General Certificate of Secondary Education
June 2012

Statistics   43101H

Unit 1: Statistics Written Paper (Higher)

Final

Mark Scheme

Mark schemes are prepared by the Principal Examiner 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 examiners participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for standardisation each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, examiners encounter unusual answers which have not been raised they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' 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.

Glossary for Mark Schemes

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

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.	
E	Explain marks are awarded for a full and detailed explanation.	
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.	
ft	Follow through marks. Marks awarded following a mistake in an earlier step.	
SC	Special case. Marks awarded within the scheme for a common misinterpretation which has some mathematical worth.	
oe	Or equivalent. Accept answers that are equivalent. eg, accept 0.5 as well as $\frac{1}{2}$	

Unit 1 Higher Tier

Q	Answer	Mark	Comments
1(a)	00 - 49 range includes 50 numbers	B1	
	$40 / 80 \times 100$ ($= 50$)	B1	SC1 for 50 or 50% or ½ seen
1(b)(i)	(S C S S C) M S S S M	B2	B1 for 10 - 14 correct
	S M C C S C S S S S		
1(b)(ii)	5, 12, 3	B1ft	
1(b)(iii)	Greater than expected for Serious	B2ft	Any 2 for B2
	Less for Critical now		Any 1 for B1
	As expected for Minor		
2(a)	Fully correct	B2	Up to 2 errors B1
2(b)	8 + 6.6	M1	At least one correct
	14.6	A1	
2(c)	50 - 59	B1	
2(d)	Higher % of females	B1	
3(a)(i)	Use of the toothpaste Wondershine (E)	B1	
3(a)(ii)	The number of fillings the child needs during the experiment (B)	B1	
3(a)(iii)	How many sweets the child eats (C)	B1	Either order
3(a)(iv)	How often the child cleans his/her teeth (A)	B1	
3(b)	Discrete	B1	

Q	Answer	Mark	Comments
4(a)	Burglary	B1	
4(b)	Drug offences	B1	
4(c)	Theft	B1	
4(d)	More officers per head of population	B1	Differences in recording crime oe
4(e)	Data in % not actual numbers	B1	
5(a)	The values are 100	B1	oe
5(b)	No change 2007 – 2009	B1	oe
5(c)	Clothing	B1	
5(d)	Most important item of expenditure	B1	
5(e)(i)	$108 / 105 \times 630$	M1	
	648	A1	
5(e)(ii)	$630/105 \times 100$ or Their $648/108 \times 100$	M1	
	Their 648 – their 600	M1 dep	
	Increase 48	A1 ft	
6(a)(i)	positive agreement	B1	Students doing well in one oral test likely to do well in the other oral test.
6(a)(ii)	No agreement between the two tests	B1	
6(b)(i)	18	B1	
6(b)(ii)	2	B1	
6(b)(iii)	80 and 11 lessons missed	B1B1	SC1 for 11 and 80 or 80 and 11 in second box only

Q	Answer	Mark	Comments
6(b)(iv)	No….correlation weak	B1	Other factors influence performance
7(a)(i)	Stratified random	B1	Accept stratified
7(a)(ii)	$n/400 \times 80$ where $n = 10$ or 60 or 330	M1	Condone $n = 9$ or 59 or 329 for M1 only
	Other two illustrated	A1	
7(b)	Select (80) random numbers using tables/calculator/computer generated	B1	SC1 for : put all the seat numbers or numbers 1 – 400 or all 400 numbers in a hat and withdraw 80
	Ignore repeats (and numbers > 400)	B1	
	Match to seats	B1	
7(c)	Will not give a sample of 80	B1	
	Missed the seats 01 - 10	B1	oe
8(a)	Line passing through (9, 9.5)	B1	
	Gradient correct and line: must be from at least $x = 2.5$ to $x = 20$	B1	
8(b)(i)	$y = -0.5x + 14$	B1 ft	ft only on intercept and must be negative gradient and reach y axis
8(b)(ii)	14 absences for no service	B1 ft	on graph or equation
8(c)	$-10 + 14 = 4$	B1 ft	
8(d)	Extrapolation trap	B1	
	Negative value	B1	
9(a)	18	B1	
9(b)	Reading off at correct points 7 and 63	M1	
	$51 - 4 = 47$	A1	Accept 47 – 48 inc.

