

Marking Your Papers

- Do a complete exam (i.e. all three papers).
- Use the answers and mark scheme to mark each exam paper.
- Use the tables below to record your marks.

Paper 1

Q	Mark	Q	Mark
1		14	
2		15	
3		16	
4		17	
5		18	
6		19	
7		20	
8		21	
9		22	
10		23	
11		24	
12		25	
13		26	
Total		/80	

Paper 2

Q	Mark	Q	Mark
1		15	
2		16	
3		17	
4		18	
5		19	
6		20	
7		21	
8		22	
9		23	
10		24	
11		25	
12		26	
13		27	
14		28	
Total		/80	

Paper 3

Q	Mark	Q	Mark
1		15	
2		16	
3		17	
4		18	
5		19	
6		20	
7		21	
8		22	
9		23	
10		24	
11		25	
12		26	
13		27	
14		28	
Total		/80	

- Add together your marks for the three papers to give a total mark out of 240.

Total Mark = Paper 1 Total + Paper 2 Total + Paper 3 Total

Total Mark = / 240

Estimating Your Grade

- If you want to get a rough idea of the grade you're working at, we suggest you compare the total mark you got to the latest set of grade boundaries.
- Grade boundaries are set for each individual exam, so they're likely to change from year to year. You can find the latest set of grade boundaries by going to www.cgpbooks.co.uk/gcsegradeboundaries
- Jot down the marks required for each grade in the table below. Use these marks to estimate your grade. If you're borderline, don't push yourself up a grade — the real examiners won't.

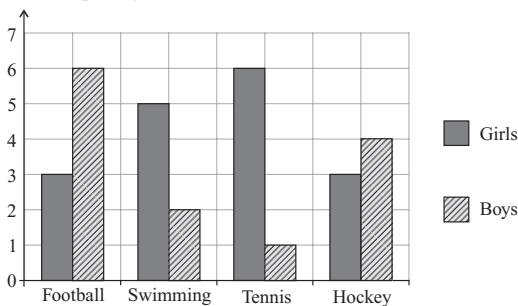
Total mark required for each grade					Estimated Grade
Grade	5	4	3	2	
Total mark out of 240					

- Remember, this will only be a rough guide, and grade boundaries will be different for different exams, but it should help you to see how you're getting on.

Answers

Paper 1

- 1 $\frac{113}{1000}$ [1 mark]
- 2 $40 : 25 = 8 : 5$ [1 mark]
- 3 a) F [1 mark]
b) $x = 3$ [1 mark]
- 4 $3.97 \times 1000 = 3970$ m [1 mark]
- 5 a) $-12, -8, -6, 2, 6$ [1 mark]
b) $2 - -8 = 10$ [1 mark]
- 6 $5p \times 28 = 140p$
 $10p \times 41 = 410p$
 $140p + 410p = 550p$
 $550p \div 50p = 11$, so she gets 11 50p coins.
[3 marks available — 1 mark for the total of the 5p or 10p coins, 1 mark for the overall total, 1 mark for the final answer]
- 7 $1.2 - 0.2 \times 4 = 1.2 - 0.8 = 0.4$ [1 mark]
So $\frac{1.2 - 0.2 \times 4}{0.05} = \frac{0.4}{0.05} = \frac{40}{5} = 8$ [1 mark]
[2 marks available in total — as above]
- 8 E.g. 6 (multiple of 3) + 6 (multiple of 6) = 12 (not a multiple of 9) [1 mark]
- 9 a) $9a + 7b$ [1 mark]
b) $6a^2$ [1 mark]
- 10 1% of £300 = £3, so 2% = £3 × 2 = £6 [1 mark]
Interest for 4 years = £6 × 4 = £24 [1 mark]
£300 + £24 = £324 [1 mark]
[3 marks available in total — as above]
- 11 a) $3 + 6 + 5 + 2 + 6 + 1 + 3 = 26$ pupils
The frequency of the final bar should be $30 - 26 = 4$

