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Mark scheme

January 2023

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 Examiner.

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

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Glossary for Mark Schemes

Functional Skills examinations are marked in such a way as to award positive achievement wherever possible. Thus, for Functional Skills Mathematics papers, marks are awarded under various categories.

If a student uses a method which is not explicitly covered by the mark scheme the same principles of marking should be applied. Credit should be given to any valid methods. Examiners should seek advice from their senior examiner if in any doubt.

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 for correct working following a mistake in an earlier step.
SC	Special case. Marks awarded for a common misinterpretation which has some mathematical worth.
M dep	A method mark dependent on a previous method mark being awarded.
B dep	A mark that can only be awarded if a previous independent mark has been awarded.
oe	Or equivalent. Accept answers that are equivalent. eg accept 0.5 as well as $\frac{1}{2}$
[a, b]	Accept values between a and b inclusive.
[a, b)	Accept values $a \leq \text{value} < b$
3.14 ...	Accept answers which begin 3.14 eg 3.14, 3.142, 3.1416
Use of brackets	It is not necessary to see the bracketed work to award the marks.

Examiners should consistently apply the following principles.

Diagrams

Diagrams that have working on them should be treated like normal responses. If a diagram has been written on but the correct response is within the answer space, the work within the answer space should be marked. Working on diagrams that contradicts work within the answer space is not to be considered as choice but as working, and is not, therefore, penalised.

Responses which appear to come from incorrect methods

Whenever there is doubt as to whether a student has used an incorrect method to obtain an answer, as a general principle, the benefit of doubt must be given to the student. In cases where there is no doubt that the answer has come from incorrect working then the student should be penalised.

Questions which ask students to show working

Instructions on marking will be given but usually marks are not awarded to students who show no working.

Questions which do not ask students to show working

As a general principle, a correct response is awarded full marks.

Misread or miscopy

Students often copy values from a question incorrectly. If the examiner thinks that the student has made a genuine misread, then only the accuracy marks (A or B marks), up to a maximum of 2 marks are penalised. The method marks can still be awarded.

Further work

Once the correct answer has been seen, further working may be ignored unless it goes on to contradict the correct answer.

Choice

When a choice of answers and/or methods is given, mark each attempt. If both methods are valid then M marks can be awarded but any incorrect answer or method would result in marks being lost.

Work not replaced

Erased or crossed out work that is still legible should be marked.

Work replaced

Erased or crossed out work that has been replaced is not awarded marks.

Premature approximation

Rounding off too early can lead to inaccuracy in the final answer. This should be penalised by 1 mark unless instructed otherwise.

Continental notation

Accept a comma used instead of a decimal point (for example, in measurements or currency), provided that it is clear to the examiner that the student intended it to be a decimal point.

Section A

Q	Answer	Mark	Comments			
1	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td style="width: 30px; height: 30px;"></td> <td style="width: 30px; height: 30px;"></td> <td style="width: 30px; height: 30px;"></td> </tr> </table>				B1	

Q	Answer	Mark	Comments
2	Two million three hundred (and) seven thousand (and) forty nine	B1	
	Additional Guidance		
	Ignore punctuation and spelling		

Q	Answer	Mark	Comments
3	Alternative method 1		
	0.614 with 0.121 and 0.114 seen or 0.614 with 0.121 and 0.621 seen or 0.614 with 0.114 and 0.386 seen	B2	oe comparison B1 0.121 or 0.114
	Alternative method 2		
	$\frac{0.379 + 0.614}{2}$ or 0.4965	M1	
	0.614 with 0.4965 seen	A1	
	Additional Guidance		
	Allow negative values for the differences		
	In alt 1 for B2 accept correctly rounded values if a decision can still be made		

Q	Answer	Mark	Comments
4	$4 \times \pi \times 2.3^2$	M1	oe eg $\pi 4 \times 2.3^2$
	[66.4, 66.5] or 21.16π	A1	oe eg $\frac{529}{25} \pi$
	cm^2	B1	accept square centimetres
	Additional Guidance		
	Accept units in the body of the work if not contradicted on answer line		

