AQA Qualifications

Functional Mathematics

Level 2

4368

Mark scheme and Guidance

4368
June 2015

V1 Final Mark Scheme

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts: alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this Mark Scheme are available from aqa.org.uk

Glossary for Mark Schemes

Examinations are marked to award positive achievement.

Marks are awarded for demonstrating the following interrelated **process skills**.

Representing Selecting the mathematics and information to model a situation.

- **R.1** Candidates recognise that a situation has aspects that can be represented using mathematics.
- **R.2** Candidates make an initial model of a situation using suitable forms of representation.
- **R.3** Candidates decide on the methods, operations and tools, including ICT, to use in a situation.
- **R.4** Candidates select the mathematical information to use.

Analysing Processing and using mathematics.

- **A.1** Candidates use appropriate mathematical procedures.
- **A.2** Candidates examine patterns and relationships.
- **A.3** Candidates change values and assumptions or adjust relationships to see the effects on answers in models.
- **A.4** Candidates find results and solutions.

Interpreting Interpreting and communicating the results of the analysis.

- **I.1** Candidates interpret results and solutions.
- **I.2** Candidates draw conclusions in light of situations.
- **I.3** Candidates consider the appropriateness and accuracy of results and conclusions.
- **I.4** Candidates choose appropriate language and forms of presentation to communicate results and solutions.

In particular, individual marks are mapped onto the following **skills standards**.

Representing Making sense of the situations and representing them.
A learner can:

- **Ra** Understand routine and non-routine problems in familiar and unfamiliar contexts and situations.
- **Rb** Identify the situation or problems and identify the mathematical methods needed to solve them.
- **Rc** Choose from a range of mathematics to find solutions.

Analysing Processing and using the mathematics.
A learner can:

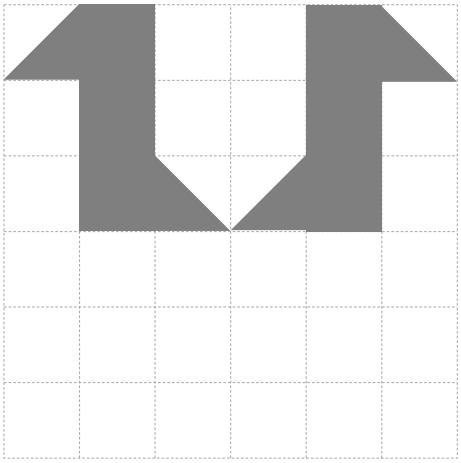
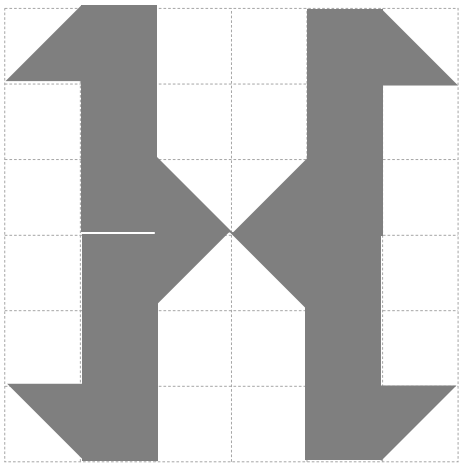
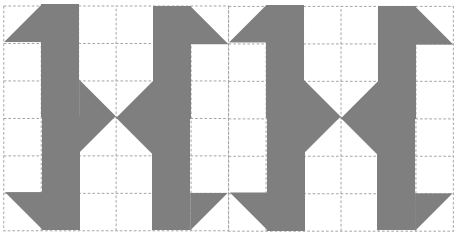
- **Aa** Apply a range of mathematics to find solutions.
- **Ab** Use appropriate checking procedures and evaluate their effectiveness at each stage.

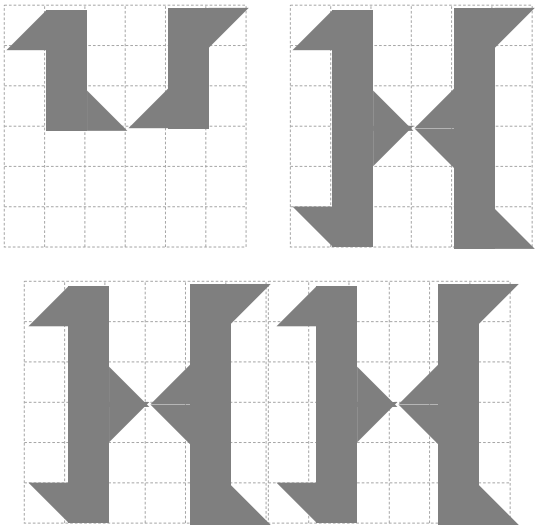
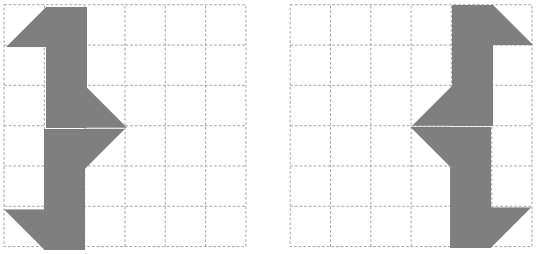
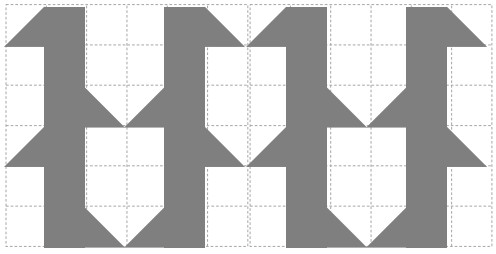
Interpreting Interpreting and communicating the results of the analysis.
A learner can:

