Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

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.

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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)(i)	85	**1**	
1(a)(ii)	455	**2**	**M1** for 260 ÷ 20 × 35 oe
1(a)(iii)	61	**3**	**B2** for 61.5… seen or **M1** for 2000 ÷ 650 soi or for $\frac{x}{2000}=\frac{20}{650}$ oe or other attempt at scaling up with 650 or for 650 ÷ 20 oe
1(b)(i)	40	**3**	**M2** for $\frac{1.89-1.35}{1.35}$ [× 100] oe or $\frac{1.89}{1.35}\times 100$ oe or **M1** for oe $\frac{1.89}{1.35}$[×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 × $\frac{4}{10}$ oe or 3 × $\frac{10}{4}$ 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 $45 \div$ *their* **(d)(i)** value for C shown
2(a)(i)	$20\,[< t \leqslant]\,25$	**1**	
2(a)(ii)	$25\,[< t \leqslant]\,30$	**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 **M1**dep 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 *their* 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** *their* 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

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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 ½ 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 $\frac{310}{(3 \times theirx + 7)}$ or $\frac{310}{(5 \times theirx - 9)}$ Alt method using simultaneous eqns **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**	
	$\frac{360\times(29.5-(7+8+9.47))}{2\times\pi\times7}$	**M3**	**M2** for $\frac{x}{360}\times2\times\pi\times7$ = *their* arc length oe or **M1** for $\frac{x}{360}\times2\times\pi\times7$ oe
	41.15 to 41.171..	**B1**	
5(d)	45[.0] or 44.98 to 45.01 nfww	**4**	**M3** for ½ × 8 × 7 × sin 78 oe + $\frac{41.2}{360}\times\pi\times7^2$ oe OR **M1** for ½ × 8 × 7 × sin 78 oe or ½ × 8 × 9.47 × sin *their* **(b)** oe **M1** for $\frac{41.2}{360}\times\pi\times7^2$ 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 ⩽ grad ⩽ 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 $\frac{rise}{run}$
6(c)(ii)	[*y* =] *their***(c)(i)** *x* + *their y*-intercept final answer	**2**	**Strict FT** *their y*-intercept for *their* line **M1** for *y* = *their***(c)(i)** *x* + *any value* or '*c*' oe seen or for *y* = *any value*(non-zero) *x* or '*mx*' + *their 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

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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 × *their* positive root + 3 evaluated to 3sf or better **M1** for 3 × *their* 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 = $\frac{\textit{their } x}{6}$ oe or sin = $\frac{\textit{their}(2x-3)}{6}$ oe
8(a)(i)	1	**2**	**M1** for h(0) or for 2^{8-3x}
8(a)(ii)	8	**2**	**M1** for g(¼) 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** *their* **(a)(i)(a)** and correct reason **B1FT** for *their* **(a)(i)(a)** 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** (*their* 24 – 2) × 180 dep on **(b)(i)** an integer and > 6 **M1** for (*their* 24 – 2) × 180 oe or *their* 24 × 11 × *their* 15 oe or 11 × 360