Q	Answer	Mark	Comments
5	A cross or dot or indication at (0, 1)	B1	oe eg vertex of right-angled triangle to find midpoint
	(0, 1)	B1ft	ft their plotted point which must be on the line
	Additional Guidance		
	Accept clear indication of point if not labelled as C		
	(0, 1) on answer line but not plotted or plotted incorrectly		B0B1
	A cross at (0, 1) and (1, 0) on answer line		B1B0

Q	Answer	Mark	Comments
6	Any two of 70, 270 and 180	M1	implied by 520
	(their 70 + their 270 + their 180) ÷ 20 or 520 ÷ 20	M1dep	
	26	A1	ignore rounding eg to 30 if 26 seen
	Additional Guidance		
	Up to M1 may be awarded for correct work, with no answer, or incorrect answer, even if this is seen amongst multiple attempts		
	Brackets not recovered can score maximum M1 eg $70 + 270 + 180 \div 20 = 349$ (no brackets used)		M1

Section B

Q	Answer	Mark	Comments
7(a)	Alternative method 1		
	$29 \div (7 + 1)$ or $3(\dots)$	M1	oe
	$29 - \text{their } 3$ or 26	M1dep	
	$\text{their } 26 \times 4.99$ or 129.74	M1	their 26 must be an integer
	$29 \times 4.25 + 3.90$ or 127.15	M1	
	(£)129.74 and (£)127.15 and Bags and stuff	A1	
	Alternative method 2		
	29×4.99 or 144.71	M1	
	$29 \div (7 + 1)$ or $3(\dots)$	M1	oe
	$\text{their } 144.71 - \text{their } 3 \times 4.99$ or 129.74	M1dep	dep on M2
	$29 \times 4.25 + 3.90$ or 127.15	M1	
	(£)129.74 and (£)127.15 and Bags and stuff	A1	
	Alternative method 3		
	7×4.99 or 34.93	M1	oe
	$3 \times \text{their } 34.93$ or 104.79	M1dep	oe $7 \times 3 \times 4.99$ oe is M2
	$\text{their } 104.79 + 5 \times 4.99$ or 129.74	M1dep	
	$29 \times 4.25 + 3.90$ or 127.15	M1	
	(£)129.74 and (£)127.15 and Bags and stuff	A1	
	Additional Guidance		
	Common error dividing by 7 not 8 eg $29 \div 7 = 4.(1)$ $25 \times 4.99 = 124.75$ $29 \times 4.25 + 3.90 = 127.15$ he should choose Best book bags		M0M0M1 M1A0

Q	Answer	Mark	Comments
7(b)	Alternative method 1		
	$\pi \times 7^2 \times 25 \times \frac{3}{5}$	M2	oe M1 $\pi \times 7^2 \times 25$ or 1225π or [3846, 3849] or $25 \div 5 \times 3$ or 15
	[2307, 2309.4]	A1	may be implied
	40 × their [2307, 2309.4] ($\div 1000$) or [92280, 92376] or [92.2, 92.4]	M1	oe their [2307, 2309.4] must come from using at least two of π , 7 and 25 or π , 7, and 15
	$13 \times 6 (\times 1000)$ or 78 or 78000	M1	
	78 and [92.2, 92.4] and No or 78000 and [92280, 92376] and No	A1ft	ft their [2307, 2309.4] which must come from using at least two of π , 7 and 25 or π , 7, and 15
	Alternative method 2		
	$\pi \times 7^2 \times 25 \times \frac{3}{5}$	M2	oe M1 $\pi \times 7^2 \times 25$ or 1225π or [3846, 3849] or $25 \div 5 \times 3$ or 15
	[2307, 2309.4]	A1	may be implied
	$13 \times 6 (\times 1000)$ or 78 or 78000	M1	
	13 × 6 × 1000 ÷ their [2307, 2309.4] or 33.(...) or $13 \times 6 \times 1000 \div 40$ or 1950	M1	oe their [2307, 2309.4] must come from using at least two of π , 7 and 25 or π , 7, and 15
	33.(...) and No or [2307, 2309.4] and 1950 and No	A1ft	ft their [2307, 2309.4] which must come from using at least two of π , 7 and 25 or π , 7, and 15