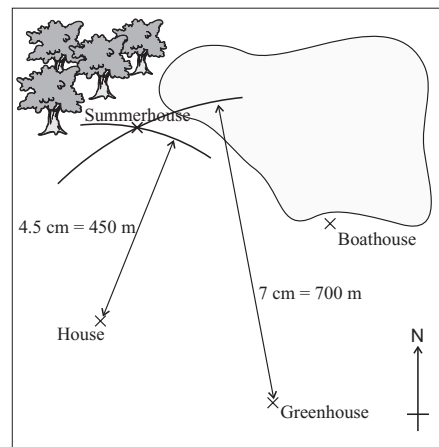


[2 marks available — 2 marks for correctly drawing missing bar, otherwise 1 mark for attempting to add the seven frequencies shown on the chart]

- b) Number of children whose favourite sport is swimming is $5 + 2 = 7$. The probability is $\frac{7}{30}$
[2 marks available — 1 mark for the numerator (7) and 1 mark for the denominator (30)]
- c) 2 boys chose swimming and 6 girls chose tennis, so the ratio is $2 : 6 = 1 : 3$ in its simplest form.
[2 marks available — 2 marks for the correct answer, otherwise 1 mark for 2 : 6]
- 12 Geometric [1 mark]
Rule: multiply the previous term by 4 [1 mark]
- 13 a)
- | Pattern | Number of triangles | Number of dots | Number of lines |
|-----------|---------------------|----------------|-----------------|
| Pattern 1 | 1 | 3 | 3 |
| Pattern 2 | 2 | 4 | 5 |
| Pattern 3 | 3 | 5 | 7 |
| Pattern 4 | 4 | 6 | 9 |
- [1 mark]

- b) The number of lines column increases by 2 each time. The column would continue 11, 13, 15, 17, 19, 21. Pattern 10 has 21 lines.
[2 marks available — 1 mark for finding the sequence, 1 mark for the correct number of lines in Pattern 10]
You could also find an expression for the n th term ($2n + 1$) and work out the value when put $n = 10$, $(2 \times 10) + 1 = 21$.
- c) (i) The number of dots is two more than the pattern number, so $D = n + 2$
[2 marks available — 2 marks for $D = n + 2$, otherwise 1 mark for $n + 2$, $D - n = 2$, or '2 more than the pattern number']
(ii) Number of dots in pattern 200 = $200 + 2 = 202$ [1 mark]

- 14 The number of tickets sold was:
Adults: $(8 \times 3) + 6 = 30$
Child: $(8 \times 5) + 2 = 42$
Senior: $(8 \times 2) + 4 = 20$
Adult tickets: $30 \times \pounds 9 = \pounds 270$
Child tickets: $42 \times \pounds 5 = \pounds 210$
Senior tickets: $20 \times \pounds 6.50 = \pounds 130$
Total sales = $270 + 210 + 130 = \pounds 610$
[6 marks available — 1 mark for each correct number of tickets sold (adult, child, senior), 1 mark for multiplying number of tickets sold by cost, 1 mark for attempting to add up the total sales, 1 mark for correct answer]
- 15 a) 067° (Accept answer between 065° and 069°) [1 mark]
b) Distance on map = 4.3 cm
Actual distance = $4.3 \times 100 = 430$ metres
[2 marks available — 2 marks for an answer in the range 420 m–440 m, otherwise 1 mark for a measurement in the range 4.2 cm–4.4 cm]
c) Draw an arc of a circle with radius 4.5 cm from the house and 7 cm from the greenhouse.



