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**MATHEMATICS**

**0580/23**

Paper 2 (Extended)

**May/June 2018**

MARK SCHEME

Maximum Mark: 70

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**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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This document consists of **5** printed pages.

**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	- 5	1	
2	$w(1 + w^2)$ final answer	1	
3	6.15 or 6.153 to 6.154 or $6\frac{2}{13}$	1	
4	3, 4, 6, 9, 12, 18	2	<b>B1</b> for list with one or two errors or omissions or for a complete list of products
5	25.3[0]	2	<b>M1</b> for $22 \times \frac{15}{100}$ oe or better
6(a)	210 000 cao	1	
6(b)	4120 cao	1	
7	162	2	<b>M1</b> for $225 \times 0.72$ oe
8(a)	[0].004 82 cao	1	
8(b)	$5.2 \times 10^7$	1	
9	- 11	2	<b>M1</b> for $1 - p = 3 \times 4$ or better or $-\frac{p}{3} = 4 - \frac{1}{3}$ or better
10	$(a + 2b)(2 - x)$ final answer	2	<b>M1</b> for $2(a + 2b) - x(a + 2b)$ or $a(2 - x) + 2b(2 - x)$ or $-a(x - 2) - 2b(x - 2)$
11	$[\pm] \sqrt{\frac{A}{2\pi + y}}$ final answer	2	<b>M1</b> for $\frac{A}{2\pi + y} = x^2$ <b>M1</b> for correctly square rooting their expression in $x^2$ If zero scored <b>SC1</b> for $\frac{[\pm] \sqrt{A}}{2\pi + y}$
12	8	2	<b>M1</b> for Venn diagram with 1 correct region or for a correct method e.g. $5 + 13 - x + x + 10 - x = 20$ oe or better

Question	Answer	Marks	Partial Marks
13	$\frac{1}{3-x}$ nfwf final answer	2	<b>B1</b> for $(3-x)(3+x)$ or $-(x-3)(x+3)$
14	$\frac{2}{3}\mathbf{p} + \frac{1}{3}\mathbf{q}$	2	<b>M1</b> for correct route e.g. $\overline{OT}$ or $\overline{OQ} + \overline{QT}$ or for $\overline{QT} = \frac{2}{3}(-\mathbf{q} + \mathbf{p})$ oe or for $\overline{PT} = \frac{1}{3}(-\mathbf{p} + \mathbf{q})$ oe
15	$\frac{6}{5}$	<b>B1</b>	accept equivalent fractions e.g. $\frac{18}{15}$
	$\frac{2}{3} \times \text{their } \frac{5}{6}$	<b>M1</b>	or $\frac{10}{15} \div \frac{18}{15}$ oe
	$\frac{5}{9}$ cao	<b>A1</b>	
16(a)	50 cao nfwf	2	<b>B1</b> 12.5 seen or <b>M1</b> for $12 + 0.5$ or better
16(b)	12.3	1	
17(a)	27	1	
17(b)	$3t^9$ final answer	2	<b>B1</b> for $kt^9$ or for $3t^k$ ( $k \neq 0$ )
18	$6p^2 + 5p - 6$ final answer	3	<b>B2</b> for $6p^2 + 9p - 4p - 6$ or <b>B1</b> for three correct terms
19	150	3	<b>M1</b> for $y = k(x-1)^2$ <b>M1</b> for $[y = ]$ <i>their</i> $k \times (6-1)^2$ oe  OR <b>M2</b> for $\frac{y}{24} = \frac{(6-1)^2}{(3-1)^2}$
20	$[w = ] 95$ $[x = ] 85$ $[y = ] 48$	3	<b>B1</b> for each If <b>B0</b> scored for $x$ and for $y$ , <b>SC1</b> for <i>their</i> $x + \text{their } y = 133$
21	$\frac{1}{y(y-1)}$ or $\frac{1}{y^2-y}$ final answer	3	<b>B1</b> for common denominator of $y(y-1)$ or $y^2-y$  <b>B1</b> for $y - (y-1)$ or $y - y + 1$
22(a)	$15 - 4n$ final answer	2	<b>B1</b> for $15 - kn$ or $p - 4n$ ( $k \neq 0$ )
22(b)	$3 \times 2^{n-1}$ oe final answer	2	<b>B1</b> for recognition of powers of 2 such as $2^k$

Question	Answer	Marks	Partial Marks
23	102.1 or 102.06 to 102.07	4	<b>M2</b> for $[\cos x =] \frac{11^2 + 5^2 - 13^2}{2 \times 11 \times 5}$ or <b>M1</b> for $13^2 = 11^2 + 5^2 - 2 \times 11 \times 5 \cos x$  <b>A1</b> for $-0.209\dots$ or $-\frac{23}{110}$
24(a)	25	2	<b>M1</b> for $\frac{90 \times 1000}{60 \times 60}$ oe
24(b)	1.25	1	<b>FT</b> $\frac{\text{their(a)}}{20}$ correctly evaluated
24(c)	1250	2	<b>2FT</b> for <i>their (a)</i> $\times 50$ correctly evaluated or <b>M1</b> for one area e.g. $\frac{1}{2}(40 + 60) \times 25, 25 \times 40, \frac{1}{2} \times 25 \times 20$ $\frac{1}{2}(40 + 60) \times 90, 90 \times 40, \frac{1}{2} \times 90 \times 20$ $\frac{1}{2}(40 + 60) \times \text{their } 25, \text{their } 25 \times 40, \frac{1}{2} \times \text{their } 25 \times 20$
25(a)	1.8	2	<b>M1</b> for $\frac{10}{8} = \frac{9}{AP}$ oe
25(b)	10.3 or 10.31 to 10.32	3	<b>M2</b> for $13 \times \sqrt[3]{\frac{0.25}{0.5}}$ oe or <b>M1</b> for $\sqrt[3]{\frac{0.5}{0.25}}$ oe or $\sqrt[3]{\frac{0.25}{0.5}}$ oe or $\frac{0.5}{0.25} = \left(\frac{13}{h}\right)^3$ oe
26(a)	Enlargement [scale factor] 2 [centre] (7, 0)	3	<b>B1</b> for each
26(b)	Image at (6, 4), (7, 4), (6, 8)	3	<b>B2</b> for rotation through $90^\circ$ clockwise but about other point  or <b>B1</b> for rotation through $90^\circ$ anticlockwise about any point or for triangle at (6, 4), (7, 4), (6, <i>k</i> )