ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Secondary Education

Statistics 3311

Higher Tier

Mark Scheme

2009 examination - June series

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 meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting 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 the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

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Glossary for Mark Schemes

GCSE examinations are marked in such a way as to award positive achievement wherever possible. Thus, for GCSE Statistics 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 $\frac{1}{2}$

Higher Tier

Q	Answer	Mark	Comments
1(a)	All 28 correct	B3	B2 26 or 27 correct B1 20 - 25 correct
1(b)	Letter T in the centre of 2nd row	B1	'39' rectangle
2(a)	(All) voters / adults….	B1	oe (over) 18s
	….in the town / constituency / ward / polling district / polling area	B1	oe B2 all people who (could) use the polling station (oe) B1 everyone in town (oe)
2(b)	Better response rate	E1	oe (for **interview** chosen)
	Can explain questions	E1	
Alt 2(b)	Can be done when convenient	E1	oe (for **postal** chosen)
	Everyone gets exactly same questions	E1	
2(c)(i)	Might not know the answer	E1	oe
2(c)(ii)	Needs option boxes	E1	oe
3(a)	Multiple or dual or comparative bar chart or diagram or graph	B1	Also accept multiple / dual / comparative frequency diagram
3(b)	5	B1	

Q	Answer	Mark	Comments
3(c)	Not possible to tell, the % higher (slightly) but we do not know whether the population of 5 year olds is larger/ necessary data not available	E2	E1 Not possible to tell, reason attempted
Alt 3(c)	True, population sizes will be similar (so % increase means actual increase)	E2	E1 True, reason attempted . Allow 'Yes' for true E0 False or No
4(a)(i)	0.3	B1	oe
4(a)(ii)	0.3 × 0.3	M1	ft their 0.3 as long as it is a valid probability
	0.09	A1ft	oe
4(a)(iii)	Independence	E1	Accept description of independence
4(b)	Adults 00 - 31	B1	or any 32 values
	Teenagers 32 - 61 and Children 62 - 99	B1	or any distinct 30 and distinct 38 values respectively
			SC1 any one allocation set within 1 of being correct
4(c)	C A T T A C T A C T	B2ft	B1 ft 8 or 9 correct ONLY ft if B1 or better awarded in part (b) and where it is possible to check a unique allocation (i.e no overlap)
4(d)	27 in male children cell	B1	
	30 in female children cell	B1	
	4 in male teenager cell and 4 in female teenager cell	B1	
	15 in male adult cell and female under 13 + female adult = 50	B1 ft	

Q	Answer	Mark	Comments
5(a)	5 correct plots and joined	B2	B1 4 correct plots and joined or 5 correct plots not joined tolerance one small square
5(b)	Café closes early / some workers day off	E1	oe eg unpopular set lunch
5(c)	Takings are highest each Friday	E1	oe
	Takings are reducing week by week	E1	one comment about the pattern within a week, one comment about the trend across weeks
6(a)	England	B1	
6(b)(i)	65 + 18.4	M1	Allow, for M1, 65 + any value from column 4 or 65 + 15.5 if working shown
	83.4	A1	Accept 83
6(b)(ii)	Getting to 65 excludes those who die before then (so average age to which they live is higher)	E1	oe
6(c)	England has a much higher population (so its higher average has more effect than the values for other countries)	E1	oe references to different population (sizes) in different countries
7(a)	Non response	E1	Not rounding
7(b)	Linear scale showing attitude extremes	B1	
	Respondent marks position on scale	B1	
7(c)	Retain exams	E1	
	Leaving age not changed	E1	

Q	Answer	Mark	Comments
8(a)	Rankings: 9 4 6 3 10 2 8 1 5 7	B1	If treat final two in each set as tied B1
	7 6 1 4 8 3 9 5 2 10	B1	
	Differences	M1	
	Sum of differences squared = 74	M1	
	Formula and sub give sp.rank = 0.551(5)	M1 A1	
8(b)	Some / moderate agreement	B1	Not allow strong or simply positive
8(c)	Opposite rankings: High matched with low	E1	
	No agreement: Rankings do not match	E1	Accept calculation error
9(a)	Vitamin supplement	B1	
	Exam performance	B1	
9(b)	Academic ability	B1	
	Matched ability groups	B1	
9(c)	Children taking a vitamin supplement will improve their exam performance in Statistics	B1	
9(d)(i)	Weight	B1	fitness
	Time spent studying	B1	reaction to tests/exams
9(d)(ii)	Random allocation mentioned	B1	
	Identify each member of the pair and toss a coin	B1	
10(a)	$(5.2 \times 3) + (2.1 \times 5) + (7.4 \times 12) =$ £114.90	M1, A1	