Q	Answer	Mark	Comments
9(c)	Reading off at 45 mins	M1	
	66 or 56 seen	A1	or 4 or 14 seen
	18	A1	
9(d)	35	B1	
9(e)	Dover: higher number of passengers processed at this point	E1	
10(a)	Fdensity × class width	M1	9.5 × 2 or 8 × 3 or 6 × 5 or 2.5 × 8 or 0.5 × 8
	(3) 19 24 30 20 4	A2	A1 For at least 3 correct excluding (3)
10(b)	(Mean =) 260 / 100	M1	
	2.6	A1	
	$\sigma = \sqrt{[2861.5 / 100 - \text{their}(2.6)^2]}$	M1	
	= 4.67	A1	4.67493 …condone 4.7 with working: 4.7 without working M0A0
10 (c)	Females lower average and lower variation	B1 ft B1 ft	or equivalent references to males
10(d)	Males 3(6.93 − 5.67) / 5.53	M1	or 3(their 2.6-1.08)/their 4.675
	(+) 0.68	A1	− 1 once for not rounding to 2dp
	Females (+) 0.98	A1ft	
10(e)	Both positive skew	B1ft	
	Females stronger positive skew	B1ft	
11(a)	Identify 3.09 (3)σ	B1	
	157 ± 3(.09) × 3.5	M1	
	146.2 − 167.8	A1	Accept 146.5 – 167.5

Q	Answer	Mark	Comments
11(b)	150g is 2 s.ds below mean	B1	
	Sight of 95% linked with 2 s.d	M1	
	2.5	A1	Accept 2.4 – 2.6

Q	Answer	Mark	Comments
11(c)(i)	Unsatisfactory trend away from mean	B1	or outside (action) limits
	Satisfactory points close to mean line	B1	
	Unsatisfactory all points above mean	B1	

Q	Answer	Mark	Comments
11(c)(ii)	To control process variability	B1	

Q	Answer	Mark	Comments
12(a)	$1 - 0.4 - 0.25$	M1	
	0.25 and 0.35	A1	Complete and correct first branch
	Complete second branch	B1ft	

Q	Answer	Mark	Comments
12(b)(i)	0.4×0.4	M1	
	0.16	A1	

Q	Answer	Mark	Comments
12(b)(ii)	$0.25 \times$ their $0.35 = (0.0875)$	M1	oe
	Their 0.0875×2	M1dep	
	0.175	A1 ft	Must be to at least 3dp

Q	Answer	Mark	Comments
12(b)(iii)	Their 0.35 × (1 − their 0.35) 0.25 × 0.75 = (0.1875) 0.4 × 0.6 = (0.24)	M1 M1	For any one product For all 3 products
	0.2275 + 0.1875 + 0.24	M1	For adding 2 or 3 products dep. on first method mark probability 0 – 1
	0.655	A1	
12(b)(iii) **Alt. 1**	0.4 × 0.25 or 0.4 × their 0.35 or 0.25 × 0.4 or their 0.35 × 0.4 or 0.25 × their 0.35 or their 0.35 × 0.25	M1 M1	For any one product For attempt at all 6 products
	0.1 + 0.14 + 0.1 + 0.14 + 0.0875 + 0.0875	M1	For adding 4, 5 or 6 products Dep. on first method mark probability within range 0 – 1
	0.655	A1	
12 (b)(iii) **Alt 2**	$(0.4)^2$ + $(0.25)^2$ + their$(0.35)^2$	M1 M1	For a correct square For all 3 squares summed
	1 − 0.345	M1	For (1 − 2 or 3 squares added) Dep on first M1 probability within range 0 -1
	0.655	A1	

12(c)	2800 × 0.25	M1	
	700	A1	