AQA

FUNCTIONAL SKILLS CERTIFICATE
Functional Mathematics

Level 2

Mark Scheme

4368

November 2016

Version: 1.0 Final

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)	their 270 ÷ 0.5 or their 270 × 2 or 540 or their 24 ÷ 0.3 or 80	M1 *Ra*	
	540 or 620	A1 *Rc*	
	200 + 15 × 2 or 230	M1 *Aa*	
	100 + 100 + 100 + their 230	M1 *Aa*	Allow one error but must include 4 exits only - **not** the 1250 mm exit
	530	A1 *Rc*	
	Clearly identifies the lower of their 540 or 620 and their 530	A1ft *Ib*	ft from 1st and 3rd M marks
1 (b)	600 – 3 × 80 or 600 – 240 or 360	M1 *Ra*	

Q	Answer	Mark	Comments
	their 360 ÷ (5 + 4) × 5 or 40 × 5 or 200 or their 360 ÷ (5 + 4) × 4 or 40 × 4 or 160	M1 *Rc*	
	Liz → £200 and Omar → £160	A1 *Ia*	Must see £ symbol and names SC2 Liz → £333.33 and Omar → £267.67 SC1 333.33 and 267.67
Check	their 200 ÷ 5 = 40 and their 160 ÷ 4 = 40 or their 200 ÷ 40 = 5 and their 160 ÷ 40 = 4 or 200 : 160 = 5 × 40 : 4 × 40	B1ft *Ab*	
	Additional Guidance		
	To award the mark for the check must show a clear understanding of ratio		

1 (c)	**Alternative method 1**		
	70 ÷ 40 or 1.75 or 1 hour 45 minutes	M1 *Ra*	

Q	Answer	Mark	Comments	
	their 1 hour 45 minutes + 50 minutes or 2 hours 35 minutes	M1 *Aa*	5.30 + their 1 hour 45 minutes or 7.15	
	5.30 + their 2 hours 35 minutes	M1 *Rc*	their 7.15 + 50 minutes	8.00 – 50 minutes
	8.05 and No or 7.15 and 7.10 and No	A2 *Ib*	A1 8.05 or 7.15 and 7.10 or A1ft correct decision for their values (only if M3 scored)	
	Alternative method 2			
	70 ÷ 40 or 1.75 or 1 hour 45 minutes	M1 *Ra*		
	their 1 hour 45 minutes + 50 minutes or 2 hours 35 minutes	M1 *Aa*	8.00 – 50 minutes or 7.10	
	8.00 – their 2 hour 35 minutes	M1 *Rc*	their 7.10 – their 1 hour 45 minutes	5.30 + their 1 hour 45 minutes
	5.25 and No or 7.15 and 7.10 and No	A2 *Ib*	A1 5.25 or 7.15 and 7.10 or A1ft correct decision for their values (only if M3 scored)	
1(c)	**Alternative method 3**			
	70 ÷ 40 or 1.75 or 1 hour 45 minutes	M1 *Ra*		
	their 1 hour 45 minutes + 50 minutes	M1		

Q	Answer	Mark	Comments
	or 2 hours 35 minutes	*Act*	
	8.00 – 5.30 or 2 hours 30 minutes	M1 *Rc*	
	2 hours 35 minutes and 2 hours 30 minutes and No	A2 *Ib*	A1 2 hours 35 minutes and 2 hours 30 minutes or A1ft correct decision for their values (only if M3 scored)

Additional Guidance
Other alternatives There are other alternative mark schemes, e.g. showing that the actual speed to arrive on time > 40 mph Arrival time 7.10 Journey time 1 hour 40 minutes (1.66 … hours) Required speed 70 ÷ 1.66 … = 42 mph **Decimal times** Students who convert between a time as a decimal to hours and minutes incorrectly (or vice versa) can score method marks only. e.g. their 1.75 hours = 2 hours 15 minutes from 1.75 hours → 1 hour 75 minutes e.g 1.75 hours + 50 minutes = 2 hours 25 minutes from 1.75 + 0.50 → 2.25

