Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

MATHEMATICS **0580/43**

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)	13.5	**3**	**M2** for $\frac{45.4[0]-40}{40}$ [× 100] or $\frac{45.4[0]}{40} \times 100$ or **M1** for $\frac{45.4[0]}{40}$ [× 100]
1(a)(ii)	35.5[0]	**3**	**M2** for $42.6[0] \div \left(1+\frac{20}{100}\right)$ or better or **M1** for recognising 42.6[0] as 120[%]
1(b)	150 cao	**2**	**M1** for $\frac{500\times 2\times 15}{100}$ oe
1(c)(i)	7800 cao	**3**	**B2** for 7790 or 7785 to 7786 or **M1** for $21000\times\left(1-\frac{18}{100}\right)^5$ oe isw If 0 or 1 scored, **SC1** for *their* 7785… seen and rounded correctly to nearest 100
1(c)(ii)	9[.00…]	**3**	**M2** for $\sqrt[12]{\frac{42190}{15000}}$ or better or **M1** for $15000\left(1+\frac{x}{100}\right)^{12}=[42190]$
2(a)(i)	1, ….., ….., …., 16	**2**	**B1** for each
2(a)(ii)	14, ….., ….., …., – 2	**2**	**B1** for each
2(b)	Fully correct smooth curves	**6**	**B3** for correct curve of $y=2^x$ or **B2FT** for 4 or 5 correct points or **B1FT** for 2 or 3 correct points **B3** for correct curve of $y=14-x^2$ or **B2FT** for 4 or 5 correct points or **B1FT** for 2 or 3 correct points
2(c)(i)	3.5 to 3.7	**1**	
2(c)(ii)	2.65 to 2.8	**1**	

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Question	Answer	Marks	Partial Marks
2(d)(i)	Correct line	**1**	Ruled, through (4, 2) and gradient −4
2(d)(ii)	Tangent (2, 10)	**2**	**B1** for each
3(a)(i)	Positive	**1**	Ignore strong, weak, etc.
3(a)(ii)	Correct ruled line	**1**	
3(a)(iii)	2	**1**	
3(b)	[mode =] 0 [median =] 1 [mean =] 1.04 or 1.041 to 1.042	**5**	**B1** **B1** **B3** or **M2** for ([10 × 0] + 8 × 1 + 3 × 2 + 2 × 3 + [0 × 4] + 1 × 5) ÷ 24 oe or **M1** for [10 × 0] + 8 × 1 + 3 × 2 + 2 × 3 + [0 × 4] + 1 × 5 oe
3(c)(i)	60.9 or 60.91... nfww	**4**	**M1** for 49, 57, 71 correct **M1** for use of Σfx with x in the correct interval including both boundaries **M1** (dep on 2nd **M1**) for *their* (78 × 49 + 180 × 57 + 162 × 71) ÷ (78 + 180 + 162)
3(c)(ii)	Correct histogram	**4**	**B1** for correct widths in correct position **B1** height 13 **B1** height 18 **B1** height 9 If 0 scored **B1** for 13, 18 and 9 seen
4(a)(i)	$\frac{8}{20}$ oe	**3**	**M2** for $\frac{2}{5}\times\frac{1}{4}+\frac{3}{5}\times\frac{2}{4}$ or **M1** for one of these products OR **M1** for probability tree identifying all 20 outcomes with the correct 8 identified OR **M1** for completed possibility space / 2-way table identifying the 8 possible outcomes out of 20, oe **SC1** for $\frac{13}{25}$ with replacement

Question	Answer	Marks	Partial Marks
4(a)(ii)	$\frac{9}{25}$ oe	**3**	**M2** for $\frac{2}{5}\times\frac{3}{5}+\frac{3}{5}\times\frac{1}{5}$ oe or **M1** for one of these products OR **M1** for probability tree identifying all 25 outcomes with the correct 9 identified OR **M1** for completed possibility space / 2-way table identifying the 9 possible outcomes out of 25, oe
4(a)(iii)	Jojo and e.g. $\frac{40}{100}>\frac{36}{100}$	**1**	**1FT** *their* **(i)** and **(ii)** dep on being in range 0 to 1
4(b)	$\frac{24}{60}$ oe	**3**	**M2** for $\frac{2}{5}\times\frac{3}{4}\times\frac{1}{3}+\frac{3}{5}\times\frac{2}{4}\times\frac{1}{3}+\frac{3}{5}\times\frac{2}{4}\times\frac{2}{3}$ oe or **M1** for any one correct product OR **M1** for 4, 5, 4 and 5, 4, 4 and 5, 5, 4 clearly identified on a tree or in a list
5(a)	15.6[0]	**4**	**B3** for $20\,900x = 326\,040$ or better or **M2** for $18\,500x + 2400(x - 2.5[0]) = 320\,040$ or **M1** for $18\,500x$ or $2400(x - 2.5[0])$
5(b)(i)	$(y+12)(y-7)$ final answer	**2**	**B1** for $(y+a)(y+b)$ where $ab = -84$ or $a+b=5$ or $y(y+12)-7(y+12)$ or $y(y-7)+12(y-7)$
5(b)(ii)	38 cao	**3**	**B2** for $y = 7$ or **M1** for $y(y+5) = 84$ oe
5(c)(i)	$168(m-0.75)+207m = 100m(m-0.75)$ oe OR $207 = 100m - 168 - 75 + \frac{126}{m}$	**M2**	May be all over common denominator **M1** for $\frac{168}{m}$ or $\frac{207}{m-0.75}$ used
	at least one interim line leading to $50m^2 - 225m + 63 = 0$	**A1**	No errors or omissions