- **Ia** Interpret and communicate solutions to multistage practical problems in familiar and unfamiliar contexts and situations.
- **Ib** Draw conclusions and provide mathematical justifications.

To facilitate marking, the following categories are used:

- **M** Method marks are awarded for a correct method which could lead to a correct answer.
- **A** Accuracy marks are awarded when following on from a correct method. It is not necessary to always see the method. This can be implied.
- **B** Marks awarded independent of method.
- **ft** Follow through marks. Marks awarded following a mistake in an earlier step.
- **SC** Special case. Marks awarded within the scheme for a common misinterpretation which has some mathematical worth.
- **oe** Or equivalent. Accept answers that are equivalent.
  eg, accept 0.5 as well as $\frac{1}{2}$

Q	Answer	Mark	Comments
1(a)		B1 *Aa*	For reflection of given shape in a vertical line seen in any grid
		B1ft *Aa*	For reflection in a horizontal line of two shapes based on original shape
		B1ft *Aa*	ft their four shapes based on original shape B3 if correct

	Additional Guidance	
1(a)	Award marks for designs based on the given shape only. Start by marking the bottom design and award B3 if fully correct. If incorrect look for a correct reflection in a vertical line for the 1st B1 and a correct reflection of two shapes in a horizontal line for the 2nd B1	
	 This scores the same mark if only the bottom design is shown.	B0B1ftB1ft
	 This scores B3 only if the final grid is fully correct.	B1B1ftB0
	 The reflection in the vertical line and the final translation can be seen in the bottom design, so award these marks whatever is shown on the other grids.	B1B0B1ft

Q	Answer	Mark	Comments
1(b)	100 cm^2 circled	B1 *Aa*	

1(c)	**Alternative Method 1**		
	Allow ± 0.2 cm tolerance on all lengths ft for their areas		
	12 × 6 (× their 100) or 72 or 7200	M1 *Ra*	Total rug area
	4 × 2 (× their 100) (× 4) or 8 or 32 or 800 or 3200	M1 *Rb*	Area of white
	their 7200 – their 3200 or 4000 or (their 72 – their 32) (× their 100) or 40	M1 *Aa*	Total rug area – total white area
	White → 3200 cm^2 and Black → 4000 cm^2	A2ft *Ia* *Ia*	For A2 must see colours and cm^2 A1 White → 3200 or Black → 4000 For A1 must see colours ft their 100

Q	Answer	Mark	Comments
1(c)	**Alternative Method 2**		
	Allow ± 0.2 cm tolerance on all lengths ft for their areas		
	12 × 10 or 120 or 6 × 10 or 60 or 4 × 10 or 40 or 2 × 10 or 20	M1 *Ra*	
	their 120 × their 60 or 7200 and their 40 × their 20 (× 4) or 800 or 3200	M1 *Rb*	Must be scaled length × scaled length and total area and white area
	their 7200 – their 3200 or 4000	M1 *Aa*	total rug area – total white area
	White → 3200 cm^2 and Black → 4000 cm^2	A2 *Ia* *Ia*	For A2 must see colours and cm^2 A1 White → 3200 or Black → 4000 For A1 must see colours

Q	Answer	Mark	Comments
1(c)	**Alternative Method 3**		
	Allow ± 0.2 cm tolerance on all lengths ft for their areas		
	4 × 2 (× their 100) (× 4) or or 8 or 32 or 800 or 3200	M1 *Rb*	White area
	12 × 1 (× their 100) (× 2) or 12 or 24 or 1200 or 2400 or 4 × 0.5 (× their 100) (× 2) or 2 or 4 or 200 or 400 or 4 × 1 (× their 100) (× 3) or 4 or 12 or 400 or 1200	M1 *Ra* *Aa*	Black area
	their 2400 + their 400 + their 1200 or 4000 or (their 24 + their 4 + their 12) (× their 100) or 40	M1 *Aa*	Total black area
	White → 3200 cm^2 and Black → 4000 cm^2	A2ft *Ia* *Ia*	For A2 must see colours and cm^2 A1 White → 3200 or Black → 4000 For A1 must see colours ft their 100

