



MATHEMATICS

0580/42

Paper 4 (Extended)

May/June 2018

MARK SCHEME

Maximum Mark: 130

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.

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)(i) | 85 | 1 | |
| 1(a)(ii) | 455 | 2 | M1 for $260 \div 20 \times 35$ oe |
| 1(a)(iii) | 61 | 3 | B2 for 61.5... seen or M1 for $2000 \div 650$ soi or for $\frac{x}{2000} = \frac{20}{650}$ oe or other attempt at scaling up with 650 or for $650 \div 20$ oe |
| 1(b)(i) | 40 | 3 | M2 for $\frac{1.89 - 1.35}{1.35} [\times 100]$ oe or $\frac{1.89}{1.35} \times 100$ oe or M1 for oe $\frac{1.89}{1.35} [\times 100]$ soi |
| 1(b)(ii) | 1.75 nfww | 3 | M2 for $1.89 \div \left(\frac{100+8}{100}\right)$ or better or M1 for 1.89 associated with 108 [%] |
| 1(c) | 10.1 or 10.06... | 3 | M2 for $\sqrt[3]{\frac{20.8}{15.6}}$ oe or M1 for $15.6 \times k^3 = 20.8$ oe |
| 1(d)(i) | 14:15 | 3 | B2 for correct unsimplified 3 term ratio A: B: C or correct unsimplified two term ratio A : C or M1 for attempt to find common multiple of 4 and 10 or other common value for B or for $7 \times \frac{4}{10}$ oe or $3 \times \frac{10}{4}$ oe |

| Question | Answer | Marks | Partial Marks |
|-----------|-------------------------------------|-------|---|
| 1(d)(ii) | 147 | 3 | M2 for $\frac{45}{15}(14 + 20 [+15])$ oe or $45 \div 3 \times 4 + (45 \div 3 \times 4) \div 10 \times 7 [+45]$ or M1 for $45 \div 3$ oe or $45 \div$ <i>their (d)(i)</i> value for C shown |
| 2(a)(i) | $20 < t \leq 25$ | 1 | |
| 2(a)(ii) | $25 < t \leq 30$ | 1 | |
| 2(a)(iii) | 28.3 or 28.33.. | 4 | M1 for 22.5, 27.5, 32.5, 37.5, 42.5 soi M1 for $\sum fx$ where x is in the correct interval including boundaries M1dep for $\sum fx \div 120$ or $\sum fx \div (44 + 32 + 28 + 12 + 4)$ |
| 2(a)(iv) | $\frac{4}{120}$ oe isw | 1 | |
| 2(b)(i) | 76, 104, 116, 120 | 2 | B1 for one error FT other values or for 3 correct |
| 2(b)(ii) | Correct curve | 3 | B1 for correct horizontal placement for 6 plots B1FT for correct vertical placement for 6 plots B1FT dep on at least B1 for reasonable increasing curve or polygon through <i>their</i> 6 points If 0 scored SC1FT for 5 out of 6 points correctly plotted |
| 2(b)(iii) | 27 to 27.5 | 1 | |
| 2(b)(iv) | 8.5 to 9.5 | 2 | B1 for [UQ=] 32 to 32.5 or [LQ=] 23 to 23.5 |
| 2(b)(v) | 8, 9, 10, 11 or 12 | 2 | B1 for 108 to 112 seen or B1FT <i>their</i> graph reading at 37 mins seen |
| 3(a)(i) | Image at (3, -3), (7, -3), (7, -5) | 2 | B1 for reflection in any $x = k$ or if 3 correct points not joined |
| 3(a)(ii) | Image at (-5, 1), (-1, 1), (-5, -1) | 2 | B1 for translation by $\begin{pmatrix} -2 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 4 \end{pmatrix}$ or if 3 correct points not joined |

