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General Certificate of Secondary Education
March 2012

Mathematics 43601H

Higher

Unit 1

Final

Mark Scheme

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The following abbreviations are used on the mark scheme:

M	Method marks awarded for a correct method.
M dep	A method mark which is dependent on a previous method mark being awarded.
A	Accuracy marks awarded when following on from a correct method. It is not necessary always to see the method. This can be implied.
B	Marks awarded independent of method.
Q	Marks awarded for quality of written communication.
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.
oe	Or equivalent.
[*a*, *b*]	Accept values between a and b inclusive.

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1a	Stem 4, 5, 6, (7) and suitable key	B1	
	Leaves 6 8 9 1 2 3 3 5 7 9 0 1 4 5 2	B2	B1 one error Unordered is one error
	Stem, leaves and aligned correctly to show distribution	Q1	Strand (ii) Logical organised working
1b	55	B1 ft	ft their stem-and-leaf
1c	0.05 × their 55 (= 2.75)	M1	oe their 55 must be < 59
	their 55 + their 2.75 (= 57.75) or 59 – their 2.75 (= 56.25)	M1 dep	
	Yes and 57.75 or Yes and 56.25	A1 ft	ft their 55 only
	Alternative method 1		
	59 – their 55 (= 4)	M1	their 55 must be < 59
	$\frac{\text{their } 4}{\text{their } 55}$ × 100 (= 7.(…))	M1 dep	oe
	Yes and 7.(…)	A1 ft	ft their 55 only
	Alternative method 2		
	0.05 × their 55 (= 2.75) or 59 – their 55 (= 4)	M1	oe their 55 must be < 59
	0.05 × their 55 (= 2.75) and 59 – their 55 (= 4)	M1 dep	oe their 55 must be < 59
	Yes and 2.75 and 4	A1 ft	ft their 55 only
	Alternative method 3		
	$\frac{59}{\text{their } 55}$ (× 100) or 1.07(…) or 107.(…)	M1	oe their 55 must be < 59
	their 1.07(…) – 1 or their 107.(…) – 100	M1 dep	May be implied by correct final answer
	Yes and 7.(…)	A1 ft	ft their 55 only
	Alternative method 4		
	1.05 seen	M1	
	their 55 × 1.05 or 59 ÷ 1.05	M1 dep	oe their 55 must be < 59
	Yes and 57.75 or Yes and 56.(…)	A1 ft	ft their 55 only

2a	All 6 points correct ($\pm\frac{1}{2}$ sq)	B2	4 or 5 points correct B1 Ignore extras
2b	Draws a suitable line of best fit	M1	
	Answer appropriate to their line of best fit	A1 ft	ft their plots and appropriate line Must be integer answer SC1 8 or 9 or 10
2c	Cannot tell	B1	

3a	Total girls = 90	B1	
	Girls can whistle = 36	B1 ft	ft $\frac{40}{100}$ × their 90
	Girls cannot whistle = 54	B1 ft	ft their 90 – their 36
	Boys can whistle = 24	B1 ft	ft their 36 ÷ 3 × 2
	Boys cannot whistle = 6	B1 ft	ft 30 – their 24
			Note: if all correct B5: <table><tr><td>24</td><td>36</td></tr><tr><td>6</td><td>54</td></tr><tr><td>30</td><td>90</td></tr></table>
3b	Any valid reason implying group may not be representative of whole population eg Group only contains children More girls than boys Only 120 in the group Only one area (or school)	B1	

4	162 or 108 or 36 or 18	B1	±2
	$\frac{\text{their } 162}{360} \times 100$ (= [44, 46])	M1	oe
	[44, 46] and Yes	A1	
	Alternative method 1		
	198 (±2)	B1	198 (±2)
	$\frac{\text{their } 198}{360} \times 100$ (= [54, 56])	M1	oe $\frac{\text{their } 198}{360} \times 100$ (= [54, 56])
	[54, 56] and 60 and Yes	A1	[54, 56] and 45 and Yes
	Alternative method 2		
	162 or 108 or 36 or 18	B1	±2
	0.4 × 360 (= 144)	M1	oe
	144 and [160, 164] and Yes	A1	
	Alternative method 3		
	198	B1	±2
	0.6 × 360 (= 216)	M1	oe
	216 and [196, 200] and Yes	A1	
	Alternative method 4		
	30% or 10% or 5%	B1	±1%
	their 30% + their 10% + their 5%	M1 dep	oe At least one percentage must be in tolerance
	[44, 46] and Yes	A1	

5	**Version 1** for marking amended paper with slowest time given in table 10.54		
	(10.03 + 10.61 + 10.08)(÷3)	M1	Correct method for mean of any three or all five of Oscar's times
	30.72 or 10.24	A1	
	(10.23 × 5 – 9.15 – 10.54)(÷3)	M1	
	31.46 or 10.48(…) or 10.49	A1	Accept 10.5 with correct working
	their 10.24 and their 10.48(…) or their 10.49 and correct ft decision or their 30.72 and their 31.46 and correct ft decision	A1 ft	Allow rounding or truncating throughout
	Version 2 used to mark paper with slowest time given in table 10.45		
	(10.03 + 10.61 + 10.08)(÷3)	M1	Correct method for mean of any three or all five of Oscar's times
	30.72 or 10.24	A1	
	(10.23 × 5 – 9.15 – 10.45)(÷3)	M1	
	31.55 or 10.5(1…) or 10.52	A1	Accept 10.5 with correct working
	their 10.24 and their 10.5(1…) or their 10.52 and correct ft decision or their 30.72 and their 31.55 and correct ft decision	A1 ft	Allow rounding or truncating throughout

