**Cambridge Assessment International Education**
Cambridge International General Certificate of Secondary Education

**MATHEMATICS** **0580/31**

Paper 3 (Core) **May/June 2019**

MARK SCHEME

Maximum Mark: 104

**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.

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## 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.

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**Abbreviations**

cao correct answer only
dep dependent
FT follow through after error
isw ignore subsequent working
oe or equivalent
SC Special Case
nfww not from wrong working
soi seen or implied

| Question | Answer | Marks | Partial Marks |
|---|---|---|---|
| 1(a) | 6.8[0] | **1** | |
| 1(b) | 4.9[0] | **2** | **M1** for 3.4[0] + 2 × [0].85 soi |
| 1(c)(i) | 280.5[0] | **1** | |
| 1(c)(ii) | 379.5[0] | **2** | **FT** *their* **(c)(i)** + 99<br>**M1** for 8 × 1.5 × 8.25 soi<br>or (8 × 1.5 + 34) × 8.25 soi |
| 1(d) | 33 | **2** | **M1** for 7.5, 7, 8, 10.5 |
| 1(e) | 85.20 cao | **3** | **B2** for 85.1999…<br>OR<br>**M1** for 9395 ÷ 110.27<br>**B1** for *their* answer to at least 3 dp correctly rounded to 2 dp |
| 1(f) | 13 891.5[0] | **3** | **M2** for $12\,000 \times (1 + \frac{5}{100})^3$ oe<br><br>or **M1** for $12\,000 \times (1 + \frac{5}{100})^2$ oe |
| 2(a) | 6 | **1** | |
| 2(b) | 3 + 2 × (12 – 4) = 19 | **1** | |
| 2(c) | $\frac{11}{15}$ [0].749 $\frac{3}{4}$ 76[%] | **2** | **B1** for 3 in the correct order<br>or 0.75, (0.749) , 0.76, 0.73…<br>or 75%, 74.9%, (76%), 73….% |
| 2(d)(i) | 16.3 | **1** | |
| 2(d)(ii) | 512 | **1** | |
| 2(e) | 2 | **1** | |
| 2(f) | 1 2 3 6 9 18 | **2** | **B1** for 4 or 5 correct factors only<br>or 6 correct factors with one extra<br>or 1 × 18, 2 × 9, 3 × 6 |
| 2(g) | 4 or 8 | **1** | |

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| Question | Answer | Marks | Partial Marks |
|---|---|---|---|
| 2(h) | $\frac{1}{5}$ cao | **1** | |
| 2(i) | 352 | **2** | **M1** for 160 ÷ 5 [ × 11] |
| 3(a)(i) | Correct bar | **3** | **M1** for 5, 12, 17 or 34<br>**M1** for 40 – *their*34 |
| 3(a)(ii) | 5 | **1** | |
| 3(a)(iii) | Adult | **1** | **FT** |
| 3(a)(iv) | $\frac{12}{40}$ oe | **1** | |
| 3(b)(i) | 86 | **1** | |
| 3(b)(ii) | 45 | **2** | **M1** for 18, 27, 31, 45, or 45, 60, 72, 104 |
| 3(b)(iii) | 51 | **2** | **M1** for<br>(104 + 18 + 72 + 31 + 27 + 45 + 60) ÷ 7<br>soi $\frac{357}{7}$ |
| 4(a) | 56 | **2** | **M1** for 180 – 118 soi by 62 |
| 4(b) | 144 | **3** | **M2** for 180 – (360 ÷ 10) oe<br>**M1** for 360 ÷ 10 soi by 36 |
| 4(c) | 32<br>58 | **2** | **B1** for each<br>or for *their x* + *their y* = 90<br>or angle *F* marked as 90 |
| 4(d) | 28 alternate | **2** | **B1** for each |
| 4(e) | 35 | **2** | **M1** for $21^2 + 28^2$ or better |
| 5(a)(i) | 18*a* final answer | **2** | **M1** for 2 × (7*a* + 2*a*) oe |
| 5(a)(ii) | $14a^2$ final answer | **2** | **M1** for 7*a* × 2*a* |
| 5(b) | 6 9 14 | **2** | **B1** for 2 correct or 5 6 9 |
| 5(c)(i) | −4 −6 −12 6 4 3 | **3** | **B2** for 4 or 5 correct<br>or **B1** for 2 or 3 correct |
| 5(c)(ii) | Correct curve | **4** | **B3FT** for 9 or 10 points correctly plotted<br>or **B2FT** for 7 or 8 points correctly plotted<br>or **B1FT** for 5 or 6 points correctly plotted |
| 5(c)(iii) | Correct ruled line drawn | **1** | |
| 5(c)(iv) | 1.3 to 1.7 | **1** | **FT** *their* curve and *their* line |
| 6(a) | 4 points correctly plotted | **2** | **B1** for 2 or 3 points correctly plotted |
| 6(b) | Positive | **1** | |

