **A1** for line drawn through at least two points **A1** for a line from (6, 0) to (0, 6) (**B2** for plotting three correct points / **B1** for plotting two correct points) SC **B1** for line through (0, 6) or for gradient of –1
			Total for Question: 3 marks

M39.

Answer	Mark	Additional Guidance
$5n + 1$	2	**B2** for $5n + 1$ oe (**B1** for one of $5n + a$)
		Total for Question: 2 marks

M40.

	Working	Answer	Mark	Additional Guidance
(a)		$5(x + 2)$	1	**B1**
(b)	$(x - 3)(x + 5)$ $x^2 - 3x + 5x - 15$	$x^2 + 2x - 15$	2	**M1** for 3 out of 4 terms of x^2, $-3x$, $5x$, -15 correct **A1** for $x^2 + 2x - 15$
				Total for Question: 3 marks

M41.

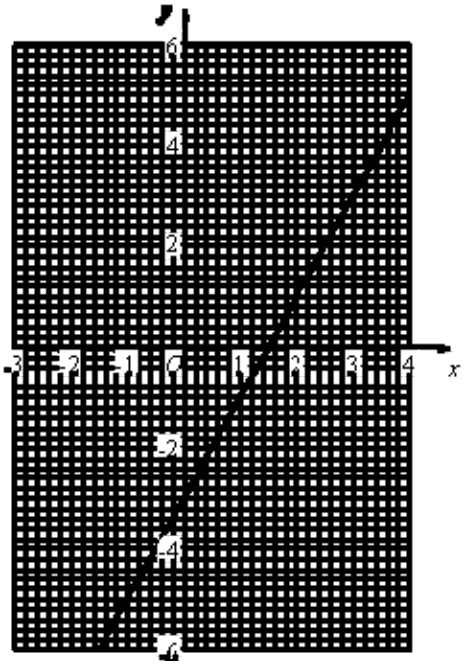
	Answer	Mark	Additional Guidance
(a)	6, 4, 3, 1	2	**B2** for correct values in table (**B1** for any 2 correct)

(b)	graph	2	**B2** for correct line (**B1** for all "points" plotted correctly) or gradient –1 or y intercept at 6
			Total for Question: 4 marks

M42.

	Working	Answer	Mark	Additional Guidance
(a)	$4(2x + 5) + 2(3x - 2)$ $8x + 20 + 6x - 4$	$14x + 16$	2	**M1** for either $8x + 20$ or $6x - 4$ or $4 \times 2x + 4 \times 5$ or $2 \times 3x - 2 \times 2$ or $14 \times$ or $+ 16$ **A1** for $14x + 16$
(b)	$x^2 + 5x + 8x + 40$	$x^2 + 13x + 40$	2	**B2** cao (**B1** for 3 or 4 of the 4 terms correct, can be implied by $x^2 + 13x + n$ or $nx^2 + 13x + 40$)
				Total for Question: 4 marks

M43.

	Working							Answer	Mark	Additional Guidance
(a)	x	–2	–1	0	1	2	3	Table	2	**B2** for 2 correct entries
	y	–7	**–5**	–3	–1	**1**	3			(**B1** for 1 correct entry)
(b)								Graph	2	**B2** for straight line from (–2, –7) to (3, 3) (**B1** for 5 of their points correctly plotted **or** single straight line passing through (0, –3) from x = –2 to +3 **or** for a straight line with gradient 2 from x = –2 to +3 **or** correct straight line that passes through 3 correct points)
										Total for Question: 4 marks

M44.

	Working	Answer	Mark	Additional Guidance
(a)	$4(2x + 5) + 2(3x - 2)$ $8x + 20 + 6x - 4$	$14x + 16$	2	**M1** for either $8x + 20$ or $6x - 4$ or $4 \times 2x + 4 \times 5$ or $2 \times 3x - 2 \times 2$ or $14 \times$ or $+ 16$ **A1** for $14x + 16$
(b)		$y(y - 4)$	1	**B1**
				Total for Question: 3 marks

M45.

	Working	Answer	Mark	Additional Guidance
(a)	$2x - 3 + x + 6 + 3x + 1$	$6x + 4$	2	**M1** for $2x - 3 + x + 6 + 3x + 1$ **or** $6x + k$ seen **A1** for $6x + 4$, condone P = $6x + 4$ but not $x = 6x + 4$ or $0 = 6x + 4$
(b)	$6x + 4 = 37$ $6x = 33$ $x = 5.5$	5.5	2	**M1** for "$6x + 4$" = 37, must be 3 term linear equation with coefficient of $x \neq 1$ **A1** for 5.5, $\frac{11}{2}$, $5\frac{1}{2}$ oe or ft for their "$6x + 4$" provided x is positive. **OR** **M1** for a correct 2 stage numerical process to find x **A1** for 5.5, $\frac{11}{2}$, $5\frac{1}{2}$ oe or ft for their "$6x + 4$" provided x is positive. T&I Allow 2 marks for 5.5oe , otherwise 0 (**SC B1** "$x + k = 37$" or "$kx = 37$) NB Do not award marks in (a) for $6x + 4$ in (b)
				Total for Question: 4 marks

M46.

