Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

MATHEMATICS **0580/42**

Paper 4 (Extended) **May/June 2019**

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.

Cambridge International will not enter into discussions about these mark schemes.

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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)	16.5 or 16.49...	**3**	**M2** for $\frac{1.13-0.97}{0.97}[\times 100]$ oe or $\frac{1.13}{0.97}\times 100$ oe or **M1** for $\frac{1.13}{0.97}$ oe
1(b)(i)	35	**2**	**M1** for $60 \div (5+7)$
1(b)(ii)	140	**1**	
1(c)	$1.26 final answer	**3**	**B2** for 1.259... or 1.26 but not as final answer or **M1** for $2.25 \div 0.9416$ If 0 scored, **SC1** for 1.13 × 0.9416
1(d)	15[.0…]	**3**	**M2** for $\sqrt[21]{\frac{58000}{1763000}}$ oe or **M1** for $58000 = 1763000\ (k)^{21}$
1(e)	1239.75	**2**	**B1** for 43 + 0.5 or 28 + 0.5 oe seen
2(a)	103	**3**	**M1** for angle *ABC* or angle *ACB* = $\frac{1}{2}(180-26)$ oe **M1** for angle *ABF* = 26 or angle *CBD* or angle *FBE* = 77 or exterior angle *ACB* = 103 correctly identified or in correct position

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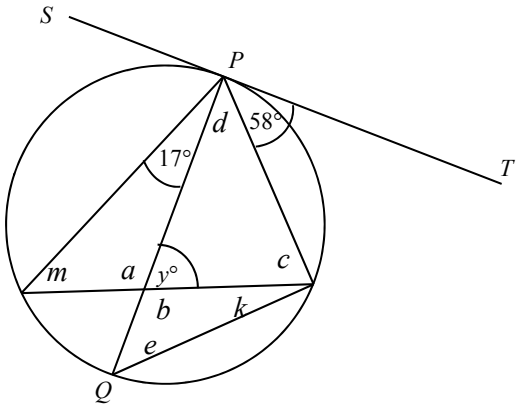
Question	Answer	Marks	Partial Marks
2(b)	75	**5**	**B4** for 105 at *a* or *b* **or** 73 at *c* **and** 32 at *d* or **B3** for 58 at *m* **or** 58 at *e* **and** 17 at *k* or **B2** for 32 at *d* **and** 90 soi at (*c*+*k*) **or** 32 at *d* **and** 17 at *k* **or** 73 at *c* or **B1** for 90 soi at (*c* + *k*) or between tangent and radius **or** 32 at *d* **or** 17 at *k* 
3(a)	$1 - r$	**1**	
3(b)(i)	$(1 - r)(1.3 - r)$ [= 0.4]	**1**	**FT** *their***(a)** dep on **(a)** being an expression in *r*
3(b)(ii)	$1.3 - 1.3r - r + r^2$ or better nfww	**M1**	**FT** *their* **(b)(i)**
	$0.9 - 2.3r + r^2 [= 0]$ OR $13 - 13r - 10r + 10r^2 = 4$ oe	**M1**	**Strict FT** *their* expansion to a quadratic then equating to 0.4 and then collecting to 3 terms on 'one side' OR **Strict FT** *their* expansion to a quadratic = 0.4 all multiplied by 10
	$10r^2 - 23r + 9 = 0$	**A1**	no errors or omissions seen