6a	39, 47, 50	B1	
6b	Plots at UCBs ($\pm\frac{1}{2}$ sq)	B1	Allow one error or omission
	Heights correct ($\pm\frac{1}{2}$ sq)	B1 ft	Allow one error or omission Increasing function not straight line ft values from table
	Smooth curve or polygon	B1 ft	ft their 5 plots Increasing function not straight line B3 only for fully correct
6c	Attempt to read off at 12 inches	M1	from any increasing graph eg 14 or 36 seen
	50 – their 14 (= 36)	M1	
	$\frac{\text{their } 36}{50}$	A1 ft	oe fraction Correct ft from their graph only
	Alternative method 1		
	Attempt to read off at 12 inches	M1	from any increasing graph eg 14 or 36 seen
	(1 –) $\frac{\text{their } 14}{50}$	M1	
	$\frac{\text{their } 36}{50}$	A1 ft	oe fraction Correct ft from their graph only
	Alternative method 2		
	$\frac{3}{5} \times 20$ (= 12) or $\frac{2}{5} \times 20$ (= 8)	M1	$\frac{15-12}{15-10} \times 20$ or $\frac{12-10}{15-10} \times 20$
	their 12 + 13 + 8 + 3	M1	Condone $10 \leq$ their $12 < 14$
	$\frac{36}{50}$	A1	oe fraction
	Alternative method 3		
	$\frac{3}{5} \times 20$ (= 12) or $\frac{2}{5} \times 20$ (= 8)	M1	$\frac{15-12}{15-10} \times 20$ or $\frac{12-10}{15-10} \times 20$
	50 – 6 – their 8	M1	Condone $6 <$ their $8 \leq 10$
	$\frac{36}{50}$	A1	oe fraction

7a	Median and quartiles marked at 2.2, 4.2, 7.6	B1	$\pm\frac{1}{2}$ square
	IQR box formed and whiskers correctly joined to 0, 9.5	B1	$\pm\frac{1}{2}$ square
7b	Comment that median, lower quartile, min, max or range is unchanged	B1	
	Comment that IQR is smaller with new system so waiting times are more consistent/better	B1	
7c	$\frac{205}{450} \times 50$ or $\frac{134}{450} \times 50$ or $205 \div 9$ or $134 \div 9$ or 22.7(…) or 14.8(…) or 23 or 15 or 205 – 134 (= 71)	M1	oe Condone 22 or 14 seen
	$\frac{205}{450} \times 50$ **and** $\frac{134}{450} \times 50$ or $205 \div 9$ **and** $134 \div 9$ or 22.7(…) **and** 14.8(…) or 23 **and** 15 or $\frac{\text{their } 71}{450} \times 50$ or their $71 \div 9$ or 7.8(…) or 7.9	M1 dep	oe Condone 22 **and** 14 seen
	8	A1	

8a	12×1.5 (= 18) or 8×2.5 (= 20)	M1	20×2.5 (= 50) or 12×1
	$12 \times 1.5 + 8 \times 2.5$ or 18 + 20	M1 dep	$20 \times 2.5 - 12 \times 1$ or 50 – 12
	38	A1	
8b	1.82 or 1.815 or 1.825 seen	B1	oe eg sight of 182, 181.5 or 182.5
	30 499 999 or 29 500 000 seen or 29.5 (million)	B1	Accept 30 500 000 or 30.5 (million)
	$\frac{\text{their max}}{\text{their min}}$	M1	their max > 30 000 000 1 < their min < 1.82
	16 804 407 or 16 804 408 or 16 804 410 or 16 804 400 or 16 804 000	Q1	Strand (i) Correct mathematical notation Must be an integer answer Accept 16 800 000 or 17 000 000 or 16.8 million or 17 million if first 3 marks awarded SC3 16 804 407.16 or 16 804 407.71 SC1 [16 483 516, 16 483 517]

9a	$\frac{1}{10} \times \frac{9}{10}$ or $\frac{9}{10} \times \frac{1}{10}$ or $\frac{1}{10} \times \frac{1}{10}$	M1	oe
	$\frac{1}{10} \times \frac{9}{10} + \frac{9}{10} \times \frac{1}{10} + \frac{1}{10} \times \frac{1}{10}$	M1 dep	oe
	$\frac{9}{100} + \frac{9}{100} + \frac{1}{100}$ or $\frac{18}{100} + \frac{1}{100}$	A1	oe
	Alternative method 1		
	$\frac{9}{10} \times \frac{9}{10}$	M1	oe
	$1 - \frac{9}{10} \times \frac{9}{10}$	M1 dep	oe
	$1 - \frac{81}{100}$	A1	oe
	Alternative method 2		
	Use of sample space diagram	M1	
	Indication of correct pairs	M1 dep	
	$\frac{19}{100}$ or 19 out of 100	A1	
9b	$\frac{1}{10} \left(\times \frac{9}{9}\right)$ or $\frac{9}{10} \times \frac{1}{9}$	M1	oe
	$\frac{1}{10} \left(\times \frac{9}{9}\right) + \frac{9}{10} \times \frac{1}{9}$	M1 dep	oe
	$\frac{18}{90}$	A1	oe
	Alternative method 1		
	$\frac{9}{10} \times \frac{8}{9}$	M1	oe
	$1 - \frac{9}{10} \times \frac{8}{9}$	M1 dep	oe
	$\frac{18}{90}$	A1	oe
	Alternative method 2		
	Use of sample space diagram	M1	
	Indication of correct pairs	M1 dep	
	$\frac{18}{90}$ or $\frac{9}{45}$	A1	oe