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ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Secondary Education

Statistics 3311

Higher Tier

Mark Scheme

2006 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.

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..

Contents

AQA GCSE Statistics

The following abbreviations are used on the mark scheme:

M	Method marks awarded for a correct method.
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.
M dep	A method mark which is dependent on a previous method mark being awarded.
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.
eeoo	Each error or omission.

Higher Tier

1(a)	More detail of the shape / Distribution of the data	B1	Shows data more clearly – not enough - B0
1(b)	74	B1	Allow 73.5 oe
1(c)	9 correctly placed	B1	Must be on 2nd diagram

2(a)	Leading question – use of word disaster / use of do you agree	B1	oe Comment on wording of question
	Use of word definitely / no don't know / no maybe / possibly	B1	oe Comment on response section (could be no instruction to tick a box)
2(b)	Fair wording	B1	eg Do you support a wind turbine being built close to the village? oe
	Response boxes giving covering all degrees of response	B1	Minimum 3 boxes eg Y / N/ maybe

3(a)	8 coordinates correctly plotted	B2	B1 6 or 7 coordinates correctly plotted
3(b)	Negative	B1	
3(c)	144 ÷ 8	M1	
	18	A1	
3(d)	Correct double mean point identified	M1	
	Line touches or cuts arcs on overlay, negative gradient	A1	
3(e)	Their 12	B1ft	ft their straight line (but value must be integer)
3(f)	Extrapolation / outside range of data OR Would give negative number of calls	B1	oe

4(a)	Blue There is one circle out of 5 possibilities	B1	oe **must** have reason
4(b)	all correct 4/5 3/5 1/5 4/5 2/5 1/5 OR 0.8 0.6 0.2 0.8 0.4 0.2	B3	oe B2 2 pairs correct B1 all circle probs correct or all square probs correct or one pair correct SC1 all pairs reversed (squares and circles)
4(c)	Their $\frac{3}{5} \times \frac{4}{5}$	M1	
	$\frac{12}{25}$	A1	oe

5(a)	Mixed	B1	Accept Other Black
5(b)	35 – 30	M1	Accept 30 – 35
	5	A1	
5(c)	**Similarity** Under 16 or 35 - 64 no justification needed OR first 3 groups increase OR 65 and over smallest %	B1	Beware incorrect statements about numbers not %, penalise once
	Difference 65 and over with qualification eg higher % whites OR 16 - 34 with qualification eg lower % whites	B1	Do not allow 'young' or 'old'

6(a)(i)	300	B1	or 310 if $n + 1$ used
6(a)(ii)	470 – 230	M1	230 – 235 *LQ*
	240	A1 ft	235 – 240 for M1A1
6(a)(iii)	$\frac{63}{120}$	M1	62 - 64 inclusive
	× 100	M1	
	52.5	A1 ft	Accept 51.6% - 53.33…% from their calculations
6(a)(iv)	Read off at 108 = £540	M1 A1	
6(b)(i)	Their median is lower	B1	or Reference lower maximum (must define what they are comparing)
	Their *IQR* is smaller	B1	or Reference the reduced range (must define what they are comparing)
6(b)(ii)	Data from the non-manual sector	B1	oe eg Obtain data on part-time / full-time / hours worked
6(c)(i)	0.42, 0 0.4167 or 0.447 acceptable	M1 A1 A1	M1 for sub, either ft for males females cao
6(c)(ii)	Positive skew, symmetrical	B1 ft B1	Allow normal

7(a)	4446 ÷ 90 000	M1	M2 - 4446 ÷ 90
	× 1000	M1	M2 digits 494 seen
	49 or 49.4(per thousand)	A1	Allow 4.94(%), 4.9(%) or 5(%)
7(b)	$\frac{1020}{16000} \times 1000$	M1	
	× .25	M1	dep
	15.94, 16.5, 11.31, 7.29	A1	Values seen in any form
	51.029 per 1000	A1 cao	Accept 51 per 1000 or 51.04 or 5.1% or 5.104% must see percent sign
7(c)	Takes account of age differences: Enables comparison	B1	
7(d)	Stokeham: lower std. rate	B1	Accept lower unemployment rate No calculations no marks