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Question	Answer	Marks	Partial Marks
3(b)(iii)	$(5r-9)(2r-1)$ [= 0]	**B2**	or **B2** for e.g. $5r(2r-1)-9(2r-1)$ **and then** $5r-9=0$ **and** $2r-1=0$ or **B1** for $5r(2r-1)-9(2r-1)$ [= 0] or $2r(5r-9)-1(5r-9)$ [= 0] or $(5r+a)(2r+b)$ [= 0] where a, b are integers and $ab = +9$ or $2a+5b=-23$ If 0 scored, **SC1** for $5r-9$ **and** $2r-1$ seen but not in factorised form
	[r =] $\frac{9}{5}$ oe [r =] $\frac{1}{2}$ oe	**B1**	
3(b)(iv)	0.8 or $\frac{4}{5}$ oe	**1**	
4(a)(i)	1.5 oe	**1**	
4(a)(ii)	(0, 2)	**1**	
4(b)(i)	$y=-2x+6$ oe final answer	**3**	**B2** for $y=-2x+c$ oe or $y=mx+6$ oe $m \neq 0$ or for answer $-2x+6$ or **B1** for [gradient =] $-\frac{6}{3}$ oe or $c = +6$ soi
4(b)(ii)	$y=0.5x-1.5$ oe final answer	**3**	**B1** for [gradient =] – 1 divided by *their* gradient from **(b)(i)** evaluated soi **M1** for substitution of (9, 3) into $y = (\textit{their } m)x + c$ seen in working
4(c)(i)	12.6 or 12.64 to 12.65	**3**	**M2** for $\sqrt{(8--4)^2+(5-1)^2}$ oe or **M1** for $(8--4)^2+(5-1)^2$ oe
4(c)(ii)	(2, 3)	**2**	**B1** for each
5(a)	2.45, 0.25, – 0.25	**3**	**B1** for each
5(b)	Fully correct smooth curve	**4**	**B3FT** for 6 or 7 points or **B2 FT** for 4 or 5 points or **B1 FT** for 2 or 3 points
5(c)	0.7 to 0.8	**1**	**FT** *their* curve
5(d)(i)	Correct ruled line	**2**	**M1** for good freehand, or ruled line with gradient –1.05 to –0.95 or ruled line through (0, 2) but not line $y = 2$

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Question	Answer	Marks	Partial Marks
5(d)(ii)	Both intersections of *their* **(b)** and *their* **(d)(i)**	**2**	**Strict FT** intersection of *their* **(b)** and *their* **(d)(i)** **B1FT** for one correct OR **B2** for 0.27 to 0.28 **and** 2.38 to 2.39
5(e)	Substitutes $x = \sqrt{2}$ into $\frac{1}{2x} - \frac{x}{4}$ OR Identifies $y = 0$ oe OR Correctly manipulates to a single fraction e.g. $\frac{2-x^2}{4x}$ oe seen	**M1**	
	Concludes 'read the graph at $y = 0$' oe OR Manipulates $0 = \frac{1}{2x} - \frac{x}{4}$ oe leading to $x^2 = 2$ OR States $\frac{2-x^2}{4x}$ oe $= 0$ leading to $x^2 = 2$	**A1**	
6(a)	$x^2 + 4x - 21$ final answer	**2**	**B1** for three of $x^2, +7x, -3x, -21$
6(b)(i)	$5q^2(3p^2 - 5q)$ final answer	**2**	**B1** for $5(3p^2q^2 - 5q^3)$ or $q^2(15p^2 - 25q)$ or $q(15p^2q - 25q^2)$ or $5q(3p^2q - 5q^2)$ or for correct answer seen
6(b)(ii)	$(2g + 5k)(2f + 3h)$ final answer	**2**	**B1** for $2g(2f + 3h) + 5k(2f + 3h)$ or $2f(2g + 5k) + 3h(2g + 5k)$ or for correct answer seen
6(b)(iii)	$(9k + m)(9k - m)$ final answer	**2**	**M1** for $(9 + m)(9 - m)$ or for correct answer seen

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Question	Answer	Marks	Partial Marks
6(c)	5.5	**4**	**M1** for $5\times3(x-4)+x+2=5\times6$ **M1** for $15x-60+x+2=30$ **FT** *their* first step or $3x-12+\frac{x+2}{5}=6$ If M0M0, **SC1** for $3x - 12 + x + 2 = 30$ oe **M1dep** for $16x=88$ **FT** *their* previous steps
7(a)	$180-\frac{360}{5}$ or $\frac{(5-2)\times180}{5}$ or $\frac{(2\times5-4)\times90}{5}$ or $\frac{5\times180-360}{5}$	**M2**	or **M1** for $\frac{360}{5}$ or $(5-2)\times180$ or $90(2 \times 5 - 4)$ or $3 \times 180 \div 5$ or $6 \times 90 \div 5$ or $5 \times 180 - 360$ If 0 scored, **SC1** for $\frac{5-2\times180}{5}$
7(b)(i)	7.05 or 7.053…	**3**	**M2** for $12 \times \cos54$ oe or **M1** for implicit form or **B1** for length of edge of pentagon = 14.1 to 14.11 If 0 scored, **SC1** for right angle at *M*
7(b)(ii)(a)	22.8 or 22.81 to 22.83… nfww	**3**	**M2** for $\frac{\textit{their}\ \textbf{(b)(i)}}{\cos 72}$ oe or **M1** for implicit form oe or **B1** for *AX* = 36.9 or 36.93 to 36.94
7(b)(ii)(b)	179 or 179.1 to 179.3…	**3**	**M2** for $\frac{1}{2}\times12\times\textit{their AX}\times\sin54$ oe or $\frac{1}{2}\times12\times\textit{their OX}\times\sin108$ oe or $\frac{1}{2}\times\textit{their AX}\times\textit{their OX}\times\sin18$ or $\frac{1}{2}\times12^2\times\sin72+\text{area}\ OBX$ oe or $\frac{1}{2}\times12^2\times\sin72+\text{area}\ OMB+\text{area}\ MBX$ oe or **M1** for a correct method to find area of one relevant triangle *AOB*, *OMB*, *MBX*, *OBX* or *ONX* **seen**
8(a)(i)	15.7 or 15.70...	**4**	**M2** for $16.5^2+12.4^2-2\times16.5\times12.4\times\cos64$ or **M1** for implicit form **A1** for 246 to 247