[2 marks available — 2 marks for summerhouse plotted in the correct position with construction arcs shown, otherwise 1 mark for one correct arc or for the summerhouse in the correct position but construction arcs not shown]

- 16 The top tier needs 50% of 800 g = 400 g of sultanas [1 mark]
The middle tier needs 75% of 800 g = 600 g of sultanas [1 mark]
One wedding cake needs $800 + 400 + 600 = 1800$ g of sultanas [1 mark]
Five wedding cakes need $1800 \text{ g} \times 5 = 9000 \text{ g} = 9 \text{ kg}$ of sultanas [1 mark], so Angie does not have enough sultanas. [1 mark]
[5 marks available in total — as above]
- 17 a) 69p rounds to 70p and 2.785 kg rounds to 3 kg to 1 s.f.
So estimate is $70p \times 3$ [1 mark]
 $= 210p$ [1 mark]
[2 marks available in total — as above]
If you've done $70p \times 2.8 = 196p$ you'll still get the marks.

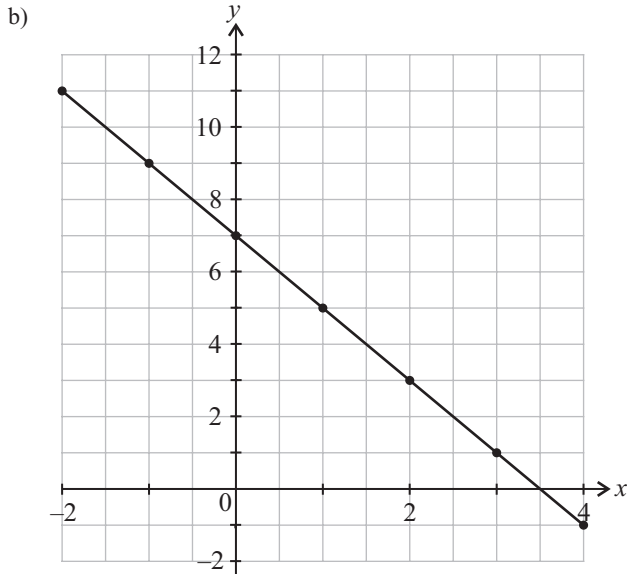
- 12 Method 1: $2 \times 27 = 54$ miles
 Expenses = $54 \times 0.40 = \text{£}21.60$ [1 mark]
 Method 2: Expenses = $(8 \times 0.40) + 17.60 = \text{£}20.80$ [1 mark]
 She should travel by the cheaper method, which is Method 2 (by car and train). [1 mark]
 [3 marks available in total — as above]

- 13 There are $\frac{3}{4} \times 28 = 21$ red cars and
 $\frac{3}{8} \times 16 = 6$ red motorbikes [1 mark for both].
 So there are $21 + 6 = 27$ red vehicles in total [1 mark].
 The probability of picking a car from the red vehicles is $\frac{21}{27} = \frac{7}{9}$ [1 mark].
 [3 marks available in total — as above]

14 a)

x	-2	-1	0	1	2	3	4
y	11	9	7	5	3	1	-1

[2 marks available — 2 marks for all entries correct, otherwise 1 mark for at least 2 correct entries]

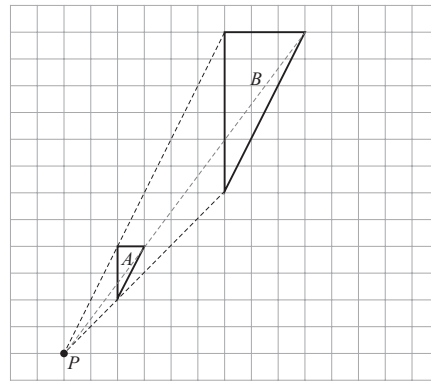


[2 marks available — 1 mark for plotting at least 3 points correctly, 1 mark for a correct straight line]

c) -2 [1 mark]

