FSMQ
MATHEMATICS

4986 – Data Handling
Mark scheme

4986
June 2014

Version/Stage: v0.1 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.

Question	Solution	Marks	Total	Comments
1(a)(i)	mean of bust measurements is (37.4 + 37.8 + 37.0 + 38.2 + 38.2 + 39.0 + 39.5 + 40.2) ÷ 8 or 307.3 ÷ 8	M1		correct method for either mean.
	38.4(125) (inches)	A1	2	Accept 38.41 or 38.413
(a)(ii)	mean of waist measurements is (31.1 + 31.1 + 30.0 + 31.2 + 30.7 + 31.5 + 32.1 + 32.3) ÷ 8 or 250 ÷ 8			
	31.25 (inches)	A1	1	Accept 31.3 SC1 272.1(25) and 221.7(375)
(b)	plots the points (38.2, 30.7), (39.0, 31.5), (39.5, 32.1) and (40.2, 32.3) correctly (within 1 square)	B2	2	B1 for correctly plotting 2 or 3 points
(c)	plots their mean point or the line goes through their mean point	B1		ft their ai and aii correct point is at (38.4, 31.25)
	ruled line through mean point and through gates (37.0, 30.1) to (37.0, 30.8) and (39.5, 31.6) to (39.5, 32.2)	B1	2	ft their points
(d)	31.4 (inches)	B2	2	ft ± 0.05 ft their line $\pm \frac{1}{2}$ square B1 correct lines drawn to line of best fit with wrong reading
(e)	any mention of the British Standard measurements or indication that they don't have the required information or that the correct measurements are not defined	B1	1	
	Total		**10**	
2(a)(i)	116.7 (pence per litre)	B1	1	Accept 'Malta'
(ii)	111.4 (pence per litre)	B1	1	Accept 'Lithuania'
(iii)	133.6 (pence per litre)	B1	1	Accept 'Finland' SC1 133.6 in 2aii and 111.4 in 2aiii

(b)	plots their median correctly correct value is 116.7	B1		ft their 2ai within ½ square
	plots their quartiles correctly correct values are 111.4 and 133.6	B1		ft their 2aii and 2aiii within ½ square
	plots whiskers at 99.5 and 137.9 and constructs box and whisker diagram correctly	B1	3	within ½ square
(c)	medians similar or median (slightly) higher for petrol (0.7)	B2	2	two correct comparisons ft their box and whisker diagram
	either quartile higher for petrol ranges the same or similar or inter-quartile range higher for petrol lowest price or highest price higher for diesel petrol has negative skew and diesel has positive skew			B1 for one correct comparison with the other comparison missing or incorrect or a repetition of the first
	Total		**8**	

Question	Solution	Marks	Total	Comments
3(a)	325 : 45	B1		
	65 : 9	B1ft	2	ft correct simplification of their ratio with one initial value correct SC1 7.2(…):1 or 9 : 65 65 : 9 gets B2
(b)	$\frac{99}{374}$	B1		
	$\frac{9}{34}$	B1ft	2	ft correct simplification of their fraction with one initial value correct $\frac{9}{34}$ gets B2
(c)	30 000 or 6000 or 12 000	M1		
	30 000 and 6000 × 2 or 12 000 or 30 000 ÷ 6000 or 5 or 30 000 ÷ 2 = 15 000	M1	3	oe 30 000 ÷ 2.5(0) ÷ 2 = 6000 or 6000 × 2.5(0) × 2 = 30 000
	30 000 ÷ 12 000 = 2.5(0) or 30 000 ÷ 6000 = 5 and 5 ÷ 2 = 2.5(0) or 30 000 ÷ 2 = 15 000 and 15 000 ÷ 6000 = 2.5(0)	A1		oe 30 000 ÷ 2.5(0) ÷ 2 = 6000 with explanation that 5934 rounds to 6000 or 6000 × 2.5(0) × 2 = 30 000 with explanation that 29 946 rounds to 30 000
	Total		**7**	