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Question	Answer	Marks	Partial Marks
8(a)(ii)	18.7 or 18.68 to 18.69	**4**	**B1** for 32 or angle *DBM* = 37 or angle *CBM* = 58 **M2** for $\frac{12.4\times\sin 53}{\sin 32}$ oe or **M1** for implicit form oe
8(b)(i)	116.1 or 116.08 to 116.09...	**2**	**M1** for $\frac{y}{360}\times 2\times\pi\times 3.8 = 7.7$ oe
8(b)(ii)	14.6 or 14.61 to 14.63…	**2**	**M1** for $\frac{\textit{their}\textbf{(b)(i)}}{360}\times\pi\times 3.8^2$ oe
9(a)	12.8[0]	**4**	**M1** for midpoints **soi** **M1** for use of $\sum fm$ with *m* in correct interval including both boundaries **M1** (dep on 2nd **M1**) for $\sum fm \div 100$
9(b)	54 84 93	**2**	**B1** for 2 correct or 1 error and 2 correct or **FT**
9(c)	correct diagram with all points correctly plotted	**3**	**B1FT** *their* **(b)** for plots at 5 correct heights **B1** for 5 points at upper ends of intervals on correct vertical line **B1FT** (dep on at least **B1**) for increasing curve or polygon through 5 points After 0 scored, **SC1FT** for 4 correct points plotted
9(d)(i)	9 to 9.8 final answer	**1**	
9(d)(ii)	8.5 to 11.5	**2**	**B1** for [UQ =] 15.5 to 17.5 or [LQ =] 6 to 7 seen
9(d)(iii)	10, 11 or 12	**2**	**B1** for 88 to 90 seen or for answer between 10 and 12
10(a)(i)	18[.0] or 17.99 to 18.00…	**3**	**M2** for $\sqrt[3]{\frac{24430\times 3}{4\pi}}$ oe or **M1** for $\frac{4}{3}\pi r^3 = 24430$
10(a)(ii)	447 or 446.8 to 446.9...	**3**	**M2** for $\pi\times 50^2\times 60 - 24430$ oe or **M1** for $\pi\times 50^2\times 60$ oe

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Question	Answer	Marks	Partial Marks
10(b)	4 [hours] 30 [mins] nfww	**4**	**B3** for 16200 or 4.5 or 270 or **M2** for $\frac{\text{figs } 18 \times \text{figs } 15 \times \text{figs } 12}{\text{figs } 2}$ oe or **M1** for figs 18 × figs 15 × figs 12 oe
10(c)	12.5 or 12.50…	**3**	**M2** for $17 \times \sqrt{\frac{159.5}{295}}$ oe or **M1** for $\sqrt{\frac{159.5}{295}}$ or $\sqrt{\frac{295}{159.5}}$ seen or for $\frac{159.5}{295} = \frac{x^2}{17^2}$ oe
11(a)	40 54 26 34	**4**	**B1** for each
11(b)	$n^2 + 3n$ or $n(n+3)$ oe	**2**	**B1** for a quadratic expression or for 2nd common difference 2 (at least 2 shown) or for 2 correct equations seen or for subtracting n^2
11(c)	100	**2**	**M1** for *their* **(b)** = 10300 seen
11(d)	[a =] $\frac{1}{2}$ oe and [b =] $\frac{5}{2}$ oe	**2**	**B1** for each or **M1** for one correct equation or for 2nd difference = 1 soi (at least 2 shown)

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