

---

**STATISTICS**

**4040/13**

Paper 1

**October/November 2017**

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 2017 series for most Cambridge IGCSE<sup>®</sup>, Cambridge International A and AS Level components and some Cambridge O Level components.

**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  $\nabla$  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**

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

| Question  | Answer                            | Marks | Partial Marks |
|-----------|-----------------------------------|-------|---------------|
| 1(a)(i)   | quota                             | 1     | B1            |
| 1(a)(ii)  | [simple] random/stratified random | 1     | B1            |
| 1(a)(iii) | systematic                        | 1     | B1            |
| 1(b)      | bias, representative              | 1     | B1            |

| Question | Answer  | Marks | Partial Marks |
|----------|---|-------|---------------|
| 2(i)(a)  | ordering of data  | 2     | M1            |
|          | 27  |       | A1            |
| 2(i)(b)  | 28  | 1     | B1            |
| 2(i)(c)  | correct method  | 2     | M1            |
|          | 26.3  |       | A1            |
| 2(ii)    | mode: possibly no repeated value, e.g. original recordings for $3 \times 28$ may have been 28.1, 27.8, 28.3 <b>oe</b> | 1     | B1            |

| Question | Answer             | Marks | Partial Marks |
|----------|--------------------|-------|---------------|
| 3(i)     | 10                 | 1     | B1            |
| 3(ii)    | 5                  | 1     | B1            |
| 3(iii)   | appropriate method | 2     | M1            |
|          | 26                 |       | A1            |
| 3(iv)    | 9                  | 1     | B1            |
| 3(v)     | 6                  | 1     | B1            |

| Question | Answer                          | Marks | Partial Marks |
|----------|---------------------------------|-------|---------------|
| 4(i)(a)  | morning                         | 1     | B1            |
| 4(i)(b)  | afternoon                       | 1     | B1            |
| 4(ii)    | $(6.33 + 5.33 + 2.50) \times 6$ | 2     | M1            |
|          | 85                              |       | A1            |
| 4(iii)   | $(4 \times 60)/5.33$ oe         | 2     | M1            |
|          | 45 (minutes)                    |       | A1            |

| Question | Answer   | Marks | Partial Marks |
|----------|--|-------|---------------|
| 5(i)(a)  | 10   | 1     | B1            |
| 5(i)(b)  | 9  | 1     | B1            |
| 5(i)(c)  | 6  | 1     | B1            |
| 5(ii)    | $(5 \times 1) + (4 \times 2) + (10 \times 3) + (3 \times 4)$   | 2     | M1            |
|          | 55   |       | A1            |
| 5(iii)   | in 4 matches, it is only known that 5 or more goals scored, so goals scored in these matches unknown | 1     | B1            |

| Question | Answer                      | Marks | Partial Marks |
|----------|-----------------------------|-------|---------------|
| 6(i)(a)  | $(0.92)^2$                  | 2     | M1            |
|          | 0.8464 oe (529/625)         |       | A1            |
| 6(i)(b)  | $0.92 \times 0.08$          | 2     | M1            |
|          | 0.0736 oe (46/625)          |       | A1            |
| 6(i)(c)  | $0.03 \times 0.05 \times 2$ | 2     | M1            |
|          | 0.003 oe (3/1000)           |       | A1            |
| 6(ii)    | $134/0.08$                  | 2     | M1            |
|          | 1675                        |       | A1            |

| Question | Answer   | Marks | Partial Marks |
|----------|--|-------|---------------|
| 7(i)     | any one of very good, good or modest group rate multiplied by standard population figure                   | 4     | M1            |
|          | sum of four such products  |       | M1            |
|          | $(100 \times 0.20) + (87.5 \times 0.40) + (80 \times 0.30) + (50 \times 0.10)$ oe                          |       | A1            |
|          | 84(%)  |       | A1            |
| 7(ii)    | total enrolments $6 + 8 + 5 + 4 (= 23)$<br>method for passes in any one of very good, good or modest group | 5     | M1            |
|          | $0.875 \times 8$ or $0.8 \times 5$ or $0.5 \times 4$   |       | M1            |
|          | $(1 \times 6) + (0.875 \times 8) + (0.8 \times 5) + (0.5 \times 4) (= 19)$                                 |       | M1            |
|          | $((\text{their } 19)/(\text{their } 23)) \times 100$   |       | M1            |
|          | 82.6(%)  |       | A1            |
| 7(iii)   | Japanese   | 2     | B1            |
|          | SPR largest  |       | B1            |
| 7(iv)    | Chemistry  | 2     | B1            |
|          | CPR largest and largest number of enrolments   |       | B1            |
| 7(v)     | total languages passes found using CPR   | 3     |               |
|          | $(0.800 \times 25) + (0.667 \times 12) + (0.765 \times 17) (= 41)$   |       | M1*           |
|          | $((\text{their } 41)/(25 + 12 + 17)) \times 100$   |       | M1dep         |
|          | 75.9(%)  |       | A1            |

| Question | Answer   | Marks | Partial Marks |
|----------|--|-------|---------------|
| 8(i)     | attempted use of class mid-points              | 3     |               |
|          | (85, 92.5, 97.5, 110, 132.5)                   |       | M1*           |
|          | correct method for mean ( $\Sigma fx = 2610$ ) |       | M1dep         |
|          | 104.4 (m)                                      |       | A1            |