Mark scheme and Additional guidance continue on the next page

7(b) cont	Alternative method 3		
	$\pi \times 7^2 \times 25 \times \frac{3}{5}$	M2	oe M1 $\pi \times 7^2 \times 25$ or 1225π or [3846, 3849] or $25 \div 5 \times 3$ or 15
	[2307, 2309.4]	A1	may be implied
	40 × their [2307, 2309.4] ÷ 1000 or [92.2, 92.4]	M1	oe their [2307, 2309.4] must come from using at least two of π , 7 and 25 or π , 7, and 15
	[92.2, 92.4] ÷ 13 or [7.09,7.11] or their [92.2, 92.4] ÷ 6 or [15.3,15.4]	M1dep	oe
	[7.09,7.11] and No or [15.3,15.4] and No	A1ft	ft their [2307, 2309.4] which must come from using at least two of π , 7 and 25 or π , 7, and 15
	Additional Guidance		
$0.6 \times 49 \pi = 92.362$		M0	

Q	Answer	Mark	Comments
8(a)	Alternative method 1		
	$5 \div 9 \times (80 - 32)$ or 26.6... or 26.7	M2	oe M1 $5 \div 9 \times (75 - 32)$ or 23.(...) or $5 \div 9 \times (81 - 32)$ or 27.(...) or $5 \div 9 \times (87 - 32)$ or 30.(...)
	9(am) and 26.6... or 9 (am) and 26.7	A1	
	Alternative method 2		
	$26 \times 9 \div 5$ or 46.8	M1	oe
	their $46.8 + 32$ or 78.8	M1	
	9 (am) and 78.8	A1	

Q	Answer	Mark	Comments
8(b)	$90 \div (3 + 2)$ or $90 \div 5$ or 18	M1	oe
	their 18×2 or 36	M1dep	$\frac{2}{5} \times 90$ is M2
	their $36 \div 10$ or 3.6	M1dep	oe
	4 with no incorrect working or values seen	A1	
	Additional Guidance		
	Incorrect method leading to 4 does not score eg 90 is 50 adults 40 children so 4 lifeguards		

Q	Answer	Mark	Comments
9(a)	Alternative method 1		
	$39 \times \frac{1}{6}$ or 6.5(0)	M1	oe eg $39 \div 6$
	$324 \div 12$ or 27	M1	oe
	$3090 \div 12 - 235$ or 22.5(0)	M1	
	their 6.5(0) + their 27 + their 22.5(0) – 25 or 31	M1dep	oe dep on M3
	31 and No	A1	
	Alternative method 2		
	$39 \times \frac{7}{6}$ or $39 + 39 \times \frac{1}{6}$ or 45.5(0)	M1	oe
	$68 + 324 \div 12$ or 95	M1	oe
	$3090 \div 12$ or 257.5(0)	M1	
	their 45.5(0) + their 95 + their 257.5(0) or 398 or their 45.5(0) + their 95 + their 257.5(0) – 25 – 39 – 68 – 235 or 31	M1dep	oe dep on M3
	398 and 367 and No or 31 and No	A1	

