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FSMQ

MATHEMATICS

6990/2 – Using and Applying Statistics
Mark scheme

6990
June 2014

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)	$\dfrac{137-76}{76}\times100$	M1		
	$=80.3\%$	A1	2	accept 80.263…..
(b)(i)	$\dfrac{24}{76}=\dfrac{?}{214}$	M1		B1 for using measurements. Accept awrt 70 provided same value is used & squared
	$?=67.6$ area is 68cm^2	A1		
(ii)	$\dfrac{24}{76}=\dfrac{?}{88}$	M1		oe
	$?=\sqrt{27.789....}$	M1		
	$=5.27(\text{cm})$ …. for side of square	A1	5	accept 5.3
(c)	$\dfrac{41.3}{100}\times26.9(=11.1097)$	M1		Alt: $(100-41.3)\div100$ M1 $\times26.9$ M1
	$26.9-11.1.....$	M1		$=15.7903$ A1
	$=15.8(\text{sq.m})$	A1	3	accept awrt 15.8
	Total		**10**	
2(a)	cf: 3700; 10240; 15690; 22490; 27980; 29320; 29941; 30265; (30570)	B1		
	using correct ucb	B1		
	correct plots $\pm\dfrac{1}{2}$sq.	B1	3	
(b)(i)	median value £19000 - £21000	B1		
(ii)	90th percentile £46000 - £50000	B1		
(iii)	10th percentile £9000 - £11000	B1	3	
(c)	skewed or asymmetric	B1		
	positive	B1	2	
(d)(i)	mean value is calculated using all data including extreme values	E1		
(ii)	London taxpayers receive a greater income on average	E1	2	oe
	Total		**10**	

Question	Solution	Marks	Total	Comments
3(a)(i)	$\overline{d} = 8.33$	B1	1	
(ii)	sd $= 0.345$	B2	2	$\sqrt{\left(\dfrac{1182.556.....}{17} - \overline{8.33...}^{2}\right)}$ M1 $= 0.345......$ A1
(iii)	$8.33... + 2 \times 0.345... = 9.02...$	M1		
	$8.33... - 2 \times 0.345... = 7.64$	M1		
	result in 1952 of 7.57 metres is outlier	A1ft	3	
(b)	140.2 or 0.1402 seen	B1		
	$\dfrac{8.90}{140.2} \times 100$	M1		
	$= 6.348$	A1	3	accept 6.35
(c)	men jump further than women on average	E1		
	men have smaller std. dev – hence are more consistent	E1	2	
	Total		**11**	
4(a)	9 correct plots	B2	2	B1 for 7 or 8 correct plots
(b)	$\overline{x} = 18.37...$	B1		answers to 3 sf or better
	$\overline{y} = 5.888...$	B1		
	$r = 0.7449...$	B1	3	
(c)	some evidence that more gold medals tend to be won by countries with larger populations	E1	1	
(d)(i)	$a = 0.3139.... \; b = 0.1192....$	B1,B1		B1 for 2 correct values not attributed
	$y = 0.314x + 0.119$	B1	3	cao
(ii)	line through their mean $(18.4, 5.89)$	B1ft		
	line through $(0, 0.119)$ or another calculated value	B1ft		
	correct line	B1	3	
(e)(i)	$y = 0.314 \times 34.8 + 0.119 (= 11.0462)$	M1		
	11 medals	A1ft	2	must be whole number
(ii)	suggests equation (or line) is not very reliable	E1	1	oe accept any sensible comment
	Total		**15**	

Question	Solution	Marks	Total	Comments
5(a)(i)	$P(W < 920): z = \dfrac{920 - 800}{80}$	M1		attempt at standardising
	$z = 1.5$			
	$P(z < 1.5)$	M1		
	$= 0.9332$	A1	3	
(ii)	$P(W < 780): z = \dfrac{780 - 800}{80}$			
	$z = -0.25$	B1		must be negative
	$P(z < -0.25) = 1 - P(z < 0.25)$	M1		
	$= 1 - 0.5987 = (0.4013)$			
	$P(-0.25 < z < 1.5) = 0.9332 - 0.4013$	M1		their values
	$= 0.5319$	A1	4	
(b)	$90\%: z = -1.28(2)$	B1		allow -1.29
	$-1.28 = \dfrac{W - 800}{80}$	M1		
	$-1.28 \times 80 + 800 = W$	M1		
	$697 \text{ (grams)} = W$	A1	4	accept $696 - 700$ cso
(c)	$35 + \dfrac{350}{500} \times 35 (= 59.5)$	M1		
	$+20$	m1		
	$= 79.5 \text{ minutes}$	A1	3	accept 80
	Total		**14**	
	TOTAL		**60**	