Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

MATHEMATICS **0580/41**

Paper 4 (Extended) **October/November 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)	[p =] 132 [q =] 77	**3**	**B1** for 132 [=p] **B2** for 77 [=q] or **M1** for 180 – (55 + 48) oe or for *their* p – 55
1(b)	74	**3**	**B2** for $5x - 10 = 360$ or **M1** for $x + (x + 5) + (2x - 25) + (x + 10) = 360$ or for $5x - 10 = k$
1(c)	175	**3**	**M2** for $180 - \frac{360}{72}$ or for $\frac{180(72-2)}{72}$ or **M1** for $\frac{360}{72}$ or for 180 (72 – 2)
1(d)	[u =] 30 [v =] 60 [w =] 60 [x =] 120 [y =] 40	**6**	**B1** for 30 **B1** for 60 **B1** for 60 FT *their v* **B1** for 120 FT 2 × *their w* **B2** for 40 or **B1** for angle $BDC = 20$ or angle $ADO = 30$ or angle $ADB = 70$
1(e)	26	**4**	**B3** for $360 - 22 = 10x + 3x$ oe or better or for $5x + 1.5x = 180 - 11$ oe or better or **M2** for $360 - (3x + 22) = 2 \times 5x$ oe or for $5x + \frac{1}{2}(3x + 22) = 180$ oe or **SC2** for $360 + 22 = 10x + 3x$ oe or better or **M1** for $180 - 5x$, $10x$ or $360 - (3x + 22)$ correctly placed on the diagram or identified or for angle A + angle $C = 5x$
2(a)	[Ali] 2700 [Mo] 2100	**3**	**B2** for one correct or for correct values reversed or **M1** for 600 ÷ (9 – 7) or for any equation that would lead to an answer of 300, 2700 or 2100, or 4800 (for the total)

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Question	Answer	Marks	Partial Marks
2(b)	11	**3**	**M2** for $\frac{220-195.8}{220}[\times 100]$ or for $[100-]\frac{195.8}{220}\times 100$ or **M1** for 220 – 195.8 or for $\frac{195.8}{220}$ or a correct implicit equation for percentage reduction or for $\frac{195.8-220}{220}$
2(c)	84	**3**	**M2** for $\frac{63}{1-\frac{25}{100}}$ oe or **M1** for associating 63 with (100 – 25)% or a correct implicit equation for the original price.
3(a)	662.45	**2**	**M1** for $600\times\left(1+\frac{2}{100}\right)^5$ oe
3(b)(i)	800	**2**	**M1** for $x\left(1+\frac{5}{100}\right)^2=882$ oe or **SC1** for answer 82
3(b)(ii)	5 nfww	**2**	**M1** for trial with $882\times\left(1+\frac{5}{100}\right)^n$ with $n>1$
4(a)(i)	955 or 955.0 to 955.2	**2**	**M1** for $2\times\pi\times 8\times 19$ oe
4(a)(ii)	812 or 811.7 to 811.9...	**2**	**FT** *their* (i) × 0.85 **M1** for *their* (i) × 0.85 or *their* (i) × 85
4(b)(i)	$\frac{\frac{4}{3}\times\pi\times 6^3}{\frac{1}{3}\times\pi\times 8^2}$ or cancelling clearly seen to reach 13.5	**M2**	**M1** for $\frac{4}{3}\times\pi\times 6^3=\frac{1}{3}\times\pi\times 8^2\times h$
4(b)(ii)	15.7 or 15.69...	**2**	**M1** for $8^2 + 13.5^2$ or better
4(b)(iii)	394 or 395 or 394.3 to 394.6...	**1**	**FT** $\pi \times 8 \times$ *their* (b)(ii)

Question	Answer	Marks	Partial Marks
4(c)	567	**3**	**M2** for $\frac{168}{V} = \left(\frac{80}{180}\right)^{\frac{3}{2}}$ oe or better or **M1** for $\left(\frac{180}{80}\right)^{\frac{1}{2}}$ or $\left(\frac{80}{180}\right)^{\frac{1}{2}}$ oe seen or better
4(d)	51.3 or 51.34...	**3**	**M2** for $\tan = \frac{5}{4}$ oe or **M1** for recognition of angle *PBX*
5(a)	4.29 or 4.285 to 4.286	**3**	**M2** for $\frac{150}{\frac{450}{3.6} - \frac{120}{4} - \frac{180}{3}}$ or **M1** for [time =] 120 ÷ 4 or 180 ÷ 3 or 450 ÷ 3.6 or $3.6 = \frac{150+180+120}{\text{total time}}$
5(b)	82.8 or 82.81 to 82.82 using cosine rule	**4**	**M2** for $\frac{150^2 + 120^2 - 180^2}{2 \times 150 \times 120}$ or **M1** for $180^2 = 120^2 + 150^2 - 2 \times 120 \times 150 \cos(...)$ **A1** for $\frac{4500}{36000}$ oe
5(c)(i)	127.2 or 127.1 to 127.2 or 127	**1**	**FT** 210 – *their* (b)
5(c)(ii)	307.2 or 307.1 to 307.2 or 307	**2**	**FT** 180 + *their*(c)(i) **M1** for 180 + *their* (c)(i)
5(d)	15 or 14.99 to 15.04	**2**	**M1** for $\cos(\textit{their}\ (\text{b})) = \frac{\text{dist}}{120}$ oe
6(a)(i)	34	**1**	
6(a)(ii)	18	**2**	**B1** for [l.q. =] 25 or [u.q. =] 43 seen
6(a)(iii)	60	**2**	**M1** for 140 written
6(b)(i)	49	**1**	
6(b)(ii)	20	**1**	
6(b)(iii)	10	**1**	
6(b)(iv)	220	**2**	**M1** for 3 × 1 + 1 × 2 + 3 × 5 + 2 × 10 + 4 × 20 + 2 × 50
6(b)(v)	14.7 or 14.66 to 14.67	**1**	**FT** *their* (iv) ÷ 15