Q	Answer	Mark	Comments
1(c)	**Alternative Method 4**		
	Allow ± 0.2 cm tolerance on all lengths ft for their areas		
	12 × 10 or 120 or 1 × 10 or 10 or 4 × 10 or 40 or 2 × 10 or 20 or 0.5 × 10 or 5	M1 *Rb*	
	their 120 × their 10 (× 2) or 1200 or 2400 or their 40 × their 5 (× 2) or 200 or 400 or their 40 × their 10 (× 3) or 400 or 1200 and their 40 × their 20 (× 4) or 800 or 3200	M1 *Ra* *Aa*	Must be scaled length × scaled length and black area and white area
	their 2400 + their 400 + their 1200	M1 *Aa*	total black area
	White → 3200 cm^2 and Black → 4000 cm^2	A2 *Ia* *Ia*	For A2 must see colours and cm^2 A1 White → 3200 or Black → 4000 For A1 must see colours

Q	Answer	Mark	Comments
1(c)	**Alternative Method 5**		
	Allow ± 0.2 cm tolerance on all lengths ft for their areas		
	4 × 2 (× their 100) (× 4) or or 8 or 32 or 800 or 3200	M1 *Rb*	white area
	6 × 0.5 (× their 100) (× 2) or 3 or 6 or 300 or 600 or 6 × 1 (× their 100) (× 3) or 6 or 18 or 600 or 1800 or 2 × 1 (× their 100) (× 8) or 2 or 16 or 200 or 1600	M1 *Ra* *Aa*	black area
	their 600 + their 1800 + their 1600 or 4000 or (their 6 + their 18 + their 16) (× their 100) or 40	M1 *Aa*	total black area
	White → 3200 cm^2 and Black → 4000 cm^2	A2ft *Ia* *Ia*	For A2 must see colours and cm^2 A1 White → 3200 or Black → 4000 For A1 must see colours ft their 100

Q	Answer	Mark	Comments
1(c)	**Alternative Method 6**		
	Allow ± 0.2 cm tolerance on all lengths ft for their areas		
	6 × 10 or 60 or 2 × 10 or 20 or 1 × 10 or 10 or 4 × 10 or 40 or 0.5 × 10 or 5	M1 *Rb*	
	their 60 × their 5 (× 2) or 300 or 600 or their 60 × their 10 (× 3) or 600 or 1800 or their 20 × their 10 (× 8) or 200 or 1600 and their 40 × their 20 (× 4) or 800 or 3200	M1 *Ra* *Aa*	Must be scaled length × scaled length and black and white
	their 600 + their 1800 + their 1600	M1 *Aa*	total black area
	White → 3200 cm^2 and Black → 4000 cm^2	A2 *Ia* *Ia*	For A2 must see colours and cm^2 A1 White → 3200 or Black → 4000 For A1 must see colours

1(c)

Additional Guidance

Mark schemes when their 100 ≠ 100 (Alternative Methods 1, 3 and 5)

their 100 = 1	**their 100 = 10**	**their 100 = 1000**
12 × 6 or 72 M1	12 × 6 (× 10) or 72 or 720 M1	12 × 6 (× 1000) or 72 or 72000 M1
4 × 2 (× 4) or 8 or 32 M1	4 × 2 (× 4) (× 10) or 8 or 80 or 320 M1	4 × 2 (× 4) (× 1000) or 8 or 8000 or 32000 M1
their 72 – their 32 M1	their 720 – their 320 M1	their 72000 – their 32000 M1
White → 32 cm^2 A0 and Black → 40 cm^2	White → 320 cm^2 A2 and Black → 400 cm^2	White → 32000 cm^2 A2 and Black → 40000 cm^2
	A1 for either (units not needed)	

Q	Answer		Mark	Comments
1(d)	**Alternative Method 1**			
	their 4000 × 16 ÷ 6.25 or 10 240		M1 *Ra*	
	their 10 240 ÷ 150 or [68, 69]	their 10 240 ÷ 70 or [146, 147]	M1 *Aa*	Allow any evidence of division by 150
	[68, 69] and No	[146, 147] and No	A2ft *Ib* *Ib*	A1 [68, 69] or [146, 147] or A1ft Correct conclusion for their values ft their 4000 from (c)
	Alternative Method 2			
	their 4000 × 16 ÷ 6.25 or 10 240		M1 *Ra*	
	70 × 150 or 10 500		M1 *Aa*	
	10 240 and 10 500 and No		A2ft *Ib* *Ib*	A1 10 240 and 10 500 or A1ft Correct conclusion for their values ft their 4000 from (c)
	Alternative Method 3			
	70 × 150 or 10 500		M1 *Ra*	
	their 10 500 × 6.25 ÷ 16		M1 *Aa*	Award for using formula correctly in reverse if their 10 500 represents a number of strands e.g. 150 × 6.25 ÷ 16 **not** 70 × 6.25 ÷ 16
	[4101, 4102] or 4100 and No		A2ft *Ib* *Ib*	A1 [4101, 4102] or 4100 or A1ft Correct conclusion for their value ft their 4000 from (c)

