Free-Standing Mathematics Qualification

MATHEMATICS

4986 – Data Handling
Mark scheme

4986
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Version/Stage: 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

Key to mark scheme abbreviations

M	mark is for method
m or dM	mark is dependent on one or more M marks and is for method
A	mark is dependent on M or m marks and is for accuracy
B	mark is independent of M or m marks and is for method and accuracy
E	mark is for explanation
√or ft or F	follow through from previous incorrect result
CAO	correct answer only
CSO	correct solution only
AWFW	anything which falls within
AWRT	anything which rounds to
ACF	any correct form
AG	answer given
SC	special case
OE	or equivalent
A2,1	2 or 1 (or 0) accuracy marks
–*x* EE	deduct *x* marks for each error
NMS	no method shown
PI	possibly implied
SCA	substantially correct approach
c	candidate
sf	significant figure(s)
dp	decimal place(s)

No Method Shown

Where the question specifically requires a particular method to be used, we must usually see evidence of use of this method for any marks to be awarded.

Where the answer can be reasonably obtained without showing working and it is very unlikely that the correct answer can be obtained by using an incorrect method, we must award **full marks**. However, the obvious penalty to candidates showing no working is that incorrect answers, however close, earn **no marks**.

Where a question asks the candidate to state or write down a result, no method need be shown for full marks.

Where the permitted calculator has functions which reasonably allow the solution of the question directly, the correct answer without working earns **full marks**, unless it is given to less than the degree of accuracy accepted in the mark scheme, when it gains **no marks**.

Otherwise we require evidence of a correct method for any marks to be awarded.

Q	Solution	Mark	Total	Comment
1(a)	cf numbers 7, 28, 43, 56, 67, 72 Points plotted at end of groups Correct heights and points joined by curve or straight lines	B1 B1 B1ft	3	implied by correct graph ± ½ square ± ½ square for heights ft their cf if graph does not turn down
1(b)(i)	Correct reading from cf 18 or 18.5	B1ft	1	± ½ square
1(b)(ii)	Correct reading from cf 36 or 36.5	B1ft	1	± ½ square
1(b)(iii)	Correct reading from cf 54 or 54.5	B1ft	1	± ½ square
1(c)	Quartiles correct and box drawn Median correct End lines correct and whiskers drawn	B1ft B1ft B1	3	ft their quartiles ft their median 0 for lowest value 137 or 140 for highest value
1(d)	Two correct comparisons of the number of runs scored in the two formats, one comparing spread and one comparing average or one of the five values on a box plot	B2ft	2	eg his IQR is higher in tests (so he is more consistent in one-day internationals) the medians are similar (so his average is about the same in both) his highest score in tests is higher than one-day internationals (so his best performance has been in tests) B1 any one correct comparison of number of runs scored in the two formats
	Total		**11**	

2(a)	Suitable hypothesis about the difference between the reading difficulty level in books for children and books for adults	B1	1	For example 'The reading will be easier in a children's novel.'
2(b)	Any number of syllables × frequency	M1		Any fx
	Σfx for number of syllables or 146	M1dep		60 + 70 + 12 + 4
	Their 146 ÷ 100 or 1.46	M1dep		
	206.835 – (1.015 × 7.11) – (84.6 × their 1.46)	M1		206.835 – 7.21665 – 123.516
	[76, 76.2]	A1	5	
2(c)	Fairly difficult	B1	1	
2(d)	Correct comparison of their reading difficulty level for 'Horrid Henry Rules the World' and their reading difficulty level for 'Sense and Sensibility' and correct comment about support or otherwise for their hypothesis	B2ft	2	eg 'The reading level for Sense and Sensibility is more difficult. This supports my hypothesis.' B1 Correct comparison of their reading difficulty level for 'Horrid Henry Rules the World' and their reading difficulty level for 'Sense and Sensibility' with no or incorrect comment about support or otherwise for their hypothesis or gives evidence of support or otherwise for their hypothesis about only one type of book
	Total		**9**	

Q	Solution	Mark	Total	Comment
3(a)	84% or 0.84 or $\frac{84}{100}$	B1	1	oe fraction, decimal or percentage $\frac{42}{50}, \frac{21}{25}$
3(b)	Only a sample or Age range given in article	B1	1	oe statement
	Total		**2**	
4(a)	=SUM(B2:B9)	B1	1	
4(b)(i)	2335 in B10	B1		
4(b)(ii)	Any one angle correct or correct method seen	M1		
	All angles correct	A1ft	3	ft their total in B10
4(c)	Shows that their angles sum to 360°	B1ft	1	ft their angles if they sum to 360°
	Total		**5**	
5(a)	'Leading question' or 'Not enough is not defined'	B1	1	Accept 'biased'
5(b)	Question with time frame included (visits per week or month)	B1		Time frame can be implied by consistent time periods in the response section
	At least three possible responses with no overlapping values	B1	2	Must include 'Never' oe and cover all possibilities.
5(c)	Tally chart or table, broken down into 7 hourly sections covering 9am to 4pm	B1		Condone 9-10, 10-11 etc
	Appropriate headings and frequency column	B1	2	At least three columns, with one for tallies and one for frequency
	Total		**5**	