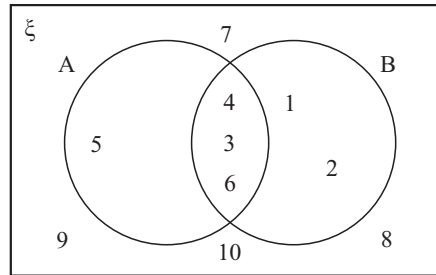
- 15 $3(2x - 4) = 2x + 8$
 $6x - 12 = 2x + 8$ [1 mark]
 $4x = 20$ [1 mark]
 $x = 5$ [1 mark]
 [3 marks available in total — as above]
- 16 He has multiplied the denominator and numerator by 5, but he should have just multiplied the numerator by 5. [1 mark]
- 17 E.g. The vertical scale does not begin at 0 so the graph could be misinterpreted.
 The horizontal scale does not increase by even amounts.
 The graph is difficult to read due to the thickness of the line.
 [3 marks available — 1 mark for each correct comment]

- 18 Angle $EBF = 90^\circ$ [1 mark]
 Angles on a straight line add up to 180° ,
 so angle $ABE = 180 - 90 - 39 = 51^\circ$ [1 mark]
 Angles ABE and DEH are corresponding angles,
 so angle $DEH = 51^\circ$ [1 mark]
 [3 marks available in total — as above]
- 19 a) $L = 2(3x + 1) + 2(2x - 3) - 2$ [1 mark]
 $= 6x + 2 + 4x - 6 - 2 = 10x - 6$ [1 mark]
 [2 marks available in total — as above]
- b) $L = 10x - 6 = 2(5x - 3)$, so it is always even as it can be written as $2 \times$ a whole number, where the whole number is $(5x - 3)$
 [2 marks available — 1 mark for writing the expression as $2(5x - 3)$ and 1 mark for explaining why this is always an even number.]



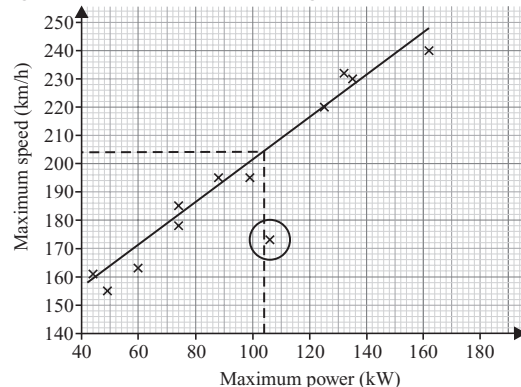
[2 marks available — 2 marks for image totally correct, otherwise 1 mark for 2 vertices in the correct position or for an image of the correct size but positioned incorrectly on the grid]

- 21 Elements of A are 3, 4, 5, 6
 Elements of B are 1, 2, 3, 4, 6



[3 marks available — 3 marks for a completely correct diagram, otherwise 1 mark for identifying the elements of sets A and B and 1 mark for correct elements in the intersection.]

- 22 8 litres of orangeade costs $(3 \times \text{£}1.60) + (5 \times \text{£}1.20) = \text{£}10.80$
 So 1 litre of orangeade costs $\text{£}10.80 \div 8 = \text{£}1.35$
 18 litres of orangeade cost $\text{£}1.35 \times 18 = \text{£}24.30$
 [4 marks available — 1 mark for using the ratio to find the cost of 8 litres of orangeade, 1 mark for dividing by 8, 1 mark for multiplying by 18 and 1 mark for the correct final answer.]
 There are several different methods you could use here. Any correct method with full working shown and a correct final answer would get 4 marks.
- 23 $y = \frac{x^2 - 2}{5}$
 $5y = x^2 - 2$ [1 mark]
 $5y + 2 = x^2$
 $x = \pm \sqrt{5y + 2}$ [1 mark]
 [2 marks available in total — as above]
- 24 a) 125 kW [1 mark]
 b) See diagram in part d).
 [1 mark for circling the point shown]
 c) Strong positive correlation [1 mark]
 d) Ignore the outlier when drawing a line of best fit.