1(d)	**Additional Guidance**	
	their 4000 Must be an area (**not** 150 or 70). Follow through from (c) Allow 7200 (or digits 72) or 3200 (or digits 32) even if their answer in (c) is different Any answer for the black area worked out in (d) takes precedence over their answer in (c)	
	Answer in (c) 4000 7200 × 16 ÷ 6.25 = 18 432 18 432 ÷ 150 = 122.88 and Yes	M1M1A1ft
	Answer in (c) 320 320 × 16 ÷ 6.25 = 819.2 819.2 ÷ 150 = 5.46 … and No	M1M1A2ft
	Answer in (c) 40 40 × 16 ÷ 6.25 = 102.4 102.4 ÷ 150 = 0.68 … and No	M1M1A2ft
	Answer in (c) 40 40 × 16 ÷ 6.25 = 102.4 and No because only 1 pack is needed (implied division by 150)	M1M1A2ft
	Answer in (c) 40 40 × 16 ÷ 6.25 = 102.4 and No	M1M0A0
	A1ft Must score M2	

Q	Answer	Mark	Comments
1(e)	**Alternative Method 1**		
	122 × 1.54 or 187.88 or 1.5 × 12.5 or 18.75	M1 *Ra*	oe e.g. 12.5 + 12.5 ÷ 2 Allow 2 × 12.5 or 25
	their 187.88 + their 18.75 or 206.63	M1 *Aa*	Two costs added their 18.75 can be 12.5(0) or 25
	their 206.63 × 20 ÷ 100 or 41.3 …	M1 *Rc*	M2 their 206.63 × 1.2 their 206.63 must be an amount of money
	their 206.63 + their [41.32, 41.33]	M1 *Aa*	
	(£)[247, 248] and Yes	A2 *Ib*	A1 (£)[247, 248] or A1ft Correct conclusion from their value

Q	Answer	Mark	Comments
1(e)	**Alternative Method 2**		
	122 × 1.54 or 187.88 or 1.5 × 12.5 or 18.75	M1 *Ra*	oe e.g. 12.5 + 12.5 ÷ 2 Allow 2 × 12.5 or 25
	their 187.88 × 20 ÷ 100 or [37.57, 37.58] or their 18.75 × 20 ÷ 100 or 3.75	M1 *Aa*	M2 their 187.88 × 1.2 or their 18.75 × 1.2 their 187.88 and their 18.75 must be amounts of money
	their 187.88 + [37.57, 37.58] or [225.45, 225.46] or 18.75 + 3.75 or 22.5(0)	M1 *Rc*	
	their [225.45, 225.46] + their 22.5(0)	M1 *Aa*	Both costs must have their VAT added
	(£)[247, 248] and Yes	A2 *Ib*	A1 (£)[247, 248] or A1ft Correct conclusion from their value

	Additional Guidance	
	For A1ft Alternative Method 1: must score a minimum of M1M1M0M1 Alternative Method 2: must score a minimum of M1M0M1M1	
	2 m of rug canvas – Alternative method 1	
	122 × 1.54 + 12.5 × 2 or 212.88 212.88 + 212.88 × 0.2 [255, 256] and No	M1M1 M1M1 A2
	2 m of rug canvas – Alternative method 2	
1(e)	122 × 1.54 (187.88) or 12.5 × 2 (25) 187.88 + 187.88 × 0.2 or 187.88 + [37.57, 37.58] or [225.45, 225.46] or 25 + 25 × 0.2 or 25 + 5 or 30 their [225.45, 225.46] + 30 [255, 256] and No	M1 M1M1 M1 A2
	Calculating VAT Adding on 20% with a clear but incorrect method for calculating 20% scores M0M1 Candidates might start by adding VAT to the unit costs. 1.54 → 1.748 or 1.74 or 1.75 12.5(0) → 15 Marks should be allocated as follows M2 → working out VAT M1 → total cost of packs of wool or total cost of rug canvas M1 → total cost of wool and canvas A marks → as Alternative Methods 1 and 2	

Q	Answer	Mark	Comments
2(a)	**Alternative Method 1**		
	250 ÷ 100 × 15 or 37.5(0)	M1 *Rb*	
	17 × 12.5 or 212.5(0)	M1 *Ra*	
	their 37.5 + their 212.5(0)	M1 *Ab*	
	37.5 + 212.5(0) = (£)250 and Yes	A1 *Ia*	Must see full method for M1M1M1

