Cambridge Assessment International Education

Cambridge O Level

STATISTICS **4040/12**

Paper 1 **October/November 2022**

MARK SCHEME

Maximum Mark: 100

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the October/November 2022 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

[Turn over

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

MARK SCHEME NOTES

The following notes are intended to aid interpretation of mark schemes in general, but individual mark schemes may include marks awarded for specific reasons outside the scope of these notes.

Types of mark

M Method marks, awarded for a valid method applied to the problem.

A Accuracy mark, awarded for a correct answer or intermediate step correctly obtained. For accuracy marks to be given, the associated Method mark must be earned or implied.

B Mark for a correct result or statement independent of Method marks.

When a part of a question has two or more 'method' steps, the M marks are in principle independent unless the scheme specifically says otherwise; and similarly where there are several B marks allocated. The notation 'dep' is used to indicate that a particular M or B mark is dependent on an earlier, asterisked, mark in the scheme.

The symbol √ implies that the A or B mark indicated is allowed for work correctly following on from previously incorrect results. Otherwise, A and B marks are given for correct work only.

Abbreviations

AG answer given on question paper
awrt answer which rounds to
cao correct answer only
dep dependent
ft follow through after error
oe or equivalent
SC special case
soi seen or implied
www without wrong working

Question	Answer	Marks	Partial Marks
1(a)	10	**1**	B1
1(b)	13	**1**	B1
1(c)	29/35	**1**	B1

Question	Answer	Marks	Partial Marks
2(a)	positive: as one variable increases, the other also increases **or** variables in direct proportion	**2**	B1
	negative: as one variable increases, the other decreases **or** variables in inverse proportion		B1
2(b)	A positive **and** B negative	**3**	B1
	A strong		B1
	B weak *if zero scored allow SC1 for linear positive for A*		B1
2(c)	eight scattered points showing no correlation	**1**	B1

Question	Answer	Marks	Partial Marks
3(a)	the number of teenagers who like Hip-hop and Disco but not Rock	**1**	B1
3(b)(i)	35	**1**	B1
3(b)(ii)	16	**1**	B1
3(b)(iii)	12	**1**	B1
3(c)	10 + 7 (=17) **or** 9 + 7 + 10 + 14 (=40)	**2**	M1
	42.5[%]		A1

Question	Answer	Marks	Partial Marks
4(a)(i)	9	**1**	B1
4(a)(ii)	32	**1**	B1
4(a)(iii)	13	**1**	B1
4(b)	mid-point of 3–5 class is 4	**3**	B1
	$(20 \times 1) + (9 \times 2) + (5 \times$ *their* 4) **or** (2+3+4+6+5) + (2+4+6+4+2) + *their* (4+4+8+4+0)		M1
	58		A1
4(c)	any valid reason, e.g. number of dentists/doctors unknown, perhaps fewer dentists in the town than doctors, larger number of doctor visits could be shared around several doctors, sample may not fairly represent whole town, sample size is small for a whole town	**1**	B1

Question	Answer	Marks	Partial Marks
5(a)	5	**1**	B1
5(b)	any product of three probabilities with denominators 6 **soi**	**5**	M1
	five possible ways 6 3 2 6 3 1 5 4 3 5 4 2 5 4 1 any three identified with no incorrect extras **soi** *(allow M1 for one or two identified with no incorrect extras **soi**)*		M2
	evidence of 6 cases for any correct way used		M1
	30/216 or 5/36		A1
5(c)	(*their* 5/36)^2	**2**	M1
	25/1296 or 0.0193 **ft**		A1√

Question	Answer	Marks	Partial Marks
6(a)(i)	Lizzy, range smallest	**1**	B1
6(a)(ii)	Emma, range largest	**1**	B1
6(a)(iii)	valid point relating to limitations of range as a measure of dispersion, e.g. small/large range not a consequence of just one (or two) atypical journey(s) much shorter/longer than all the others, journey times evenly spread out, no extreme value(s) in journey times	**1**	B1
6(b)(i)	398	**1**	B1
6(b)(ii)	$(42.6 \times 10) - (36.2 \times 10)$ **oe**	**2**	M1
	64		A1
6(c)	longest journey time = shortest journey time + range for any worker implied by 41, 42 48, 46 or 47 seen	**2**	M1
	7		A1

Question	Answer	Marks	Partial Marks
7(a)	attempted use of class mid-points (21 23 25 27 29 31)	**7**	M1*
	correct method for mean (Σfx=1108) **dep**		M1dep
	26.3 – 26.4		A1
	finding values of $f \times$variable squared		M1
	correct method for SD or variance (Σfx^2=29530) **dep**		M1dep
	2.67 – 2.69 or 2.47 – 2.48		A1
	26.4 **and** 2.67		A1