Maximum speed = 204 km/h (allow ± 2).
 [2 marks available — 1 mark for drawing a line of best fit (ignoring the outlier), 1 mark for accurately reading from your graph the speed corresponding to a power of 104 kW]

e) 190 kW lies outside of the range of data plotted on the scatter graph. [1 mark]

25 Ollie's expression:
 $(x + 4)^2 - 1 = (x + 4)(x + 4) - 1 = x^2 + 4x + 4x + 16 - 1$ [1 mark]
 $= x^2 + 8x + 15$ [1 mark]

Amie's expression:
 $(x + 3)(x + 5) = x^2 + 3x + 5x + 15 = x^2 + 8x + 15$, [1 mark]
 so the two expressions are equivalent.

[3 marks available in total — as above]

26 a) Angle for car = $360 - 162 - 36 - 45 = 117^\circ$ [1 mark]
 Number of office assistants that travel by car is $= \frac{117}{360} \times 80 = 26$ [1 mark]

[2 marks available in total — as above]

b) Total number of staff that travel by car = $26 + 18 = 44$ [1 mark]
 44 represents 40% of the staff in the company, so the total number of staff (100%) is $44 \div 40 \times 100 = 110$ [1 mark]
 [2 marks available in total — as above]

27 a) Mass of cylinder = volume \times density
 $= 1180 \times 2.7 = 3186$ g
 [2 marks available — 1 mark for using the density formula correctly and 1 mark for the correct final answer.]

b) Mass of cube = mass of cylinder = 3186 g
 Volume of cube = mass \div density
 $= 3186 \div 10.5 = 303.428\dots$ cm³
 Side length = $\sqrt[3]{303.428\dots}$
 $= 6.719\dots$ cm = 6.7 cm (to 2 s.f.)

[4 marks available — 1 mark for using the density formula correctly, 1 mark for finding the volume of the cube, 1 mark for attempting to find the cube root of the volume and 1 mark for the correct final answer.]

28 $\sin x = \frac{18}{24}$ [1 mark]
 $x = \sin^{-1}\left(\frac{18}{24}\right)$ [1 mark] = 48.590... = 48.6 (to 1 d.p.) [1 mark]
 [3 marks available in total — as above]

Paper 3

1 $0.4 > 0.34$
 $\frac{3}{4} = 0.75$
 $7\% < 0.7$
 [2 marks available — 2 marks for all correct signs, otherwise 1 mark for 2 signs correct]

2 0.404 [1 mark]

3 20 800 [1 mark]

4 -16.2 [1 mark]

5 8 [1 mark]

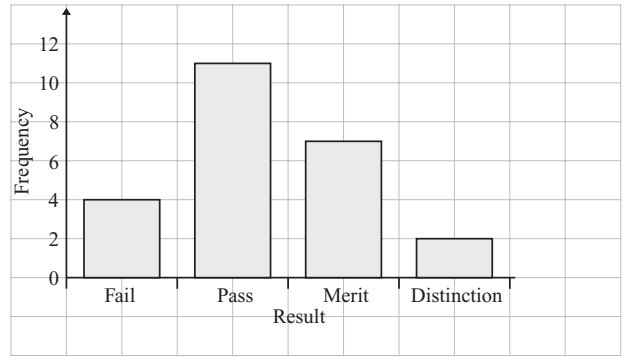
6 a)

Result of exam	Tally	Frequency
Fail		4
Pass	++++ + + +	11
Merit	+++	7
Distinction		2
TOTAL:		24

[2 marks available — 1 mark for tally marks fully correct, 1 mark for correct frequencies]