Q	Answer	Mark	Comments
2 (a)	560	B1 *Aa*	

2 (b)	**Alternative method 1**		
	300 ÷ 750 or $\frac{2}{5}$ or 0.4	M1 *Ra*	or 750 ÷300 or 2.5
	their $\frac{2}{5}$ × 60 or their 0.4 × 60	M1 *Rc*	or 60 ÷ 2.5
	24	A1 *Aa*	
	Alternative method 2		
	750 ÷ 60 or 12.5	M1 *Ra*	calories per minute
	300 ÷ their 12.5	M1 *Rc*	
	24	A1 *Aa*	
Check	reverse or alt method e.g. 24 ÷ 60 × 750 = 300 or 300 ÷ 24 × 60 = 750 or 24 × 12.5 = 300 and 60 × 12.5 = 750	B1ft *Ab*	
2 (b)	**Additional Guidance**		
	Misread Award a maximum of M2 for any other value from table used instead of 750, eg 840 ÷ 60 = 14 300 ÷ 14 21.4	 M1 M1 A0	
	Award marks for main question if working/answer seen in Check		

<table>
<tr><th>Q</th><th>Answer</th><th>Mark</th><th>Comments</th></tr>
<tr><td rowspan="9">2 (c)</td><td>works out correct calories for given time for one machine</td><td>B1
Aa</td><td>any time for any machine
level can be omitted</td></tr>
<tr><td>attempts to work out calories for each of three or four different machines compatible with specified level and time</td><td>B1
Aa</td><td>level and time must be given – level can be implied from calories per hour
either level except for stair climber which must be at level 1
must use a correct method but allow numerical slips</td></tr>
<tr><td>between 5 and 20 minutes on all machines chosen</td><td>B1
Ia Ia</td><td>must be at least 3 machines</td></tr>
<tr><td>their total calories for all machines chosen between 850 and 1000</td><td>B1ft
Ia Ia</td><td>ft correct method for calories only
does not need to be given
must be at least 3 machines</td></tr>
<tr><td>total time 60 minutes</td><td>B1
Aa</td><td>does not need to be given
must be 4 machines</td></tr>
<tr><td>fully correct plan clearly communicated using all four machines</td><td>B2
Ia Ia</td><td>B1 plan using all four machines with up to two errors/omissions</td></tr>
<tr><td colspan="3">Additional Guidance</td></tr>
<tr><td colspan="3">
<table>
<tr><td>Treadmill</td><td>Level 2</td><td>15 min</td><td>225 calories</td></tr>
<tr><td>Bike</td><td>Level 2</td><td>20 min</td><td>280 calories</td></tr>
<tr><td>Stair climber</td><td>Level 1</td><td>10 min</td><td>160 calories</td></tr>
<tr><td>Rower</td><td>Level 2</td><td>15 min</td><td>262.5 calories</td></tr>
<tr><td colspan="2">Totals</td><td>60 min</td><td>927.5 calories</td></tr>
</table>
For fully correct plan (for B2) must see
Use of at least one of each machine
all times between 5 minutes and 20 minutes (inclusive)
levels for each machine with Level 1 for the stair climber
all times totalling 60 minutes (total need not be given)
correct calories for each machine (compatible with time and level)
correct total calories between 850 and 1000 (total need not be given)
Examples of errors and omissions
number of calories incompatible with level and/or time
one Level missing or Stair climber used at Level 2
total time not 60 minutes
total calories out of given range
Wrong method for calculating calories (all machines) can score B0B0B1B0B1B0 max
Not giving levels (all machines) can score B1B0B1B1B1B0 max
Not giving levels or times can score 1st B1 only
Using stair climber at Level 2 can score B1B1B1B1B1B1
</td></tr>
</table>

Q	Answer	Mark	Comments
2 (d)	30 × 2.5 or 30 + 30 + 15 or 75	M1 *Ra*	
	180 ÷ 4 or 45	M1 *Rb*	
	their 75 + their 45 + 112 or 250 – their 75 – their 45 – 112	M1 *Aa*	can be implied from correct totals
	75 + 45 + 112 = 232 or 250 – 75 – 45 – 112 = 18	A1 *Ib*	
	Additional Guidance		
	Award 4 marks if 232 seen with no working		