Question	Solution	Marks	Total	Comments
4				

Years trading (y)	**Number of companies**		
$0 < y \leq 10$	16	5	80
$10 < y \leq 30$	25	20	500
$30 < y \leq 50$	9	40	360
$50 < y \leq 80$	6	65	390
$80 < y \leq 110$	1	95	95
$110 < y \leq 160$	3	135	405
Total	**60**		**1830**

(a)	correct mid-intervals	M1		at least four correct
	each frequency multiplied by their mid-interval and the results added: (16 × their 5) + (25 × their 20) + (9 × their 40) + (6 × their 65) + (1 × their 95) + (3 × their 135) or 80 + 500 + 360 + 390 + 95 + 405 or 1830	M1		must be from a sum of values × frequencies
	their 1830 ÷ 60	M1	4	
	30.5	A1		accept 30 or 31 with correct working
(b)	$\frac{10}{60}$	B1	1	oe fraction, decimal or percentage
	Total		**5**	

Question	Solution	Marks	Total	Comments
5	$\sqrt{15}$ or 3.87… or $0.75^2 \times \pi \times 15$ or 26.5…. or $0.75^2 \times 15$ or 8.4(375)….	M1		
	$1.5 \times \sqrt{15}$ or 1.5 × their 3.87(298…) or $\sqrt{their\ 26.5 \div \pi} \times 2$ or $\sqrt{their\ 8.4375} \times 2$	M1		$\frac{3\sqrt{15}}{2}$ implies M1M1
	[5.8, 5.81]	A1		
	5.81(cm)	A1ft	4	rounding of any number > 3sf to 3sf and M2 scored SC3 2.90 or 11.62 or 3.97 SC2 [2.9, 2.91] or [11.6, 11.62] or [3.96, 3.97]
	Total		**4**	
6				

	A	B	C	D	E
1	**Type of training**	**2011**	**2012**	**Decrease in number of applications**	**Percentage decrease**
2	Secondary	22 585	19 019	3 566	15.79
3	Middle	260	134	126	48.46
4	Primary	25 337	21 862	3 475	13.72

(a)(i)	column D	B1	1	
(a)(ii)	their 3566 ÷ 22 585 × 100 or their 126 ÷ 260 × 100 or their 3475 ÷ 25 337 × 100	M1		
	15.79 or 48.46 or 13.72	A1ft		ft their D column accept 15.8 or 16 or 15.78… for 15.79 accept 48.5 or 48 or 49 or 48.46 … for 48.46 accept 13.7 or 14 or 13.71… for 13.72

	15.79 and 48.46 and 13.72	A2ft		ft their D column A1 for incorrectly rounded values as above or two values correct to 2dp
(b)	$\frac{D4}{B4}\times 100$ or $\frac{B4-C4}{B4}\times 100$ or $100-\frac{C4}{B4}\times 100$ or $(1-\frac{C4}{B4})\times 100$ or D4 ÷ (B4 ÷ 100)	B1	1	Condone (E4) = before the expression or = E4 after the expression Accept * instead of ×
	Total		**6**	

Question	Solution	Marks	Total	Comments
7				

Valuation band	Rateable value of property, v (£ thousands)	Number of properties		
A	$0 < v \leq 40$	9 340	40	233.5
B	$40 < v \leq 52$	11 650	12	970.83
C	$52 < v \leq 68$	5 320	16	332.5
D	$68 < v \leq 88$	3 470	20	173.5
E	$88 < v \leq 120$	1 680	32	52.5
F	$120 < v \leq 160$	400	40	10
G	$160 < v \leq 320$	60	160	0.375
H	$320 < v$	0		

(a)	correct class intervals	B1		implied by correct frequency densities
	correct frequency densities	M1A1ft		ft their class intervals M1 for 5 or 6 correct. Accept rounding to nearest whole number or better
	Correct drawing of histogram for their frequency densities	M1A1ft	5	M1 for 2 bars correct. ft their frequency densities
(b)	$\frac{20}{32} \times 1680$ or their 52.5 × 20 or 1050	M1		
	60 + 400 + their 1050 [1500, 1520]	M1dep A1	3	only accept 1500 with correct working
	Total		**8**	
8(a)	values are negative	B1	**1**	
(b)	percentage of what is not given title does not reflect the graph either axis not labelled	B1	1	
	Total		**2**	
	TOTAL		**50**	