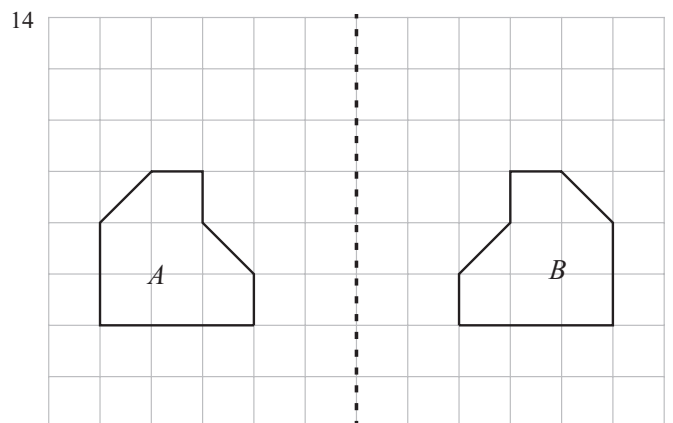
b) $\frac{4}{24} = \frac{1}{6}$
 [2 marks available — 2 marks for correct answer, otherwise 1 mark for $\frac{4}{24}$ or $\frac{2}{12}$]

c) E.g.



[3 marks available — 1 mark for correct vertical axis scale and labelling, 1 mark for 4 labelled bars of equal widths, 1 mark if the bars all have heights that agree with the frequencies found in (a)]

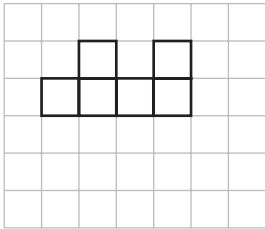
- 7 a) Impossible [1 mark]
 b) There are 5 blue pencils, so evens. [1 mark]
- 8 a) Trapezium [1 mark]
 b) Parallelogram [1 mark]
- 9 $\begin{pmatrix} -5 \\ 0 \end{pmatrix}$ [1 mark]
- 10 Square numbers: 1, 4, 9, 16, 25, 36...
 Prime numbers: 2, 3, 5, 7, 11, 13, 17...
 $2 \times 5 \times 9 = 90$, so Rick's numbers are 2, 5, and 9.
 [3 marks available — 3 marks for correct answer, otherwise 1 mark for listing at least 2 square numbers or 2 prime numbers, 1 mark for 3 numbers which multiply to give 90, but which aren't 1 square number and 2 prime numbers.]
 You could also answer this by using a factor tree to find that $90 = 2 \times 3 \times 3 \times 5 = 2 \times 9 \times 5$
- 11 1 cupcake needs $132 \div 12 = 11$ g sugar.
 So 30 cupcakes need $30 \times 11 = 330$ g sugar.
 [2 marks available — 1 mark for a correct method, 1 mark for the correct answer]
- 12 Multiples of 12: 12, 24, 36, 48, 60 ...
 Multiples of 10: 10, 20, 30, 40, 50, 60, ...
 The smallest number of biscuits they could each have bought is 60.
 This is 6 packets of shortbread biscuits.
 [3 marks available — 3 marks for the correct answer, otherwise 2 marks for finding that smallest number of biscuits they can buy is 60, or 1 mark for listing at least three multiples of 12 or 10]
- 13 Mary needs $2 \times 30 = 60$ scones, 30 tubs of clotted cream and 30 small pots of jam. [1 mark]
 $60 \div 10 = 6$ packs of scones, costing $6 \times \pounds 1.35 = \pounds 8.10$ [1 mark]
 $30 \div 6 = 5$ tubs of clotted cream, costing $5 \times \pounds 2.95 = \pounds 14.75$ [1 mark]
 30 pots of jam costing $30 \times \pounds 0.40 = \pounds 12$ [1 mark]
 The total cost is $\pounds 8.10 + \pounds 14.75 + \pounds 12 = \pounds 34.85$, so yes, she has enough money. [1 mark]
 [5 marks available in total — as above]



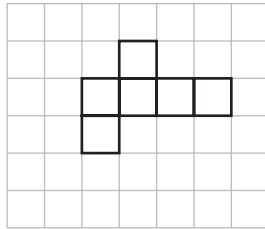
[2 marks available — 1 mark for each correct shape]