Q	Answer	Mark	Comments
10(b)	Their (114.9/90) × 100 = 127.7	M1 A1ft	(ft on their 114.9)
10(c)	Selling price increases at a faster rate	E1 ft	
11(a)	300/50 = 6	B1	
	$\sqrt{\frac{1962}{50} - 36}$ $\sqrt{3.24}$ 1.8 days	M1 A1ft A1	Formula and substitution 3.24 A O on its own
11(b)	6 +/– 2(1.8) = 2.4 to 9.6 days	M1 M1 dep A1 ft	1 for idea of a limit : 6(mean) ± a quantity for ±2 for 2 × ' their' 1.8
11(c)	Point estimate equal to (their 6)	B1 ft	
11(d)	Variability reduced by 1/2	E2	Variability reduced E1 or variability reduced by factor of 4 E1 or sample size increased by factor of 4 E1
12(a)	(24.2 – 3.9) / 14 = 1.45	M1, A1	
	24.2 = (1.45)(20) + c c = –4.8 y = 1.45*x* –4.8	M1 A1	
12(b)	(1.45 × 68 – 4.8) 93.8	M1 A1	Accept 94 with/without working
12(c)(i)	Negative mark	E1	Must be explained

Q	Answer	Mark	Comments
12(c)(ii)	Mark exceeding 100	E1	
13(a)	Divisions at 0.5, 2.5… etc	B1 B1	B1 for sight of continuity corrrection: B1 For 'time' limits fully correct
	fq. Density 1, 1.25, 2, 3.3, 6.5, 4, 1	M1, A2	–1 for each error
	Fully correct graph	B1	Heights, scale, labels
13(b)	Negative	B1	
	Long left hand tail	E1	or correct reference to relative position of mode, median etc.
13(c)	9^{th} decile corresponds to 45^{th} term:	B1	ref. 5^{th}. from top : allow final 10% : 90% if used needs to be fully explained
	Must be in class 16.5 - 22.5	B1dep	or 15 - 16 only goes to 44^{th}
13(d)	(8/50) × 100 = 16%	M1, A1	SC1 For (6/50) × 100 = 12% or SC1 for $\frac{6 + \text{incorrect fraction of } 8}{50} \times 100 = ...$
14(a)	Readings at 60, 90 etc	B1	
	Position of median on plot box	B1	
	Quartiles	B1	
	Box and whiskers	B1	
14(b)	IQR = 25.2 – 24.6 = 0.6	M1	
	1.5 ×0.6 = 0.9	M1	
	Outside of 26.1	A1ft	their 26.1 accept 23.7- 26.1 or equiv. interval
14(c)(i)	Supplier C	B1	
14(c)(ii)	Supplier B above the median 50% scrapped	E1	or as a result of median
	Supplier A rejects at upper end	E1	or outside of limits

Q	Answer	Mark	Comments
14(d)	Cost, on time delivery,quality	B1	oe
15(a)	Tree diagram: first set of branches	B1	
	remaining sets	B1 × 3	
15(b)	1 – Pr (late)	M1	or P(E) + P(T)
	Any one of: 0.3 × their 0.2 (= 0.06) or their 0.25 × 'their' 0.23 (= 0.0575) or 'their' 0.45 × 'their' 0.05 (= 0.0225)	M1	Any one of: 0.3 × 'their' 0.65 (= 0.195) their 0.25 ×their 0.12 (= 0.03) 'their' 0.45 × their 0.75 (= 0.3375) 0.3 × 0.15 (= 0.045) their 0.25 × 0.65 (= 0.1625) 'their' 0.45 × 0.2(= 0.09)
	'their' 0.06 + 'their' 0.0575 + 'their' 0.0225	M1 dep	All 6 added
	1 – (0.06 + 0.0575 + 0.0225) = 0.86	A1	0.5625 + 0.2975 = 0.86
15(c)	their 0.75 + 0.2 = 0.95	M1, A1	cao their 0.4275/ their 0.45 M1
15(d)	(1 – 0.86) = 0.14	M1	
	(0.14 × 0.14 × 0.86)	M1, A1	
	× 3	M1	
	= 0.0505(68)	A1	cao accept 0.0506 or 0.051