2(a)	**Alternative Method 2**		
	250 ÷ 100 × 15 or 37.5(0)	M1 *Rb*	
	250 – their 37.5(0) or 212.5(0)	M1 *Ra*	
	their 212.5(0) ÷ 17 or their 212.5(0) ÷ 12.5(0)	M1 *Ab*	
	212.5(0) ÷ 17 = (£)12.5(0) and Yes or 212.5(0) ÷ 12.5(0) = 17 and Yes	A1 *Ia*	Must see full method for M1M1M1

Q	Answer	Mark	Comments
2(a)	**Alternative Method 3**		
	17 × 12.5(0) or 212.5(0)	M1 *Rb*	
	250 – their 212.5(0) or 37.5(0)	M1 *Ra*	
	their 37.5(0) ÷ 250 × 100 or 250 ÷ 100 × 15 or 37.5(0)	M1 *Ab*	
	37.5(0) ÷ 250 × 100 = 15 and Yes or 250 – 17 × 12.5(0) = 37.5(0) and 250 ÷ 100 × 15 = 37.5(0) and Yes	A1 *Ia*	Must see full method for M1M1M1

Q	Answer	Mark	Comments
2(a)	**Alternative Method 4**		
	100 – 15 or 85	M1 *Rb*	
	250 × their 85 ÷ 100 or 212.5(0)	M1 *Ra*	
	their 212.5(0) ÷ 17 or their 212.5(0) ÷ 12.5(0) or 17 × 12.5(0)	M1 *Ab*	
	212.5(0) ÷ 17 = 12.5(0) and Yes or 212.5(0) ÷ 12.5(0) = 17 and Yes or 250 × 85 ÷ 100 = 212.5(0) and 17 × 12.5(0) = 212.5(0) and Yes	A1 *Ia*	Must see <u>full</u> method for M1M1M1

	Additional Guidance	
2(a)	Must see full method for M3A1	
	10% → 25 5% → 12.5 15% → 37.5	M1
	17 × 12.5 = 212.5	M1
	37.5 + 212.5 = 250 Yes (full method shown)	M1A1
	15% of 250 = £37.50	M1
	17 × £12.50 = £212.50	M1
	£37.50 + £212.50 = £250 Yes (full method not shown)	M1A0
	250 ÷ 15 = 16	M0
	17 × 12.5 = 212.5	M1
	16 + 212.5 = 228.5 No	M1A0

Q	Answer		Mark	Comments
2(b)	39 ÷ 12 or 3.25 or (free →) 3 or (pay →) 2		M1 *Ra*	
	2 × 280 or 560	their 280 × 3 ÷ 4 or 210	M1 *Ra*	M1 → any multiple of a single cost × 3 ÷ 4
	their 560 × 3 ÷ 4 or 420	210 × 2 or 420	M1 *Rc*	
	£420		A1 *Aa*	Must see £
	Additional Guidance			
	their 560 Misreads of 280 can score M1M0M1A0 Misreads can be any other value in the table on the Data Sheet Do not allow combinations of student and staff costs Can be any multiple of a single cost. E.g.			
	5 × 280 = 1400			M0M0
	1400 × 3 ÷ 4 = 1050			M1A0
	Using 3 for their 2			
	3 × 280 = 840 840 × 3 ÷ 4 = 630			M1M0 M1A0
	39 ÷ 12 = 3.25 3 × 280 = 840 840 × 3 ÷ 4 = 630			M1 M0 M1A0

Q	Answer	Mark	Comments
2(c)	**Alternative Method 1** (Comparing **means**)		
	$2 \times 10 + 5 \times 9 + 6 \times 8 + 11 \times 7 + 12 \times 6 + 8 \times 5 + 2 \times 4 + 2 \times 3 + 1 \times 2 + 1 \times 1$ or $20 + 45 + 48 + 77 + 72 + 40 + 8 + 6 + 2 + 1$ or 319	M1 *Ra*	or $5 \times 10 + 5 \times 9 + 7 \times 8 + 9 \times 7 + 7 \times 6 + 2 \times 5 + 2 \times 3 + 2 \times 2 + 1 \times 1$ or $50 + 45 + 56 + 63 + 42 + 10 + 6 + 4 + 1$ or 277 Total of at least 9 products shown or attempted with at least 5 of the products correct
	their 319 ÷ 50 or 6.38	M1 *Aa*	or their 277 ÷ 40 or [6.9, 6.93] Allow their 319 ÷ 40 <u>and</u> their 277 ÷ 50
	6.38 and [6.9, 6.93] and Maya	A2 *Ib* *Ib*	A1 6.38 and [6.9, 6.93] or A1ft Correct conclusion from their means
	Alternative Method 2 (Comparing **medians**)		
	2 + 5 + 6 + 11 + 12 or listing at least 26 values in ascending or descending order	M1 *Ra*	or 5 + 5 + 7 + 6 or listing at least 21 values in ascending or descending order
	Selects 25th and 26th highest values	M1 *Aa*	or selects 20th and 21st highest values
	6 and 7 and Maya	A2 *Ib* *Ib*	A1 6 and 7 or A1ft Correct conclusion from their medians