Q	Answer	Mark	Comments
3 (a)	any one of patio, vegetable patch, lawn, path or flower bed shown with correct size but not necessarily in correct position	B1 *Ra*	Labels not necessary Patio → 10 cm by 3 cm Vegetable patch → 10 cm by 1 cm Lawn → 10 cm by 8 cm Path → 10 cm by 1 cm Lawn → circle radius 2 cm
	any two of patio, vegetable patch, lawn, path or flower bed shown with correct sizes but not necessarily in correct position	B1 *Rb*	
	patio, vegetable patch, lawn and path shown with correct sizes and positions	B1 *Aa*	
	circular flower bed shown within or at edge of lawn – can be any radius	B1 *Aa*	
	patio, vegetable patch, lawn, path and circular flower bed with correct sizes, in correct position and labelled correctly	B1 *Ia*	
	Additional Guidance		
	Allow freehand attempt at circle for 4th B1 but not 5th B1 Diagram with front and back reversed can score B1B1B0B1B1 Allow 'horizontal vegetable patch' with ends touching fence		

3 (b)	**Alternative method 1**

Q	Answer		Mark	Comments
	15 × 4.5 or 67.5		M1 *Ra*	
	their 67.5 ÷ 7.4 or [9.1, 9.122] or their 67.5 ÷ 8.6 or [7.8, 7.85]		M1 *Rb*	
	their 10 × 128.50 or 1285 or their 8 ×139.75 or 1118		M1 *Ia*	their 10 must be from their [9.1, 9.122] their 8 must be from their [7.8, 7.85] both must be rounded up to an integer
	their 1285 – their 1118		M1 *Aa*	or 1285 – 175 or 1118 + 175
	167 and No or 1110 and 1118 and No or 1293 and 1285 and No		A2 *Ib Ib*	A1 167 or 1110 and 1293 or A1ft correct decision for their values (only if 1st and 4th M marks scored)
	Alternative method 2			
	15 × 4.5 or 67.5		M1 *Ra*	
	their 67.5 ÷ 7.4 or [9.1, 9.122] or their 67.5 ÷ 8.6 or [7.8, 7.85]		M1 *Rb*	or 10 × 7.4 or 8 × 8.6
	their 10 × 128.50 – 175 or 1110	their 10 × 128.50 – 175 or 1110	M1 *Ia*	their 10 must be from their [9.1, 9.122] their 8 must be from their [7.8, 7.85] both must be rounded up to an integer
	their 1110 ÷ 8	their 1110 ÷ 139.75	M1 *Aa*	
	138(.75) or 139 and No	7.9(4 …) and No	A2 *Ib Ib*	A1 138(.75) or 139 or 7.9(4 …) A1ft correct conclusion for their values (only if 1st and 4th M marks scored)

3(b)	Additional Guidance	
	Example (common error) 15 × 4.5 = 67.5	M1

Q	Answer	Mark	Comments
	$8.6^2 = 73.96 \rightarrow 74$ boxes and $7.42 = 54.76 \rightarrow 55$ boxes	M0	
	1 × 139.75 = 139.75 and 2 × 128.50 = 257 257 – 139.75 = 117.25 No	M0 M1 A1ft	
	Example (another common error) 15 + 4.5 = 19.5 19.5 ÷ 8.6 = 2.23 and 19.5 ÷ 7.4 = 2.64 3 × 139.75 = 419.25 and 3 × 128.50 = 385.50 419.25 – 385.50 = 33.75 No	 M0 M1 M1 M1 A1ft	
	Failing to round up the number of boxes can score M1M1M0M1A1ft		

3 (c)	50 (cm)		B1 *Aa*	
	246 300 × their 50 or 12 315 000		M1 *Rb*	allow digits 12315
	their 12 315 000 ÷ 1000 or 12 315	their 12 315 000 ÷ 800 or 15 393.75	M1 *Rc*	or 800 × 1000 or 800 000
	their 12 315 ÷ 800 or 15.3(9...) or 15.4	their 15 393.7 ÷ 1000 or 15.3(9...) or 15.4	M1 *Aa*	or their 12 315 000 ÷ 800 000 or 15.3(9...) or 15.4
	16		A1 *Ib*	
	Additional Guidance			
	Multiplying by their 50 can be done at any stage in the calculation			