Mark scheme and Additional guidance continue on the next page

9(a) cont	Alternative method 3		
	$39 \times \frac{1}{6}$ or 6.5(0)	M1	oe eg $39 \div 6$
	$324 \div 12$ or 27	M1	oe
	$3090 \div 12 - 235$ or 22.5(0)	M1	
	their 6.5(0) + their 27 + their 22.5(0) or 56 and 25 + 30 or 55	M1dep	dep on M3
	56 and 55 and No	A1	
	Alternative method 4		
	$39 \times \frac{7}{6}$ ($\times 12$) or $39 + 39 \times \frac{1}{6}$ ($\times 12$) or 45.5(0) ($\times 12$) or 546	M1	oe
	$68 \times 12 + 324$ or $816 + 324$ or 1140	M1	oe
	their 45.5(0) $\times 12$ + their 1140 + 3090 or 4776	M1dep	oe dep on M2
	their 4776 – (25 + 39 + 68 + 235) $\times 12$ or their 4776 – 4404 or 372 and 12×30 or 360	M1dep	oe dep on M3
	360 and 372 and No	A1	
	Additional Guidance		
	Values may be combined in slightly different ways to compare eg in Alt 1 the £30 may be subtracted instead of 25 and the result of 26 compared with 25		
	Allow 0.16 or better for $\frac{1}{6}$		
Use the alt that favours the student			

Q	Answer	Mark	Comments
9(b)	Alternative method 1		
	1.012 seen	M1	oe implied by 247 940
	245 000 × 1.012 ² or 250 915.28	M1	oe eg 247 940 × 1.012
	250 915.(28) and Yes or 915.(28) over	A1	
	Alternative method 2		
	245 000 × 0.012 or 2940 or 245 000 + 2940 or 247 940	M1	oe implied by 250 880 or 5880
	their 247 940 + their 247 940 × 0.012 or their 247 940 + 2975.28 or 250 915.(28)	M1dep	oe
	250 915.(28) and Yes or 915.(28) over/left	A1	

Q	Answer	Mark	Comments	
9(c)	Comment on the trend in context eg as the temperature increases the number of hedgehogs rescued decreases or as the temperature decreases the number of hedgehogs rescued increases	B1		
	Additional Guidance			
	Comment of negative correlation on its own is insufficient for the B mark		B0	
	When its cold they rescue a lot of hedgehogs		B0	
	When its colder they rescue more hedgehogs		B1	
	Ignore extra irrelevant statements if non-contradictory			

Q	Answer	Mark	Comments	
9(d)	Appropriate line of best fit which would pass through $(-3, [35, 45])$ and $(5, [8, 15])$ and extends horizontally from at least -2 to 4	B1	intended single straight line	
	Draws a vertical line from -2 or 4 to their line of best fit	M1	implied by mark at the correct place on their line of best fit or on the vertical axis or the correct reading from their line of best fit their line of best fit must be decreasing throughout allow a curve or dotted line but not zig-zags	
	Correct readings from their line of best fit at $x = -2$ and $x = 4$	A1ft	$\pm \frac{1}{2}$ a small square ft their line of best fit which must be decreasing throughout allow a curve or dotted line but not zig-zags	
	Correct difference in temperature for their two readings.	A1ft	ft their readings	
	Additional Guidance			
	For the accuracy mark $\pm \frac{1}{2}$ a small square is taken to be from the correct readings on the vertical axis for their line of best fit using -2 and 4 on the horizontal axis			
	No line of best fit drawn			B0M0A0A0
	Taking readings from $x = -2$ and $x = -4$ is to be treated as a misread. A maximum of 3 marks can be scored using the scheme with the first A1 withheld			B1M1A0 A1ft