Q	Answer	Mark	Comments
2(c)	**Alternative Method 3** (Comparing **modes**)		
	Mode for Harry → 6 and Mode for Maya → 7 and Maya	B2 *Ra*	B1 Mode for Harry → 6 and Mode for Maya → 7
	Alternative Method 4 (Comparing **modes** and **ranges**)		
	Mode for Harry → 6 and Mode for Maya → 7	M1 *Ra*	
	Range for Harry and Maya → 9	M1 *Aa*	
	Mode 6 and 7 and Range 9 for Harry and Maya and Maya	A2 *Ib* *Ib*	A1 Mode 6 and 7 and Range 9 or A1ft Correct conclusion from their modes and ranges

Q	Answer	Mark	Comments
2(c)	**Alternative Method 5** (Comparing **proportions** A)		
	E.g. Scores of 7 or more Harry 2 + 5 + 6 + 11 = 24 or Maya 5 + 5 + 7 + 6 = 23	M1 *Ra*	E.g. Scores of 9 and 10 Harry → 2 + 5 = 7 or Maya → 5 + 5 = 10
	Harry → their $^{24}/_{50}$ and Maya → their $^{23}/_{40}$	M1 *Aa*	Harry → their $^{7}/_{50}$ and Maya → their $^{10}/_{40}$
	Harry → under half score 7 or more and Maya → over half score 7 or more and Maya or Harry → their $^{96}/_{200}$ and Maya → their $^{115}/_{200}$ and Maya or Harry → 48% and Maya → 57.5% and Maya	A1 *Ib*	Harry → 14% score 9 or 10 and Maya → 25% score 9 or 10 and Maya oe

Q	Answer	Mark	Comments
2(c)	**Alternative Method 6** (Comparing **proportions** B)		
	$2 \times 10 + 5 \times 9 + 6 \times 8 + 11 \times 7 + 12 \times 6 + 8 \times 5 + 2 \times 4 + 2 \times 3 + 1 \times 2 + 1 \times 1$ or $20 + 45 + 48 + 77 + 72 + 40 + 8 + 6 + 2 + 1$ or 319	M1 *Ra*	or $5 \times 10 + 5 \times 9 + 7 \times 8 + 9 \times 7 + 7 \times 6 + 2 \times 5 + 2 \times 3 + 2 \times 2 + 1 \times 1$ or $50 + 45 + 56 + 63 + 42 + 10 + 6 + 4 + 1$ or 277 Total of at least 9 products shown or attempted with at least 5 of the products correct
	Harry $\rightarrow$ their $^{319}/_{500}$ and Maya $\rightarrow$ their $^{277}/_{400}$	M1 *Aa*	
	E.g. Harry $\rightarrow$ their $^{1276}/_{2000}$ and Maya $\rightarrow$ their $^{1385}/_{2000}$ and Maya or Harry $\rightarrow$ 63.8% and Maya $\rightarrow$ [69, 69.3]% and Maya	A2 *Ib* *Ib*	A1 Harry $\rightarrow$ their $^{1276}/_{2000}$ and Maya $\rightarrow$ their $^{1385}/_{2000}$ or Harry $\rightarrow$ 63.8% and Maya $\rightarrow$ [69, 69.3]% or A1ft Correct conclusion from their comparable proportions

	Additional Guidance
2(c)	**Comparing proportions A** (Alternative Method 5) Two or more (consecutive) scores combined and their proportions compared can score a maximum of 3 marks. **Comparing proportions B** (Alternative Method 6) All scores combined to give total scores for Harry and Maya and their proportions compared can score 4 marks. **Comparing modes** (Alternative Method 3) Can score a maximum of 2 marks **For A1ft** Alternative Methods 1 and 2 Must see a valid method for <u>both</u> means or <u>both</u> medians Alternative Methods 4 and 6 Must score M2

Q	Answer	Mark	Comments
3(a)	**Alternative Method 1**		
	760 ÷ 95 or 8 or 450 ÷ 95 or 4.(...) or 235 ÷ 95 or 2.(...)	M1 *Rb*	or 95 × 8 = 760 or 95 × 4 = 380 or 95 × 2 = 190
	their 8 × their 4 × their 2 or 8 and 4 and 2	M1 *Ia*	their 8 and their 4 and their 2 must be integers and rounded up or down
	64 and Yes	A2 *Ib* *Ib*	A1 64 A1ft Correct conclusion from their 64 obtained from the product of their three integers correctly rounded down