| Question | Answer | Marks | Partial Marks |
|-----------|--|-----------|--|
| 3(a)(iii) | Image at (6, 3), (6, 4), (4, 3) | 3 | B2 for correct size and orientation but wrong position or if 3 correct points not joined B1 for enlargement SF $\frac{1}{2}$ with centre (3, 1) |
| 3(b) | Rotation 90° [anticlockwise]oe (- 6, - 2) | 3 | B1 for each |
| 3(c) | Reflection $y = -x$ oe | 2 | B1 for each |
| 4(a)(i) | $243p^{10}$ final answer | 2 | B1 for answer $243p^k$ or kp^{10} ($k \neq 0$) |
| 4(a)(ii) | $9xy^4$ final answer | 2 | B1 for answer with two correct elements in correct form of expression |
| 4(a)(iii) | $\frac{m^2}{25}$ final answer | 1 | |
| 4(b) | 10 | 4 | B2 for $x = 8$ or for [length of rectangle =] 31 or M1 for $5x - 9 = 3x + 7$ oe or better M1 for $\frac{310}{(3 \times \text{their } x + 7)}$ or $\frac{310}{(5 \times \text{their } x - 9)}$ <u>Alt method using simultaneous eqns</u> M1 for $5xw - 9w = 310$ and $3xw + 7w = 310$ M1 for equating coefficients of xw M1 for subtraction to eliminate term in xw |
| 5(a) | $8^2 + 7^2 - 2 \times 7 \times 8 \times \cos 78$ oe | M2 | M1 for correct implicit version |
| | 9.471.. to 9.472 | A2 | A1 for 89.7... |
| 5(b) | 46.3 or 46.29 to 46.30... | 3 | M2 for $[\sin OAC =] \frac{7 \sin 78}{9.47}$ or M1 for $\frac{\sin OAC}{7} = \frac{\sin 78}{9.47}$ |

| Question | Answer | Marks | Partial Marks |
|----------|---|-----------|---|
| 5(c) | $29.5 - (7 + 8 + 9.47)$ | M1 | |
| | $\frac{360 \times (29.5 - (7 + 8 + 9.47))}{2 \times \pi \times 7}$ | M3 | M2 for $\frac{x}{360} \times 2 \times \pi \times 7 =$ <i>their</i> arc length oe or M1 for $\frac{x}{360} \times 2 \times \pi \times 7$ oe |
| | 41.15 to 41.171.. | B1 | |
| 5(d) | 45[.0] or 44.98 to 45.01 nfw | 4 | M3 for $\frac{1}{2} \times 8 \times 7 \times \sin 78$ oe + $\frac{41.2}{360} \times \pi \times 7^2$ oe OR M1 for $\frac{1}{2} \times 8 \times 7 \times \sin 78$ oe or $\frac{1}{2} \times 8 \times 9.47 \times \sin$ <i>their</i> (b) oe M1 for $\frac{41.2}{360} \times \pi \times 7^2$ oe |
| 6(a) | $-2[.0], -0.2, 2.5$ | 3 | B1 for each |
| 6(b) | Fully correct curve | 5 | B4 for correct curve, but branches joined or B3FT for 9 or 10 correct plots or B2FT for 7 or 8 correct plots or B1FT for 5 or 6 correct plots and B1 indep two separate branches not touching or cutting y-axis |
| 6(c)(i) | Correct tangent and $3 \leq \text{grad} \leq 5$ | 3 | B2 for close attempt at tangent to curve at $x = -2$ and answer in range OR B1 for ruled tangent at $x = -2$, no daylight at $x = -2$ and M1dep (dep on B1 or close attempt at tangent) [at $x = -2$] for $\frac{\text{rise}}{\text{run}}$ |
| 6(c)(ii) | [y =] <i>their</i> (c)(i) x + <i>their</i> y-intercept final answer | 2 | Strict FT <i>their</i> y-intercept for <i>their</i> line M1 for $y =$ <i>their</i> (c)(i) x + <i>any value</i> or 'c' oe seen or for $y =$ <i>any value</i> (non-zero) x or 'mx' + <i>their</i> y-intercept seen oe |
| 6(d)(i) | 1.05 to 1.25 | 1 | |
| 6(d)(ii) | -2.3 to -2.2 -0.4 to -0.3 0.3 to 0.4 | 3 | B1 for each After 0 scored B1 for $y = -4$ ruled |