Q	Answer	Mark	Comments	
10(a)	3900 ÷ 65 or 60	M1		
	1540 ÷ 35 or 44	M1		
	60 and 44	A1		
	(their 60 – their 44) ÷ their 44 (× 100) or 0.36... (× 100) or 36.(...)% or their 60 ÷ their 44 (× 100) or 1.36... (× 100) or 136.(...)% or their 44 × 1.32 or 58.(...) or their 44 × 0.32 or 14.(...)	M1	oe	
	36.(...)% and Yes or 136.(...)% and Yes or 58.(...) and 60 and Yes or 14.(..) and 16 and Yes or [45.9, 46] and 44 and Yes	A1ft	ft their 60 and 44	
	Additional Guidance			
	eg answers 65 and 35 for number of washes $65 - 35 = 30$, $30 \div 35 \times 100 = 85$ Yes			M0M0A0M1 A1ft
	The final two marks are independent of the first three marks eg using 3900 and 1540 for number of washes $1540 \times 0.32 = 492.8$ $1540 + 492.8 = 2032(.8)$ and Yes			M0M0A0M1 A1ft
	Ignore attempt to also calculate 32% of their 60 but decision must clearly be using 32% of their 44 If only 32% of 60 is found (without 32% of 40) then the final two marks cannot be awarded			

Q	Answer	Mark	Comments
10(b)	11×10 or 110	M1	
	$\pi \times 3^2$ or [28.2, 28.3] or 9π	M1	oe implied by [7.06, 7.1]
	their 110 – their [28.2, 28.3] \div 4 or [102.9, 103]	M1dep	oe dep on M2
	their [102.9, 103] \div 15 or 6.8(6...) or 6.87 or 7(bottles)	M1	oe their [102.9, 103] > 15
	their 6.86 rounded up to the nearest integer \times 1.95	M1dep	dep on previous M1
	13.65 with [102.9, 103] seen	A1	correct money notation
	Additional Guidance		
Using the incorrect formula for a circle may lead to an answer of 13.65 but can score a maximum of 3 marks eg $11 \times 10 = 110$ $3 \times 3 = 9$ $110 - 9 = 101$ $101 \div 15 = 6.7$ so 7 bottles $7 \times 1.95 = 13.65$			M1 M0 M0 M1 M1A0

Q	Answer	Mark	Comments
10(c)	Alternative method 1 – works in ml with vinegar first		
	0.45×700 or 315	M1	oe implied by 31 may be implied by 385
	0.5×568 or 284	M1	oe
	their 315 – their 284 or 31	M1dep	dep on M2
	$700 -$ their 315 or 385	M1	oe their 315 must come from an attempt to use 45% and 700
	Vinegar = 31 Water = 385	A1	
	ml on both	B1	consistent with the units they are working in
	Alternative method 2 – works in ml with water first		
	$1 - 0.45$ or 0.55	M1	oe eg 55%
	$(1 - 0.45) \times 700$ or 0.55×700 or 385	M1	oe
	0.5×568 or 284	M1	oe
	$700 -$ their 385 – their 284 or 31	M1	oe dep on M3
	Vinegar = 31 Water = 385	A1	
	ml on both	B1	consistent with the units they are working in

Mark scheme and Additional guidance continue on the next page

10(c) cont	Alternative method 3 – works in pints		
	$700 \div 568$ or 1.23...	M1	
	$0.45 \times$ their 1.23 or [0.554,0.555]	M1dep	oe
	their [0.554,0.555] – 0.5 or 0.05...	M1dep	dep on previous M1
	$(1 -$ their 0.45) \times their 1.23 or 0.67... or their 1.23 – their [0.554,0.555] or 0.67... or 0.68	M1dep	oe dep on first M1
	Vinegar = 0.05... (more) Water = 0.6765 or 0.68	A1	
	Pints on both	B1	consistent with the units they are working in
	Alternative method 4 – different units		
	0.45×700 or 315	M1	oe
	700 – their 315 or $(1 -$ their 0.45) $\times 700$ or 385	M1dep	oe
	their 315 $\div 568$ or [0.554,0.555]	M1dep	
	their [0.554,0.555] – 0.5 or 0.05...	M1dep	
	Vinegar = 0.05... (more) Water = 385	A1	
	Pints for vinegar and ml for water	B1	consistent with the units they are working in
	Additional Guidance		
	Students may use a mix of Alt methods. Award the marks that favour the student		



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