Q	Answer	Mark	Comments
3(a)	**Alternative Method 2**		
	760 ÷ 95 or 8 or 450 ÷ 95 or 4.(...) or 235 ÷ 95 or 2.(...)	M1 *Rb*	
	their 8 × their 4 or 32 and 60 ÷ their 2 or 30	M1 *Ia*	their 8 and their 4 and their 2 must be integers and rounded up or down e.g. 2 layers of 30
	or their 8 × their 2 or 16 and 60 ÷ their 4 or 15		
	or their 4 × their 2 or 8 and 60 ÷ their 8 or 7.5		
	30 and 32 and Yes or 16 and 15 and Yes or 8 and 7.5 and Yes	A2 *Ib* *Ib*	A1 30 and 32 or 16 and 15 or 8 and 7.5 A1ft Correct conclusion from their values rounded down
	Additional Guidance		
	For A1ft Must score M2		

Q	Answer	Mark	Comments
3(b)	80 × (0.)79 or 6320 or (£)63.2(0) or (120 – 80) ÷ 2 × 99 or 1980 or 19.8(0)	M1 *Rb*	
	their 63.2(0) + their 19.8(0)	M1 *Ra*	Must add two costs for > 1 of each box Can be in pence or £
	(£)83	A1 *Aa*	SC2 (£)100.80 SC1 (£)100.8
3(b) Check	80 × 80 + their 20 × 100 = 8400 or 80 × 0.8(0) + their 20 × 1 = 84	B1ft *Ab*	ft their cost(s)
3(b)	**Additional Guidance**		
	40 double boxes Can score SC2 or M2		
	80 × 0.79 + 40 × 0.94 = 100.8		M2A0
	£100.80 with no working		SC2
	100.8 with no working		SC1
	Checking mark for 40 double boxes		
	80 × 80 + 40 × 90 = 10000 or 80 × 0.8(0) + 40 × 0.9(0) = 100		B1ft

Q	Answer	Mark	Comments
3(c)	80 ÷ 5 (× 4) or 16 or 64	M1 *Rb*	
	4.5(0) × their 20 or 90 or 2.5(0) × their 64 or 160 or 1.25 × their 16 or 20	M1 *Rc*	Total income Allow 40 for their 20
	their 90 + their 160 + their 20 or 270	M1 *Aa*	Must be 3 incomes
	30 × 120 or (£)36	M1 *Ra*	Ingredient costs
	4.8(0) + 50 + their 36 (+ their 83) or 173.8(0)	M1 *Aa*	Adding costs Allow their cost of boxes not included
	their 270 – their 173.8(0)	M1 *Aa*	Profit
	96.2(0) and No or 3.8(0) less and No	A2 *Ib* *Ib*	ft their 83 from (b) A1 96.2(0) or 3.8(0) A1ft Correct conclusion from their 96.2(0)

3(c)	**Additional Guidance**	
	Using 40 instead of 20 Can award M6A2 if 40 used in (b) Can award M6A1ft if 40 is not used in (b)	
	Allow 4.5(0) × 40 or 180	2nd M1
	180 + their 160 + their 20 or 360	3rd M1
	4.8(0) + 50 + their 36 + their 100.8(0) or 191.6(0)	5th M1
	96.2(0) → 168.4(0) (and Yes)	A2 or A1ft
	Boxes not included Can award M6A1ft if the cost of their boxes from (b) has been forgotten This affects 5th M1 onwards	
	With 20 double boxes	
	4.8(0) + 50 + their 36 or 90.8(0)	5th M1
	their 270 – their 90.8(0)	6th M1
	179.2(0) and Yes	A1ft
	With 40 double boxes	
	4.8(0) + 50 + their 36 or 90.8(0)	5th M1
	their 360 – their 90.8(0)	6th M1
	269.2(0) and Yes	A1ft
	For A1ft Must score 3rd M1, 5th M1 and 6th M1	

Q	Answer	Mark	Comments
4(a)	57	B1 *Ra*	
	their 57 ÷ 4.2 or [13.5, 13.6]	M1 *Rb*	their 57 must be a total length
	14	A1ft *Ib*	ft B0M1 SC1 2 m → 1 (length) or 5 m → 2 (lengths) or 7 m → 2 (lengths) or 10 m → 3 (lengths) or 11 m → 3 (lengths) or 12 m → 3 (lengths)
	Additional Guidance		
	2nd M1 Allow trial and improvement. E.g. 12 × 4.2 = 50.4, 13 × 4.2 = 54.6, … Must see at least 3 trials or 14 × 4.2 = 58.8 **A1ft** Must round up If their 57 is a multiple of 4.2 (e.g. 42 or 63) can score B0M1A0 only **SC1** Look on diagram for number of lengths of individual sections		