Question	Answer	Marks	Partial Marks
7(b)	[(*their* Σ*fx*) × 126/42] ÷ 12	**3**	M1
	277 kg *their* Σ*fx* ÷ 4 correct to 3sf **ft**		A1√
	valid comment relating to milk production e.g. total amount of milk produced every 42 days stays the same, mean (for each 42 day period) unchanged, herd continues to produce milk at same rate as observed in the data		B1
7(c)	indication of column area proportional to class frequency, implied by non-standard frequencies of 6 or 14 or 5 **or** implied by calculating areas/counting squares	**5**	M1*
	frequencies/areas/squares for profitable identified: 14 28 56		A1
	5 10 20		A1
	[(14 + 5)/30] × 100 **or** [(28 + 10)/*their*60]] × 100 **or** [(56 + 20)/*their*120] × 100 **dep**		M1dep
	63.3[%]		A1

Question	Answer	Marks	Partial Marks
8(a)	25 43 54 62 68 73 77 80	**1**	B1
8(b)	horizontal plots at UCBs	**3**	B1
	vertical plots at cfs		M1
	smooth curve through eight plotted points		A1
8(c)(i)	0.87 – 0.93	**1**	B1
8(c)(ii)	Q1: find magnitude for cf = 20 (0.35 – 0.45)	**4**	M1
	Q3: find magnitude for cf = 60 (1.80 – 1.90)		M1
	use IQR = Q3 – Q1		M1
	1.35 – 1.55 from correctly drawn graph		A1
8(d)	read magnitude for cf = 62 + (0.45)(80 – 62) (=70.1)	**2**	M1
	2.65 – 2.75		A1

Question	Answer	Marks	Partial Marks
8(e)	clear attempt to read magnitude for cf = 78	**2**	M1
	correct value from *their* correctly drawn graph		A1
8(f)	no/median better **and** valid reason	**2**	B1
	second valid reason examples: distribution is very unsymmetrical, mean affected by the (relatively) few large values, mean affected by extreme values, more than half of values less than 1.0, lots of values bunched at one end of the distribution		B1

Question	Answer	Marks	Partial Marks
9(a)	correctly plotted points *(allow B1 for 6 or 7 correct)*	**2**	B2
9(b)	3	**1**	B1
9(c)	method for LSA (5.3+5.4+5.5+5.6)/4, (14+13+12+9)/4	**3**	M1
	plot of (5.45, 12)		A1
	plot of (5.6125, 8.375) **and** (5.775, 4.75)		B1
9(d)	straight line through at least two of *their* plots in **(c)**	**4**	B1
	correct method for gradient		M1
	correct method for *c* using negative gradient		M1
	m = –22.31 to –22.30 **and** c = 133 – 134		A1
9(e)	put y = 1 in *their* LOBF with negative m and positive c and find positive x **or** read x from *their* graph with negative m at y = 1	**2**	M1
	5.94m **ft**		A1√
9(f)	valid explanation e.g. linear relationship may not continue in extrapolated region, points scatter around line of best fit, extrapolation for only one person who could be completely atypical	**1**	B1

Question	Answer	Marks	Partial Marks
9(g)	3 eliminated, selecting from 13	**3**	B1
	(3/13) × (2/12)		M1
	1/26		A1

Question	Answer	Marks	Partial Marks
10(a)	220/5.6 **oe** for any country	**3**	M1
	39.3 38.7 62.6 27.8 **and** C *(allow A1 for all correct and incorrect choice* ***or** for three correct and correct choice* ***or** for non 1dp values rounding correctly **and** C)*		A2
10(b)(i)	(160/360) × 1780	**2**	M1
	791		A1
10(b)(ii)	(90/360) × 1780	**2**	M1
	445		A1
10(c)	[(84 – 60)/100] × 1780	**2**	M1
	427		A1
10(d)	(35/100) × 1780 (= 623) **or** (95/360) × 1780 (≈ 470)	**4**	M1
	(95/360) × *their* 623 **or** (35/100) × *their* 470		M1
	164 or 165		A1
	proportion of deaths by road user type same in South as in country as a whole		B1
10(e)(i)	death rates in different populations largely influenced by the age structure of the population	**1**	B1

Question	Answer	Marks	Partial Marks
10(e)(ii)	allow B1 for each of two relevant points e.g. for road accident death rates age may not be main determining factor, many other factors probably also relevant such as traffic density in different places, quality of roads, whether place predominantly urban or rural, general weather conditions in the places, laws relating to road use, e.g. speed limits, how experienced car drivers, cyclists etc are	**2**	B2