Q	Solution	Marks	Total	Comments
6(a)	450 (million) or 300 (million) or 260 (million) or 420 (million)	M1		For method marks, all numbers can be $\times 10^n$ where n is an integer
	Their 450 000 000 × 0.00035 or 157 500 or Their 260 000 000 × 0.00035 or 91 000 or Their 300 000 000 × 0.00095 or 285 000 or Their 420 000 000 × 0.00095 or 399 000	M1		Digits 1575 or 91 or 285 or 399 or 665 or 114 imply M2
	Their 157 500 – their 91 000 or 66 500 and Their 399 000 – their 285 000 or 114 000 or their 157 500 + their 285 000 or 442 500 and their 91 000 + their 399 000 or 490 000	M1		Digits 665 and 114 imply M3
	Their 114 000 – their 66 500 or their 490 000 – their 442 500	M1		Digits 475 imply M4
	47 500 (tonnes)	A1		
6(a) alt	45 – 26 or 19 or 42 – 30 or 12	M1		
	Their 19 ÷ 100 × 1 000 000 000 × 0.00035 or 66 500 or Their 12 ÷ 100 × 1 000 000 000 × 0.00095 or 114 000	M1		Digits 665 or 114 imply M2
	Their 19 ÷ 100 × 1 000 000 000 × 0.00035 or 66 500 and Their 12 ÷ 100 × 1 000 000 000 × 0.00095 or 114 000	M1		Digits 665 and 114 imply M3
	Their 114 000 – their 66 500	M1		Digits 475 imply M4
	47 500 (tonnes)	A1	5	

6(b)	950 ÷ 350 or 2.71… or $\frac{19}{7}$ oe or 350 ÷ 950 or 0.36… or 0.37 or $\frac{7}{19}$ oe	M1		
	$\sqrt{\text{their } 2.71}$ or 1.6 or 1.64… or 1.65 or $\sqrt{\text{their } 0.36...}$ or 0.6… or 0.61	M1		$\sqrt{\frac{950}{350}}$ or $\sqrt{\frac{350}{950}}$ gets M2
	[26.2, 26.4]	A1		Accept 26 with correct working, but not from a value outside the range
6(b) alt 1	950 ÷ 350 or 2.71… or $\frac{19}{7}$ oe or 350 ÷ 950 or 0.36… or 0.37 or $\frac{7}{19}$ oe	M1		
	Their 2.71 × 16² or 16² ÷ their 0.36… or [693.7, 695]	M1		$\pi \times$ their $2.71 \times 16^2 \div \pi$ or $804.2\ldots \times$ their $2.71 \div \pi$
	[26.2, 26.4]	A1		Accept 26 with correct working, but not from a value outside the range
6(b) alt 2	350 ÷ 256 or 1.36… or 1.37 or or 256 ÷ 350 or 0.73…	M1		
	950 ÷ their 1.36… or 950 × their 0.73… or [693.7, 695]	M1		
	[26.2, 26.4]	A1	3	Accept 26 with correct working, but not from a value outside the range
	Total		**8**	

Q	Solution	Mark	Total	Comment
7(a)	Class intervals correct 11, 10, 10, 5, 5, 10, 10	M1		Accept 10 for first interval. At least 6 correct
	Frequency densities correct 18.7, 46.3, 64.5, 75.8, 74, 60.3, 22.4	M1A1		Accept 20.6 for first value M1 for at least 5 correct. Accept rounding to nearest integer.
	Histogram drawn correctly	M1 A1ft	5	ft their frequency densities M1 for at least two bars correct
7(b)	379 ÷ 5 or 75.8	M1		Finds any number of fifths of 379
	Their 152 + 370 + 603 + 224 or 1348 or 2890 – (206 + 463 + 645 + their 227) or 2890 – 1541 or 1349	M1		
	$[\frac{1348}{2890}, \frac{1349}{2890}]$	A1	3	oe fraction
	or [0.466, 0.467] or 0.47 or [46.6%, 46.7%] or 47%			SC2 $[\frac{1272}{2890}, \frac{1273}{2890}]$ oe fraction, decimal or percentage [0.440, 0.441] [44.0%, 44.1%]
	Total		**8**	
8(a)	Negative	B1	1	
8(b)	Timescales are different	B1	1	
	Total		**2**	