15

Plan view



Front elevation



[2 marks available — 1 mark for each correct drawing]

16 Each trapezium has these dimensions:

Parallel sides: 12 cm and 7 cm

Height: 6 cm

$$\text{So area} = \frac{1}{2}(12 + 7) \times 6 \quad [1 \text{ mark}]$$

$$= 9.5 \times 6 = 57 \text{ cm}^2 \quad [1 \text{ mark}]$$

[2 marks available in total — as above]

17 Box B contains $c + 4$ chocolatesBox C contains $2(c + 4) = 2c + 8$ chocolates

[1 mark for both expressions correct]

Total number of chocolates in Boxes A, B and C

$$= c + c + 4 + 2c + 8 = 4c + 12 \quad [1 \text{ mark}]$$

$$\text{So } 4c + 12 = 60 \quad [1 \text{ mark}]$$

$$4c = 48$$

 $c = 12$, so the number of chocolates in Box A is 12 [1 mark], the
number in Box B is $12 + 4 = 16$ and the number in Box C is

$$2 \times 16 = 32. \quad [1 \text{ mark for boxes B and C correct}]$$

[5 marks available in total — as above]

18 a) $y \times y \times y = y^3$ [1 mark]b) Subtract the powers: $n^6 \div n^2 = n^4$ [1 mark]c) Multiply the powers: $(a^4)^3 = a^{12}$ [1 mark]19 Use Pythagoras' theorem on the triangle formed by one step and the ramp. Let x be the length of the ramp.

$$20^2 + 55^2 = x^2 \quad [1 \text{ mark}]$$

$$x^2 = 3425$$

$$\text{So, } x = \sqrt{3425} \text{ cm} \quad [1 \text{ mark}]$$

$$\text{Total length of the ramp} = 2 \times \sqrt{3425} \text{ cm}$$

$$= 117.046... \text{ cm}$$

$$= 117 \text{ cm (3 s.f.)} \quad [1 \text{ mark}]$$

[3 marks available in total — as above]

20 a) Dave's speed is $180 \div 3 = 60$ km/h [1 mark]Olivia's speed is $60 + 15 = 75$ km/hSo it takes her $180 \div 75 = 2.4$ hours [1 mark]

$$= 2 \text{ hours } 24 \text{ minutes} \quad [1 \text{ mark}]$$

[3 marks available in total — as above]

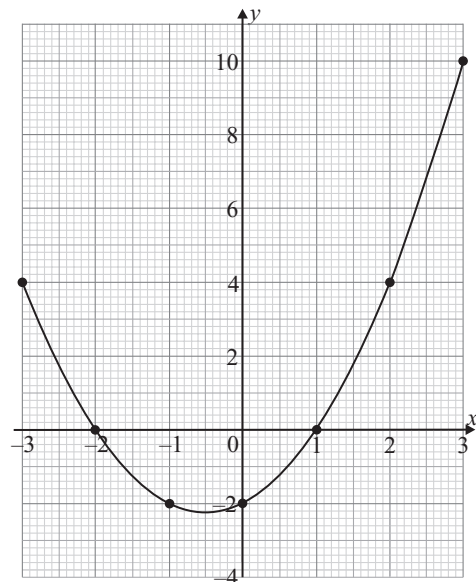
b) E.g. If Olivia drove a different distance at the same average speed, her journey time would be different [1 mark].

21 a)

x	-3	-2	-1	0	1	2	3
y	4	0	-2	-2	0	4	10

[2 marks available — 2 marks for all three values correct, otherwise 1 mark if one value is correct]

b)



[2 marks available — 1 mark for plotting the points from your table and 1 mark for joining with a smooth curve to form a U-shaped curve]

22 $2 + 3 + 5 = 10$ 'parts' in the ratio. Angles in a triangle add to 180° , so $10 \text{ parts} = 180^\circ$ and $1 \text{ part} = 18^\circ$.So, the three angles in the triangle are $(2 \times 18^\circ) = 36^\circ$,

$$(3 \times 18^\circ) = 54^\circ \text{ and } (5 \times 18^\circ) = 90^\circ.$$

One angle is 90° , so the triangle is a right-angled triangle.