4 (a)	2 × 1 (+) 3 × 4 (+) 4 × 9 (+) 5 × 12 (+) 6 × 12 (+) 7 × 15 (+) 8 × 33 (+) 9 × 698 (+) 10 × 512 or 2 (+) 12 (+) 36 (+) 60 (+) 72 (+) 105 (+) 264 (+) 6282 (+) 5120	M1 *Ra*	at least 4 correct

Q	Answer	Mark	Comments
	2 × 1 + 3 × 4 + 4 × 9 + 5 × 12 + 6 × 12 + 7 × 15 + 8 × 33 + 9 × 698 + 10 × 512 or 2 + 12 + 36 + 60 + 72 + 105 + 264 + 6282 + 5120 or 11 953	M1 *Ra*	allow two errors
	their 11 953 ÷ 1296 or [9.2, 9.23]	M1 *Rc*	
	[92, 92.3]	A1ft *Aa*	ft their [9.2, 9.23] can be implied from plotted point
	their [92, 92.3] plotted for July ± ½ small square	B1ft *Aa*	SC2 correct value plotted with no or incomplete working

4 (b)	Full description e.g. rating increases by about their 11% rating increases (from 81%) to their 92%	B2ft *Ib Ib*	B1 Part description e.g. rating increases ft their 4(a)
	Additional Guidance		
	Mark from answer in 4(a) working space if point not plotted on graph Mark positively if answer in 4(a) working space is incompatible with graph Award B1 for 'rating increases' oe without evidence or with incompatible evidence in 4(a)		

Q	Answer	Mark	Comments
4 (c)	**Alternative method 1**		
	678 + 411 or 1089 or 12 + 18 + 56 + 54 or 140	M1 *Ra*	happy and unhappy customers
	their 1089 ÷ 1296 (× 100) or 0.84 or 84.0 or their 140 ÷ 1296 (× 100) or [0.108, 0.109] or [10.8, 10.9]	M1 *Aa*	
	73.2 or 73 and No or 0.732 or 0.73 and 0.75 and No	A2 *Ib*	A1 73.2 or 73 or 0.732 or 0.73 and 0.75 or A1ft correct conclusion for their values (only if M2 scored)
	Alternative method 2		
	1296 ÷ 100 × 75 or 972	M1 *Aa*	
	(678 + 411) – (12 + 18 + 56 + 54) or 1089 – 140 or 949	M1 *Ra*	
	972 and 949 and No	A2 *Ib*	A1 972 and 949 or A1ft correct conclusion for their values (only if M2 scored)

4(c)	**Alternative method 3**

Q	Answer	Mark	Comments
	678 + 411 or 1089 or 12 + 18 + 56 + 54 or 140	M1 *Ra*	happy and unhappy customers
	(their 1089 – their 140) ÷ 1296 (× 100) or 949 ÷ 1296 (× 100) or 0.732 or 0.73	M1 *Ra*	
	73.2 or 73 and No or 0.732 or 0.73 and 0.75 and No	A2 *Ib*	A1 73.2 or 73 or 0.732 or 0.73 and 0.75 or A1ft correct conclusion for their values (only if M2 scored)

	Additional Guidance	
4(c)	**Example** (common error - rounding 10.8% down to 10) 1089 and 140 0.84 = 84% and 0.108 = 10% 74% and No	 M1 M1 A1ft
	Any answer that does not include the conversion to or from a % → M1 max	

	Alternative method 1		
4 (d)	55 ÷ 100 × 1128 or 620(.4)	M1 *Ra*	

Q	Answer	Mark	Comments
	620(.4) and No	A1 *Ib*	
	Alternative method 2		
	615 ÷ 1128 (× 100)	M1 *Ra*	
	54(.5 …) and No	A1 *Ib*	
	Alternative method 3		
	615 ÷ (55 ÷ 100) or 1118 …	M1 *Ra*	
	1118 … and No	A1 *Ib*	