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Question	Answer	Marks	Partial Marks
6(c)	13.25 nfww	**6**	**B2** for frequencies 30, 40, 30 soi or **B1** for 2 of these **M1** for 5, 12.5, 22.5 **M1** Σfx with *their* frequencies (if seen) and each x in correct interval including boundaries **M1 dependent** for $\frac{\Sigma fx}{100}$ (dependent on second M1) **OR** **Alternative Method** **B2** for frequencies 15, 15, 40, 10, 10, 10 soi or **B1** for 2 of 15, 40, 10 **M1** for 2.5, 7.5, 12.5, 17.5, 22.5, 27.5 **M1** Σfx with *their* frequencies (if seen) and each x in correct interval including boundaries **M1 dependent** for $\frac{\Sigma fx}{100}$ (dependent on second M1)
7(a)	9	**3**	**M2** for $0.42x + 0.42 = 4.2$ oe or better or **M1** for $0.21x + 0.21(x + 2)$ oe [= 420 or 4.20] or for $21x + 21(x + 2)$ oe [= 420 or 4.20] or for $420 \div 21$ oe [=20]
7(b)	$5r + p = 245$	**B1**	
	$2r + 3p = 215$	**B1**	
	45	**3**	Finds p **M1** for correctly equating coefficients of r **M1** for correct method to eliminate r OR **M1** for correctly making r the subject of one of *their* equations **M1** for correctly substituting *their* correct r to form an equation in p OR Finds r first **M1** for correctly eliminating p from *their* equations **M1** for correctly substituting *their* value of r to find p

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Question	Answer	Marks	Partial Marks
7(c)(i)	$\frac{12}{x}+\frac{6}{x-1}[=5]$	**M1**	
	$12(x-1)+6x=5x(x-1)$	**M1**	**Dependent** on previous M1 earned May be over common denominator
	$5x^2-23x+12=0$ reached, with at least one more line of working and with no errors or omissions	**A1**	
7(c)(ii)	$(5x-3)(x-4)$ final answer	**2**	**B1** for $(5x+a)(x+b)$ with $ab=12$ or $a+5b=-23$ or for $5x(x-4)-3(x-4)$ or $x(5x-3)-4(5x-3)$
7(c)(iii)	$\frac{3}{5}$ oe and 4	**1**	**FT** from their two brackets in (c)(ii)
7(c)(iv)	3 cao	**1**	
8(a)(i)	$\frac{4}{5}$ oe	**1**	
8(a)(ii)	$\frac{4}{5}$ oe	**1**	
8(b)(i)	$\frac{6}{20}$ oe nfww	**3**	**M2** for $\frac{1}{5}\times\frac{3}{4}+\frac{3}{5}\times\frac{1}{4}$ oe or $2\times\frac{1}{5}\times\frac{3}{4}$ oe or **M1** for $\frac{1}{5}\times\frac{3}{4}$ alone or $\frac{3}{5}\times\frac{1}{4}$ alone or for answer $\frac{3}{20}$ nfww After 0 scored, **SC1** for answer $\frac{6}{25}$
8(b)(ii)	$\frac{8}{20}$ oe nfww	**3**	**M2** for $1-\frac{4}{5}\times\frac{3}{4}$ or $\frac{1}{5}\times1+\frac{4}{5}\times\frac{1}{4}$ oe or $2\times\frac{1}{5}\times1$ or $2\times\frac{1}{5}\times\frac{3}{4}+2\times\frac{1}{5}\times\frac{1}{4}$ or *their* (b)(i) + $2\times\frac{1}{5}\times\frac{1}{4}$ or **M1** for answer $\frac{2\text{ or }4\text{ or }5\text{ or }6\text{ or }7}{20}$ oe nfww After 0 scored, **SC1** for answer $\frac{8}{25}$

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9(a)	$x + y \geqslant 6$ oe $y \leqslant x$ oe $x \leqslant 8$	**3**	**B1** for each
9(b)	$4x + 6y \leqslant 60$	**1**	
9(c)	Correct region indicated cao	**6**	**B1** for $x + y = 6$ ruled and long enough **B1** for $x = y$ ruled and long enough **B1** for $x = 8$ ruled and long enough **B2** for $2x + 3y = 30$ ruled and long enough or **B1** for ruled line through (0, 10) or (15, 0) but not $y = 10$ or $x = 15$
9(d)(i)	6, 6	**1**	
9(d)(ii)	34	**2**	**M1** for trying $4x + 6y$ with (4, 3) or (5, 2) or (6, 1) or (7, 0)
10(a)	– 7 $13 - 4n$ oe 36 $(n + 1)^2$ oe 125 n^3 oe 128 2^{n+2} oe	**11**	**B1** **B2** or **B1** for $13 - kn$ ($k \neq 0$) or for $k - 4n$ **B1** **B2** or **B1** for any quadratic **B1** **B1** **B1** **B2** or **B1** for 2^k oe
10(b)	...., ..., 6, 10, 16 .... , 3, 4, 7, ... 2, ..., 1, 0, ...	**3**	**B1** for each correct row
10(c)(i)	$\frac{q}{p+q}$	**1**	
10(c)(ii)	$\frac{18}{29}$	**1**	