Q	Answer	Mark	Comments
4(b)	13 or 9 or 22	B1 *Ra*	
	80 – their 22 or 58 and attempt to complete all 5 days closing times	M1 *Rb*	58 can be implied by 11.6 or 11 h 36 min Do not need am or pm
	All 5 closing times correct for their 58	A1ft *Aa*	ft B0 M1 Must see am or pm
	Additional Guidance		
	Latest closing time → 10 pm **Decimal times** For A1 assume, e.g., a time of 7.6 pm means 6 minutes past 7 An attempt to complete the table with 80 – their 22 or 58 seen scores M1 58 can be implied from 6.6 Five times of 6.36 pm in table scores B1M1A1 **Checking correct answer** If all closing times are given in pm and add up to 33 award B1M1A1 E.g. 7 pm, 7 pm, 5 pm, 7 pm and 7 pm (4 × 7 + 5 = 33) **Implied M1** M1 can be implied from the times in the table.		
	their 22 = 23 with neither 9 or 13 seen 80 – 23 (= 57) not seen but sum of pm times in table = 32	B0 M1A1ft	
	their 22 = 23 but 9 or 13 seen 80 – 23 (= 57) not seen but sum of pm times in table = 32	B1 M1A0	

Q	Answer	Mark	Comments
4(c)	**Alternative Method 1**		
	Attempt at total bottles or Attempt at total cost of fridges	M1 *Ra*	Must be for at least two fridges Must be total cost of all their fridges
	Attempt at total bottles and Attempt at total cost of fridges	M1 *Rc*	Must be for the same combination of fridges Must be total cost of all their fridges
	Attempt at total cost of display units	M1 *Aa*	Must be for at least two display units Must be total cost of all their display units
	Attempt at total cost of combination of at least 2 fridges and at least 5 display units	M1 *Aa*	
	Clearly communicated combination of at least 2 fridges and at least 5 display units with costs attempted	A1 *Ia*	Letters of fridges and display units must be seen
	Clearly communicated combination of at least 2 fridges with correct number of bottles given and ≥ 400	A1 *Ia*	
	Clearly communicated combination of at least 2 fridges and at least 2 display units with correct total cost given and between £3900 and £4100 inclusive	A1 *Ib*	

4(c)	Fully correct examples				
	Fridge A → 1 Fridge C → 3 420 bottles Unit X → 1 Unit Y → 4 £3970	Fridge A → 1 Fridge B → 1 410 bottles Unit Y → 6 £4065	Fridge B → 2 Fridge C → 1 610 bottles Unit Y → 5 £4015	Fridge A → 1 Fridge B → 1 410 bottles Unit X → 1 Unit Y → 4 £3925	Fridge A → 4 600 bottles Unit Y → 5 £3980

Q	Answer	Mark	Comments
4(c)	**Alternative Method 2**		
	Attempt at total bottles or attempt at total cost of fridges	M1 *Ra*	Must be for at least two fridges Must be total cost of <u>all</u> their fridges
	Attempt at total bottles and Attempt at total cost of fridges	M1 *Rc*	Must be for the same combination of fridges Must be total cost of <u>all</u> their fridges
	Attempt at difference between £3900 or £4100 and total cost of fridges	M1 *Aa*	Must be total cost of <u>all</u> their fridges
	Attempt to make up the difference with at least five display units	M1 *Aa*	
	Clearly communicated combination of at least 2 fridges and at least 5 display units with costs attempted	A1 *Ia*	Letters of fridges and display units <u>must</u> be seen
	Clearly communicated combination of at least 2 fridges with correct number of bottles given and ≥ 400	A1 *Ia*	
	Clearly communicated combination of at least 2 fridges and at least 2 display units with correct total cost given and between £3900 and £4100 inclusive	A1 *Ib*	

4(c)	Fully correct examples				
	Fridge A → 1 Fridge C → 3 420 bottles Unit X → 1 Unit Y → 4 £3970	Fridge A → 2 Fridge B → 2 480 bottles Unit X → 1 Unit Y → 4 £4100	Fridge B → 2 Fridge C → 1 610 bottles Unit Y → 5 £4015	Fridge A → 1 Fridge B → 1 410 bottles Unit X → 1 Unit Y → 4 £3925	Fridge A → 4 600 bottles Unit Y → 5 £3980

	Additional Guidance
4(c)	Start by checking their final answer with spread sheet. **No letters of fridges or display units** Can score M4 maximum Attempts do not need to give correct answers Use costs and/or numbers of bottles to identify the fridges and display units used **A marks** Can only be awarded if fridges and display units are identified by their letters Letters for fridges and display units need not be listed together