



Cambridge O Level

STATISTICS

4040/12

Paper 1

October/November 2020

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.

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This document consists of **8** printed pages.

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 \surd 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)(i) | random, systematic, stratified (allow B1 for any two) | 2 | B2 |
| 1(a)(ii) | random, stratified | 1 | B1 |
| 1(b) | random | 1 | B1 |
| 1(c) | 12 | 1 | B1 |

| Question | Answer | Marks | Partial Marks |
|----------|------------------------|-------|---------------|
| 2(a) | $(90/360) \times 100$ | 2 | M1 |
| | 25[%] | | A1 |
| 2(b) | $(200/360) \times 2.7$ | 2 | M1 |
| | 1.5 | | A1 |

| Question | Answer | Marks | Partial Marks |
|----------|--|-------|---------------|
| 3(a)(i) | correct method ($\Sigma x = -84$) | 2 | M1 |
| | -12 | | A1 |
| 3(a)(ii) | correct method ($\Sigma x^2 = 1050$) | 2 | M1 |
| | 6 | | A1 |
| 3(b) | 32[°C] 20 – their(-12) ft | 2 | B1√ |
| | 8[°C] | | B1 |

| Question | Answer | Marks | Partial Marks |
|----------|-----------------------------|-------|---------------|
| 4(a) | $(0.98)^2$ | 2 | M1 |
| | 0.960 | | A1 |
| 4(b) | $0.98 \times 0.02 \times 2$ | 2 | M1 |
| | 0.0392 | | A1 |
| 4(c) | $1 - (0.98)^3$ | 2 | M1 |
| | 0.0588 | | A1 |

| Question | Answer | Marks | Partial Marks |
|----------|---|-------|---------------|
| 5(a) | two-way table with rows/columns headed G, B | 4 | B1 |
| | and columns/rows headed A, R, C | | B1 |
| | cell values 2, 5, 7 3, 2, 5 in correct places, totals not required <i>(allow B1 for four or five correct, or no values but fully correct tallies)</i> | | B2 |
| 5(b) | yes/Dan's claim supported $5(R) > 2(A)$ oe ft | 3 | B1√ |
| | no/Eva's claim not supported $3(A) < 5(C)$ oe ft | | B1√ |
| | yes/Flo's claim supported $7/14 = 5/10$ oe <i>(if zero scored, allow SC1 for yes, no, yes/supported, not supported, supported)</i> | | B1 |

| Question | Answer | Marks | Partial Marks |
|-----------|--|-------|---------------|
| 6(a)(i) | 68 | 1 | B1 |
| 6(a)(ii) | Q1 find noise level for $cf = 18 (= 58)$ | 3 | M1 |
| | use $IQR = Q3 - Q1$ | | M1 |
| | 19 | | A1 |
| 6(a)(iii) | attempt to read noise level for $cf = 0.36 \times 72 (\approx 26)$ | 2 | M1 |
| | 63 | | A1 |
| 6(b) | find cf for noise level = 90 and subtract from 72 and find 7.5% of 72 | 2 | M1 |
| | 7 and 5.4 and law broken | | A1 |

| Question | Answer | Marks | Partial Marks |
|----------|--------------------------------------|-------|---------------|
| 7(a) | $(147/17\ 500) \times 1000$ | 2 | M1 |
| | 8.4 | | A1 |
| 7(b) | $(24/100) \times 17500 (= 4200)$ | 3 | M1 |
| | <i>(their 4200/1000) \times 10.5</i> | | M1 |
| | 44 | | A1 |

| Question | Answer | Marks | Partial Marks |
|----------|--|-------|---------------|
| 7(c) | so fair comparison can be made between different places/ to allow for different age structures in different populations | 1 | B1 |
| 7(d) | any group rate multiplied by standard population figure | 4 | M1 |
| | sum of five such products | | M1 |
| | $(2.5 \times 0.20) + (6.0 \times 0.25) + (7.2 \times 0.30) + (10.5 \times 0.20) + (25.0 \times 0.05)$ | | A1 |
| | 7.51 | | A1 |
| 7(e) | the proportion of young people in the town/older people in the town is smaller/larger than in the standard population | 1 | B1 |
| 7(f) | $(15\,700/1000) \times 10.4$ oe for any town | 3 | M1 |
| | 163, 89, 131, 151 and Q <i>(allow A1 for any three correct integers, or decimal value(s) rounding to correct integer(s))</i> | | A2 |
| 7(g) | indication that SDR should be larger than CDR or indication that SDR~CDR difference should be largest | 2 | M1 |
| | Q: SDR larger than CDR by largest amount | | A1 |