[3 marks available — 1 mark for finding the size of one part of the ratio, 1 mark for finding the size of at least one angle in the triangle and 1 mark for showing that one angle is 90° .]

23 a) 25% higher than $\pounds 120\,000 = 1.25 \times \pounds 120\,000$

$$= \pounds 150\,000, \text{ so House 4} \quad [1 \text{ mark}]$$

b) $\pounds 161\,280 - \pounds 144\,000 = \pounds 17\,280$ [1 mark]

$$\% \text{ change} = \frac{17\,280}{144\,000} \times 100 \quad [1 \text{ mark}] = 12\% \quad [1 \text{ mark}]$$

[3 marks available in total — as above]

24 Work back in Anna's sequence to find her 1st term:

$$17 - 3 - 3 - 3 = 8 \quad [1 \text{ mark}]$$

So the 1st term of Carl's sequence is $8 \div 2 = 4$ [1 mark]

So the first five terms of Carl's sequence are 4, 10, 16, 22, 28.

His 5th term is 28. [1 mark]

[3 marks available in total — as above]

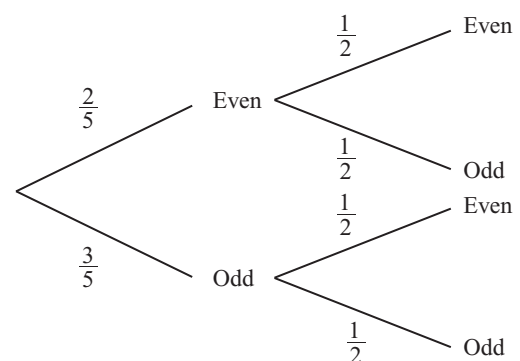
25 a) $x^2 + 7x - 18 = (x + 9)(x - 2)$

[2 marks available — 2 marks for the correct factorisation, otherwise 1 mark for an answer of the form $(x \pm a)(x \pm b)$ where a and b are numbers that multiply to make 18]

b) $(x + 9)(x - 2) = 0$

$$x = -9 \text{ or } x = 2$$

[1 mark for correct solutions using factorisation in (a)]

26 a) 1st spinner2nd spinner

[2 marks available — 1 mark for the correct probabilities for the first spinner, 1 mark for the correct probabilities for the second spinner]

b) $P(\text{two odd numbers}) = \frac{3}{5} \times \frac{1}{2}$ [1 mark]
 $= \frac{3}{10}$ [1 mark]
 [2 marks available in total — as above]

27 Change in $y = 8 - (-7) = 15$

Change in $x = 3 - (-2) = 5$

So gradient $= 15 \div 5 = 3$

So $y = mx + c$ becomes $y = 3x + c$

Put in $x = 3$ and $y = 8$ to find the value of c :

$8 = 3(3) + c$, which means $c = 8 - 9 = -1$

The equation of the line is $y = 3x - 1$.

[4 marks available — 1 mark for a correct method for finding the gradient, 1 mark for the correct gradient, 1 mark for putting one point into the equation, 1 mark for the correct answer]

28

Weight (w g)	Frequency	Mid-interval value	Frequency \times mid-interval value
$800 \leq w < 1000$	5	900	4500
$1000 \leq w < 1200$	8	1100	8800
$1200 \leq w < 1400$	9	1300	11 700
$1400 \leq w < 1600$	3	1500	4500
Total	25	—	29 500

Estimate of mean $29\,500 \div 25 = 1180$ g.

[3 marks available — 1 mark for attempting to find the mid-interval and frequency \times mid-interval values, 1 mark for dividing the sum of the frequency \times mid-interval values by 25, 1 mark for the correct answer.]