	Working	Answer	Mark	Additional Guidance
(a)	$6x + 9 + 2x + 2$ =	$8x + 11$	2	**M1** for $3 \times 2x + 3 \times 3$ or $2 \times x + 2 \times 1$ or $6x + 9$ or $2x + 2$ or $8x$ or 11 **A1** for $8x + 11$ cao
(b)	$y^2 + 4y - 3y - 12$	$y^2 + y - 12$	2	**M1** for 3 out of 4 terms of $y \times y + 4 \times y - 3 \times y - 3 \times 4$ correct including signs, or 4 terms excluding signs **A1** for $y^2 + y - 12$ or $y^2 + 1y - 12$ cao

	Total for Question: 4 marks

M47.

Working						Answer	Mark	Additional Guidance
x	–1	0	1	2	3	Straight line	3	**M2** for two correct points plotted or a correct straight line which does not cover the range $x = -1$ to $x = 3$ (**M1** for one point correctly plotted or calculated or a straight line through one correct point) **A1** for correct line between –1 and 3 **OR** **M1** for line with correct gradient **M1** for line with correct y intercept **A1** for correct line between –1 and 3
y	–5	–2	1	4	7			
								Total for Question: 3 marks

M48.

	Answer	Mark	Additional Guidance
(a)	$6m$	1	**B1** cao
(b)	x^{12}	1	**B1** for x^{12} or x^{7+5}
(c)	$y(3y + 2)$	1	**B1** cao
			Total for Question: 3 marks

M49.

	Answer	Mark	Additional Guidance
(a)	21	1	**B1** cao
(b)	$4n + 1$	2	**M1** for $4n + k$ ($k \neq 1$) **A1** oe NB $n = 4n + 1$ gets **M1** only.
			Total for Question: 3 marks

M50.

	Working	Answer	Mark	Additional Guidance
(a)		68	2	**M1** for $\frac{9}{5} \times 20 - 32$ **A1** cao
(b)	Table of values 10 20 30 40 50 50 68 86 104 122 **or** Use $y = mx + c$ With $m = \frac{9}{5}$, $c = 32$	Single line from (0, 32) to (50, 122)	3	**B3** for correct single straight line from (0, 32) to (50, 122) [B2 for at least 3 points correctly plotted (ft from (a)) and joined with line segments **or** 3 correct points plotted two of which must be the extremes with no joining **or** a single line of gradient $\frac{9}{5}$ passing through (0,32) **B1** for 2 correctly plotted points ft from (a) **or** a single line of gradient $\frac{9}{5}$ **or** a single line with positive gradient passing through (0,32) **or** 2 correct pairs of values, may include (20,68) from (a) if correct]
(c)		37.8	1	**B1** for answer in range 36 - 39 **or** ft from line drawn (± 2mm) *NB : Whole question needs to be clipped together*
				Total for Question: 6 marks

M51.

	Working	Answer	Mark	Additional Guidance
(a)	10 + 45 + 20 + 25 = 100 1 hour 40 minutes	07 10	3	**M1** for 10 + 45 + 20 + 25 or 100 seen **M1** for correct attempt to convert to hours and minutes **A1** cao **OR** **M2** for clear attempt to subtract all times from 08 50 (may be seen as working backwards) (M1 for clear attempt to take at least one time away from 08 50) **A1** cao
(b)		11 20	1	**B1** for 11 20 **or** twenty past eleven oe
(c)		12	1	**B1** cao

(d)		Straight line from (12 20, 12) to (13 50, 12) and from (13 50, 12) to (14 30, 0)	3	**M1** for straight line segment on graph **M1** for straight line with negative segment **A1** for correct graph **or** **M1** for straight line segment on graph **M1** for 12 ÷ 18 oe or 40 minutes seen **A1** for correct graph SC: B2 for the correct straight line translated to left or right
				Total for Question: 8 marks

M52.

	Answer	Mark	Additional Guidance
(a)	–2, (1), 4, 7, 10, (13)	2	**B2** for 4 values correct (B1 for 2 or 3 values correct)
(b)	Single line from (–2, –2) to (3, 13)	2	**M1** for plotting at least 5 of their points correctly **OR** single straight line with positive gradient passing thro' (0,4) from x = –2 to x = 3 **OR** single straight line of gradient 3 from x = –2 to x = 3 **OR** correct straight line that passes through 3 correct points A1 cao for correct straight line from at least (–2,–2) to (3,13)
			Total for Question: 4 marks

M53.