8(a)	124 1820 1944 341 239 580 155 21 (176)	B4	−1 each error or omission
	(620) 2080 (2700)		
8(b)(i)	$\frac{239}{2700}$	B1ft	or .0885 2dp or better follow through on numerator
8(b)(ii)	$\frac{A+B-AB}{2700} = \frac{859}{2700}$	M1 A1ft	or .318
8(b)(iii)	$\frac{1820}{2080} = \frac{7}{8}$	M1 A1	or .875 follow through on numerator and denominator
8(c)	$\frac{155}{2700} \times 200 = 11$	M1 A1ft	(11.48 accept) allow 11.5 ft on numerator only

9(a)	More detail Equal classes	B1 B1	More information, pattern, form of distribution Do not accept easier to read/graph/analyse Not reference to individual classes Not more accurate/more groups or more spread out
9(b)	$9 \leq t < 12$ $12 \leq t < 15$ $10 \leq t < 11$	B1 B1	-1 for extras or omissions
9(c)	fr. Density 1, 2, 22, 6, 3	M1 A1	Minimum of 3 fd's correct for M1
	Vertical label and scale/key	B1	For plot of actual data without frequency density B1, B1 only
	Heights	A1ft	
	Horizontal	B1	indept
9(d)	$1 - .1 = .9$	M1	
	$(.9)^5$	M1 dep	
	.59(049)	A1 cao	Accept 0.6 with correct method shown

10(a)	List	B1	
	Random Start	B1	
	Then ever 9th	B1	
10(b)	Only production	B1	Only one section of the factory
	Only male	B1	
10(c)(i)	$\frac{16}{400} \times 50 = 2$	M1 A1 cao	SC1 for one male and one female
10(c)(ii)	$\frac{24}{400} \times 50 = 3$	M1 A1	
10(d)	Continuous linear scale Labels Discrete scale (boxes) Labels	B1 B1 B1 B1	Not Yes / No Accept good / bad and agree / disagree
10(e)(i)	Plot	B2	5 or more correct B1 −1 if inconsistent horizontal scale
10(e)(ii)	Sample 6	B1	
	Justification	B1	Ref. trend
10(f)(i)	(Data) logging	B1	
10(f)(ii)	Accurate	B1	Avoids human error not cost/people

11(a)	$\frac{\sum fx}{\sum f} = \frac{747}{120} = 6.225$	M1, A1	
	$\sum fx^2 = 7201$	M1	
	Formula $\sigma = 4.61$	M1, A1	or 4.63 for $(n-1)$
11(b)(i)	Mean ↑ by 2	B1	Increase by 2 must be seen
11(b)(ii)	σ no change	B1	
11(c)(i)	Matching curve Limit at 26/26.2	B1 B1	
11(c)(ii)	Mean $\pm 3\sigma$ More peaked	B1 B1 B1	 Reference the shape
11(c)(iii)	50%	B1	
11(c)(iv)	Very small	B1	Accept zero

12(a)	$\sum d^2 = 154.5$ formula rank coefficient = –.839(3)	M1, M1 M1 A1	dep dep accept –0.84
12(b)	Negative correlation – rankings reversed – disagrees with expert	B1	Strict ft from (a) in context
12(c)(i)	0.05:- 0.02	B1, B1	–1 for each extra
12(c)(ii)	0.92	B1	
12(d)	$\frac{1964000}{107000}$	M1	$\frac{1964000}{107000}$ 1.8355 M1
	$\frac{28.278}{107000} \times 196400 = 51.9$	M1	$\times 3^2$ M1 1.3548 M1
	$\pi r^2 = 51.9$	M1	rt M1 × 3 M1 dep
	$r^2 = 16.518(9)$		
	$r = 4.06$	A1	4.06 A1 4.06 A1