| Question | Answer | Marks | Partial Marks |
|----------|--|-------|---------------|
| 8(a) | correctly plotted points <i>(allow B1 for 6 or 7 correct)</i> | 2 | B2 |
| 8(b) | positive | 2 | B1 |
| | strong | | B1 |
| 8(c) | method for upper semi-average | 3 | M1 |
| | plot of (10.2, 42.5) | | A1 |
| | plot of (6.6, 28.5) and (8.4, 35.5) | | B1 |
| 8(d) | line through at least two of <i>their</i> plots in (c) | 4 | B1 |
| | correct method for gradient | | M1 |
| | correct method for <i>c</i> | | M1 |
| | $m = 3.89$ (35/9) and $c = 2.82 - 2.84$ | | A1 |

| Question | Answer | Marks | Partial Marks |
|----------|---|-------|---------------|
| 8(e) | use graph or equation for $x = 15/2$ and multiply by 2 | 2 | M1 |
| | 64 [Calories] | | A1 |
| 8(f) | 125 Calories in one can is $125/3.3 = 38$ Calories/100 ml | 3 | M1 |
| | identify drinks above $y = 38$ from graph or original data | | M1 |
| | correct calculation and B, G, F, D <i>(if zero scored, allow SC1 for B, G, F, D)</i> | | A1 |

| Question | Answer | Marks | Partial Marks |
|-----------|--|-------|---------------|
| 9(a) | indication of area being proportional to class frequency | 4 | M1 |
| | column heights 10, 4, 1.3 <i>(allow A1 for two correct)</i> | | A2 |
| | correct column widths | | A1 |
| 9(b) | $[(3/4) \times 8] + [(2/3) \times 6]$ | 3 | M1 |
| | 10 | | A1 |
| | uniform distribution of cyclists' times through the [69–under 71 and 71–under 74] classes | | B1 |
| 9(c)(i) | 18 | 1 | B1 |
| 9(c)(ii) | 0 | 1 | B1 |
| 9(c)(iii) | 31 | 1 | B1 |
| 9(d)(i) | 6/32 or 3/16 | 1 | B1 |
| 9(d)(ii) | 2/3 | 1 | B1 |
| 9(d)(iii) | 2/18 or 1/9 | 1 | B1 |
| 9(e) | any indication of needing to choose cyclists in SA-I and K-A intersections only | 3 | M1 |
| | $(2/32) \times (4/31) \times 2$ | | A1 |
| | 1/62 or 0.0161 | | A1 |

| Question | Answer | Marks | Partial Marks |
|----------|--|-------|---------------|
| 10(a) | 46 – 60 | 1 | B1 |
| 10(b) | attempted use of class mid-points (8 23 38 53 68 83) | 7 | M1* |
| | correct method for mean ($\Sigma fx = 1909$) dep | | M1dep |
| | 50 or 50.2 or 50.23... | | A1 |
| | finding values of $f \times$ variable squared | | M1 |
| | correct method for SD or variance ($\Sigma fx^2 = 109\,337$) dep | | M1dep |
| | 19 or 18.8 or 18.80... or 18.9 | | A1 |
| | 50.2 and 18.8 | | A1 |
| 10(c) | 10 | 1 | B1 |
| 10(d) | find difference between Σf from table (= 38) and Σf from graph (= 1 + 4 + 7 + 4 + 1 + 0 + 6 + 9 + 10) | 2 | M1 |
| | 4 and Modise | | A1 |
| 10(e) | horizontal plots at <i>their</i> class mid-points | 3 | B1 |
| | vertical plots at class frequencies | | M1 |
| | ruled straight lines joining 6 plotted points and key provided/polygons labelled | | A1 |
| 10(f) | <i>Award B1 for each of any two valid conclusions</i> eg L sent a smaller proportion of short messages than M oe eg L sent a smaller proportion of long messages than M oe eg L sent a higher proportion of medium length messages than M oe eg L's message lengths less dispersed than M's oe eg L's mean message length less than M's oe eg L's messages generally shorter than M's oe | 2 | B2 |