Working	Answer	Mark	Additional Guidance
x –3 –2 –1 0 1 y –3 –1 1 3 5	Line	3	**(Table of values)** **M1** for at least 2 correct attempts to find points by substituting values of x. **M1** ft for plotting at least 2 of their points (any points plotted from their table must be correct) **A1** for correct line between –3 and 1 **(No table of values)** **M2** for at least 2 correct points (and no incorrect points) plotted OR line segment of $2x + 3$ drawn (ignore any additional incorrect segments)

			(**M1** for at least 3 correct points with no more than 2 incorrect points) **A1** for correct line between –3 and 1 **(Use of $y = mx + c$)** **M2** for at least 2 correct points (and no incorrect points) plotted OR line segment of $2x + 3$ drawn (ignore any additional incorrect segments) (**M1** for line drawn with gradient of 2 OR line drawn with a y intercept of 3 and a positive gradient) **A1** for correct line between –3 and 1
			Total for Question: 3 marks

M54.

	Working	Answer	Mark	Additional Guidance
(a)		3n + 2	2	**B2** for 3n + 2 or equivalent [B1 for 3n + k where k ≠ 2]
(b)	3 × 2 4 + 2 = 3 × 16 + 2 = 48 + 2	50	2	**M1** for $3 \times 4^2 + 2$ with a clear intention to square the 4 independent of the scalar 3 **A1** cao
				Total for Question: 4 marks

M55.

	Working	Answer	Mark	Additional Guidance
QWC (i, ii, iii)	Angle RQT= 100° (alternate angles are equal) Angle TQU = 100 – x Angle QUT = 100 – x (base angles of isos triangle) Angle QTU = 180 – (100 – x + 100 – x) angles in a triangle)	Proof	5	**B1** for angle RQT = 100° **B1** for angle TQU = 100 – x or angle QUT = 100 – x **B1** for completing the proof **C2** for all 3 reasons given **QWC: Proof should be clearly laid out with technical language correct, e.g. alternate angles are equal** [C1 for just 1 or 2 reasons given] **QWC: Proof should be clearly laid out with technical language correct, e.g. alternate angles are equal**
				Total for Question: 5 marks

M56.

	Working	Answer	Mark	Additional Guidance
(a)		$4p(2pq + 3)$	2	**B2** for $4p(2pq + 3)$ [B1 for $2p(2pq + 6)$ or $4(p^2q + 3p)$ or $p(4pq + 12)$ or $2(2p^2q + 6p)$]
(b)	$5 – 2(m – 3) = 5 – 2m + 6$	$11 – 2m$	2	**M1** for $5 – 2m + 6$ **A1** cao
				Total for Question: 4 marks

M57.

		Working	Answer	Mark	Additional Guidance
	(a)		£1 = 1.15 euros	2	**M1** for reading off one of say £10, £20, £50, etc and dividing their result by 10, 20, 50, etc **A1** for an answer in the range 1.05 to 1.25 inc.
FE	(b)	From graph, £15 = €17.25 £150000 = €172500 A – yes B - yes C - no **OR** From graph, €15.5 = £13.5, so €155000 = £135000 From graph, €17 = £14.8, so €170000 = £148000 From graph, €20 = £17.4, so €200000 = £174000 **OR** £150000 × "answer to (a)" = €172500 A – yes B – yes C – no	A – yes B - yes or no C - no	3	**M1** for a suitable reading from the graph **A1** for converting to euros (€172500 ± €2500) **C1** for correct comparison to price of the villas **OR** **M1** for a suitable reading from the graph for the price of one of the villas **A1** for converting to pounds (±£2000) **C1** for correct comparison to price of the villas for their 'correct' conversions **OR** **M1** for £150000 × "answer to (a)" **A1** for €172500 ± €2500 **C1** for correct comparison to price of the villas

		Without the use of a calculator, division by "(a)" is not likely			
					Total for Question: 5 marks

M58.

Working	Answer	Mark	Additional Guidance
Table of values x = – 1 0 1 2 3 y = – 4 1 6 11 16 **OR** Using $y = mx + c$, gradient = 5, y- intercept = 1	Single line from (– 1, – 4) to (3, 16)	3	**B3** for a correct single line from (–1, – 4) to (3, 16) B2 for at least 3 correct points plotted and joined with line segments **OR** 3 correct points plotted two of which must be the extremes with no joining **OR** a single line of gradient 5 passing through (0, 1) B1 for 2 correctly plotted points **OR** a single lie of gradient 5 OR a single line passing through (0, 1)
			Total for Question: 3 marks