| Question | Answer  | Marks | Partial Marks |
|----------|---|-------|---------------|
| 8(ii)    | indication of area being proportional to class frequency    | 4     | M1            |
|          | 3 or 4 correct heights drawn<br>(allow A1 for two correct)  |       | A2            |
|          | fully correct histogram                                     |       | A1            |
| 8(iii)   | (their $\Sigma fx$ from (i)) + (165) – (1 × 85) oe (= 2690) | 2     | M1            |
|          | 107.6 (m)   |       | A1            |
| 8(iv)    | $(7/20) \times (6/19) \times (5/18)$                        | 2     | M1            |
|          | $7/228$ oe (0.0307)   |       | A1            |
| 8(v)     | $(4/20) \times (3/19) \times (9/18)$                        | 3     | M1            |
|          | × 3   |       | M1            |
|          | $9/190$ oe (0.0474)   |       | A1            |
| 8(vi)    | $(4/20) \times (9/19) \times (7/18) \times 6$               | 2     | M1            |
|          | $21/95$ oe (0.221)  |       | A1            |

| Question | Answer   | Marks | Partial Marks |
|----------|--|-------|---------------|
| 9(i)(a)  | 1.16   | 1     | B1            |
| 9(i)(b)  | Q1 find salt content for cf = 16 (1.07)  | 4     | M1            |
|          | Q3 find salt content for cf = 48 (1.24)  |       | M1            |
|          | use of IQR = Q3 – Q1   |       | M1            |
|          | 0.17   |       | A1            |
| 9(i)(c)  | attempt to read cf for salt content 1.35 (= 60)<br>and express as percentage of 64 | 2     | M1            |
|          | awrt 94  |       | A1            |
| 9(ii)(a) | 8  | 1     | B1            |
| 9(ii)(b) | attempt to read salt content<br>for cf = their 8 + 0.5 × (64 – their 8) (= 36)     | 2     | M1            |
|          | 1.18   |       | A1            |

| Question | Answer   | Marks | Partial Marks |
|----------|--|-------|---------------|
| 9(iii)   | product of four decreasing fractions,<br>denominators 64, 63, 62, 61   | 3     | M1*           |
|          | first numerator 64 – <i>their</i> 8  |       | M1dep         |
|          | 0.578 or 0.58 (8745/15128)   |       | A1            |
| 9(iv)    | 1 – <i>their</i> 0.578   | 2     | M1            |
|          | 0.422 or 0.42 ft (6383/15128)  |       | A1✓           |
| 9(v)     | IQR<br>dispersion unchanged by same change in all population<br>elements/Q1, Q3 both decrease by same amount so<br>difference unchanged. | 1     | B1            |

| Question  | Answer  | Marks | Partial Marks |
|-----------|---|-------|---------------|
| 10(i)     | correctly plotted points<br>(allow B1 for 6 or 7 correctly plotted)   | 2     | B2            |
| 10(ii)    | method for calculating LSA  | 3     | M1            |
|           | plot of (21.25, 15)   |       | A1            |
|           | plot of (40.625, 29.375) and (60, 43.75)  |       | B1            |
| 10(iii)   | straight line through at least two of <i>their</i> plotted points in (ii)   | 4     | B1            |
|           | correct method for gradient of <i>their</i> line  |       | M1            |
|           | correct method for intercept of <i>their</i> line   |       | M1            |
|           | $m = 0.74$ to $0.75$ and $c = 0$ to $-1$ inclusive  |       | A1            |
| 10(iv)(a) | find $y$ from equation or graph using $x = 55$  | 2     | M1            |
|           | \$40  |       | A1✓           |
| 10(iv)(b) | find $x$ from equation or graph using $y = 50$  | 2     | M1            |
|           | \$70  |       | A1✓           |
| 10(v)     | as $c \approx 0$ , LOBF is $y \approx 0.74x$ or $y \approx 74\%$ of $x$<br>or<br>use equation or line to find $y$ for chosen value of $x$<br>and calculate $((x - y)/x) \times 100$ | 2     | M1            |
|           | 25(%) – 30(%)   |       | A1            |

| Question | Answer  | Marks | Partial Marks |
|----------|---|-------|---------------|
| 10(vi)   | choice consistent with reason offered<br>e.g. C because customer paid asking price/<br>graph shows plot to deviate most from LOBF on upper side | 1     | B1            |

| Question  | Answer  | Marks | Partial Marks |
|-----------|---|-------|---------------|
| 11(i)     | 33  | 1     | B1            |
| 11(ii)    | 8   | 1     | B1            |
| 11(iii)   | 17 + 15 + 16 + 8 (= 56)   | 3     | M1            |
|           | $((\text{their } 56)/(\text{their } 56 + 8 + 6)) \times 100$  |       | M1            |
|           | 80(%)   |       | A1            |
| 11(iv)    | use of $r^2$ to find radius   | 5     | M1            |
|           | $r = \sqrt{[(30/40) \times 3.5^2]}$   |       | M1            |
|           | chart drawn with $r = 2.9$ cm to 3.1 cm   |       | A1            |
|           | correct method of angle calculation   |       | M1            |
|           | correct angles: in favour $192^\circ$ , against $96^\circ$ , undecided $72^\circ$ , all $\pm 2^\circ$ , and chart complete with labelling |       | A1            |
| 11(v)     | in favour:<br>smaller proportion of males/greater proportion of females   | 3     | B1            |
|           | against:<br>greater proportion of males/smaller proportion of females   |       | B1            |
|           | undecided:<br>proportion of males and females same/approx same  |       | B1            |
| 11(vi)(a) | clear visual representation of (relative) total/number(s) in categories   | 1     | B1            |
| 11(vi)(b) | clear visual representation of relative proportions in categories   | 1     | B1            |
| 11(vii)   | closed<br>apparently customers were restricted to only three possible responses   | 1     | B1            |