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| Question | Answer | Marks | Partial Marks |
|---|---|---|---|
| 6(c) | (40, 20) indicated | **1** | |
| 6(d) | Ruled line of best fit | **1** | |
| 6(e) | 33 to 42 | **1** | **FT** their positive line |
| 7(a) | Rotation<br>[centre] (0, 0) oe<br>90[°] clockwise oe | **3** | **B1** for each |
| 7(b) | Enlargement<br>[centre] (5, −7)<br>[sf=] 3 | **3** | **B1** for each |
| 7(c) | Correct shape plotted with points<br>(6, −1) (8, −1) (6, −3) (8, −3)<br>(6, −5) | **2** | **B1** for a correct translation of $\begin{pmatrix}3\\k\end{pmatrix}$ or $\begin{pmatrix}k\\1\end{pmatrix}$ |
| 7(d) | Correct shape plotted with points<br>(−2, 5) (−6, 5) (−2, 7) (−4, 5)<br>(−4, 7) | **2** | **B1** for reflection in $y = k$ or $x = 1$ |
| 8(a) | $\pi \times 6^2 \times 17$ | **M1** | |
| | 1922.6 to 1922.91 | **A1** | |
| 8(b) | 36.5 or 36.53 to 36.54… | **5** | **B2** for 100.53 to 100.54… or $32\pi$<br>or **M1** for [0.5 ×] $\pi \times 8^2$ oe<br>and<br>**B2** for 64<br>or **M1** for [0.5 ×] 16 × 8 oe |
| 9(a) | $6a + 4b$ final answer | **2** | **B1** for $6a + kb$ or $ka + 4b$ |
| 9(b) | 30 | **2** | **M1** for $4 \times 3^2 + 3 \times -2$ or better |
| 9(c)(i) | 80 | **1** | |
| 9(c)(ii) | 7 | **2** | **M1** for $3x = 16 + 5$ or $x - \frac{5}{3} = \frac{16}{3}$ or better |
| 9(c)(iii) | 2.2 oe | **3** | **M1** for $10x + 5$ [= 27] or $2x + 1 = \frac{27}{5}$<br>**M1** for second correct step |
| 9(d) | $\frac{p+5}{3}$ or $\frac{p}{3}+\frac{5}{3}$ final answer | **2** | **M1** for $p + 5 = 3r$ oe or $\frac{p}{3} = r - \frac{5}{3}$ |

| Question | Answer | Marks | Partial Marks |
|---|---|---|---|
| 10(a) | Correct angle bisector with two pairs of correct arcs | **2** | **B1** for correct angle bisector with no/incorrect arcs<br>or two pairs of correct arcs with no line |
| 10(b) | Correct arc with radius 10.5 cm centre *C*<br>and correct region shaded | **3** | **B2** for correct arc<br>or **B1** for any arc centre *C* or 10.5 seen<br><br>**B1**dep for shading correct region dep on at least **(a) B1(b) B1** |

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