| Question | Answer | Marks | Partial Marks |
|----------|--|-----------|---|
| 6(e) | [a =] 2 [b =] 24 [n =] 5 | 3 | B2 for 2 correct or for $2x^5 + 24x^2$ [-3 = 0] or B1 for 1 correct or for $\frac{2x^5 - 3 + 4(6x^2)}{6x^2}$ [= 0] oe If 0 scored SC1 for $2x^5$ seen in final line of algebra |
| 7(a) | $x^2 + (2x - 3)^2 = 6^2$ oe or $x^2 + 4x^2 - 6x - 6x + 9 = 36$ | M1 | |
| | $4x^2 - 6x - 6x + 9$ or better | B1 | |
| | $5x^2 - 12x - 27 = 0$ | A1 | Dep on M1B1 with no errors or omissions |
| 7(b) | $\frac{-(-12) \pm \sqrt{(-12)^2 - 4(5)(-27)}}{2 \times 5}$ or better or $\frac{12}{10} \pm \sqrt{\left(\frac{12}{10}\right)^2 + \frac{27}{5}}$ | B2 | B1 for $\sqrt{(-12)^2 - 4(5)(-27)}$ or for $\left(x - \frac{12}{10}\right)^2$ oe or $\frac{-(-12) + \sqrt{q}}{2 \times 5}$ oe or $\frac{-(-12) - \sqrt{q}}{2 \times 5}$ oe or both |
| | - 1.42, 3.82 final answers | B2 | B1 for each If B0 , SC1 for answers - 1.4 or -1.415... to - 1.415 and 3.8 or 3.815 to 3.815... or answers -1.41 and 3.81 or - 1.42 and 3.82 seen in working or for -3.82 and 1.42 as final ans |
| 7(c) | 14.4 or 14.5 or 14.44 to 14.46 | 2 | 2FT for $3 \times$ <i>their</i> positive root + 3 evaluated to 3sf or better M1 for $3 \times$ <i>their</i> positive root + 3 oe |
| 7(d) | 39.5 or 39.46 to 39.54... | 2 | M1 for trig statement seen to find either angle $\sin = \frac{\text{their } x}{6}$ oe or $\sin = \frac{\text{their } (2x - 3)}{6}$ oe |
| 8(a)(i) | 1 | 2 | M1 for h(0) or for 2^{8-3x} |
| 8(a)(ii) | 8 | 2 | M1 for g($\frac{1}{4}$) or for $\frac{10}{2^x + 1}$ |

| Question | Answer | Marks | Partial Marks |
|------------|--|-------|--|
| 8(a)(iii) | $\frac{10-x}{x}$ or $\frac{10}{x}-1$ final answer | 3 | M2 for $x = \frac{10-y}{y}$ or better or $xy = 10 - x$ or better or $y + 1 = \frac{10}{x}$ or M1 for $x(y + 1) = 10$ or $y(x + 1) = 10$ or $x = \frac{10}{y+1}$ or $x + 1 = \frac{10}{y}$ |
| 8(a)(iv) | 5 | 1 | |
| 8(b) | $\frac{-3x^2 + 5x + 18}{x + 1}$ final answer | 3 | M1 for $\frac{(8 - 3x)(x + 1) + 10}{x + 1}$ B1 for $-3x^2 - 3x + 8x + 8$ [+10] |
| 9(a)(i)(a) | 62 and Isosceles [triangle] and Angle at centre is twice angle at circumference oe | 3 | B2 for 62 and one correct reason or B1 for 62 with no/wrong reason or for angle $EOD = 124$ soi or for no/wrong angle with correct reason |
| 9(a)(i)(b) | 62 and [Angles in] same segment oe or angle at centre is twice angle at circumference oe | 2 | 2FT <i>their (a)(i)(a)</i> and correct reason B1FT for <i>their (a)(i)(a)</i> with no/wrong reason or for no/wrong angle with correct reason |
| 9(a)(ii) | 8 | 3 | M2 for $(180 - 109) - 28 - 35$ oe or M1 for [angle $AED =$] $180 - 109$ oe |
| 9(b)(i) | 24 | 3 | $x =$ ext angle B2 for $[x =] 15$ isw or M1 for $x + 11x = 180$ oe or for $\frac{180(n-2)}{[n]} = \frac{360}{[n]} \times 11$ |
| 9(b)(ii) | 3960 | 2 | FT (<i>their</i> $24 - 2$) $\times 180$ dep on (b)(i) an integer and > 6 M1 for (<i>their</i> $24 - 2$) $\times 180$ oe or <i>their</i> $24 \times 11 \times$ <i>their</i> 15 oe or 11×360 |