Question	Answer	Marks	Partial Marks
5(c)(ii)	$(10m-3)(5m-21)$ OR $m=\frac{-(-225)\pm\sqrt{(-225)^2-4(50)(63)}}{2(50)}$ oe OR $m=\frac{225}{100}\pm\sqrt{\left(\frac{225}{100}\right)^2-\frac{63}{50}}$ oe	**B2**	**M1** for $(10m+a)(5m+b)$ where $ab=63$ or $5a+10b=-225$ or $10m(5m-21)-3(5m-21)$ or $5m(10m-3)-21(10m-3)$ OR **M1** for $\sqrt{(-225)^2-4(50)(63)}$ or for $p=-(-225)$, $r=2(50)$ if in form $\frac{p+\sqrt{q}}{r}$ or $\frac{p-\sqrt{q}}{r}$ OR **M1** for $\left(m-\frac{225}{100}\right)^2$ oe
	4.2[0] cao	**B1**	
6(a)(i)	116.6 or 116.56 to 116.57	**4**	**M1** for $\sin[EAD]=\frac{6}{12}$ oe **M1** for $\tan[BAC]=\frac{6}{12}$ oe **B1** for [angle DAC] = 60
6(a)(ii)	13.4 or 13.41 to 13.42	**2**	**M1** for 12^2+6^2
6(a)(iii)	10.4 or 10.39…	**3**	**M2** for $\sqrt{12^2-6^2}$ or **M1** for $AE^2+6^2=12^2$
6(a)(iv)	130 or 129.5… to 129.6	**4**	**M1** for $0.5\times6\times theirAE$ oe **M1** for $0.5\times12\times12\times\sin60$ oe **M1** for $0.5\times6\times12$ oe
6(b)(i)	3	**1**	
6(b)(ii)	51.3 or 51.30 to 51.34…	**4**	**M3** for tan = $\frac{8}{\sqrt{4^2+5^2}}$ or sin = $\frac{8}{\sqrt{4^2+5^2+8^2}}$ oe or **M2** for $\sqrt{4^2+5^2}$ or $\sqrt{4^2+5^2+8^2}$ or **M1** for angle ARB clearly indicated
7(a)	204 or 203.5 to 203.6… nfww	**4**	**M2** for $\pi\times1.5^2\times8\times60\times60$ or **M1** for $\pi\times1.5^2$ **M1** for dividing *their* volume by 1000 If 0 scored **SC1** for an answer figs 204 or figs 2035 to 2036 without working
7(b)(i)	$\pi\times6\times12+\pi\times6^2=108\pi$	**M2**	**M1** for $\pi\times6\times12$

Question	Answer	Marks	Partial Marks
7(b)(ii)	[x =] 5.2[0] or 5.196… [y =] 6	**4**	**B2** or **M1** for $4\pi x^2 = 108\pi$ seen **B2** or **M1** for $\frac{1}{2}(4\pi y^2) + \pi y^2$ or better seen
8(a)(i)	× ✓ ✓ × × ✓	**4**	**B3** for 5 correct **B2** for 4 correct **B1** for 3 correct
8(a)(ii)	$\begin{pmatrix}5\\3\end{pmatrix}$	**1**	Fraction line and/or missing brackets scores 0
8(a)(iii)	$\begin{pmatrix}4 & 8\\1 & 2\end{pmatrix}$	**2**	**B1** for 2 or 3 correct elements (dep on 2 × 2 matrix)
8(a)(iv)	$\frac{1}{2}\begin{pmatrix}3 & -1\\-4 & 2\end{pmatrix}$ oe isw	**2**	**B1** for $k\begin{pmatrix}3 & -1\\-4 & 2\end{pmatrix}$ or determinant = 2 soi
8(b)	Rotation Origin oe 90 [anticlockwise] oe	**3**	**B1** for each
9(a)	$y = -2x + 5$ oe	**3**	**B2** for $-2x + 5$ or **M1** for gradient = $-1 \div \frac{1}{2}$ or better **M1** for substituting (1, 3) into $y =$ (*their m*)$x + c$ oe If 0 scored **SC1** for (1, 3) satisfying their wrong equation ($c \neq 0$) with gradient $\neq \frac{1}{2}$
9(b)(i)	$x \geqslant 2$ oe $y \leqslant 5$ oe $y \geqslant \frac{1}{2}x$ oe	**4**	**SC3** for $x > 2$ and $y < 5$ and $y > \frac{1}{2}x$ OR **B1** for $x \geqslant 2$ **B1** for $y \leqslant 5$ **B2** for $y \geqslant \frac{1}{2}x$ or **M1** for $y \geqslant kx$ ($k > 0$) OR **SC2** for all three boundary lines identified but with incorrect sign(s) If 0 scored **SC1** for one or two correct boundary lines with incorrect sign(s)

Question	Answer	Marks	Partial Marks
9(b)(ii)	(5, 4)	**2**	**M1** for one trial of an integer point inside region or for $3x + 5y = 35$ drawn
10(a)(i)	26	**2**	**M1** for g(5) or for $\left(x^2 + 1\right)^2 + 1$
10(a)(ii)	$x^2 + 4x + 5$	**2**	**M1** for $\left(x + 2\right)^2 + 1$
10(a)(iii)	5	**2**	**M1** for $2x - 3 = 7$
10(a)(iv)	$\frac{x+3}{2}$ oe	**2**	**M1** for $x = 2y - 3$ or $y + 3 = 2x$ or $\frac{y}{2} = x - \frac{3}{2}$ oe
10(b)(i)	[0].70 cao	**2**	**B1** for [0].696 to [0].697
10(b)(ii)	4 cao	**1**	

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