MATHEMATICS (US)   **0444/21**

Paper 2 (Extended)   **May/June 2018**

MARK SCHEME

Maximum Mark: 70

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.

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	23 or 29	**1**	
2	3.87×10^{-5}	**1**	
3	4	**1**	
4	66	**2**	**B1** for 84 or -18 seen
5	94	**2**	**B1** for ACB or PAB or $ABC = 43$ or **M1** for $180 - 2 \times 43$ or for $\frac{1}{2}x = 90 - 43$
6	121	**2**	**M1** for $\sqrt{y} = 14 - 3$ or $3 - 14 = -\sqrt{y}$ or better
7	10	**2**	**M1** for $[AC^2 =] 6^2 + 8^2$
8	$7y - 23$ final answer	**2**	**M1** for $12y - 18$ or $-5y - 5$ or **B1** for $7y - k$ or $cy - 23$ $c \neq 0$
9	-7	**2**	**B1** for 3^{-3} or 3^4 or 3^7 or 3^{-7} seen or **SC1** for final answer 7
10	18	**2**	**M1** for $\dfrac{200 \times 1.5 \times 6}{100}$ oe
11	$6.45 \times 10^{p+1}$	**2**	**B1** for figs 645 or $0.35 \times 10^{p+1}$ or 61×10^{p}
12	$n < -4.4$ final answer	**2**	**M1** for $8n - 3n < -5 - 17$ or better or $3n - 8n > 17 + 5$ or better
13	$\dfrac{x^8}{2}$ or $0.5x^8$ final answer	**2**	**B1** for $\dfrac{x^8}{k}$ final answer or $\dfrac{x^k}{2}$ or $0.5x^k$ final answer
14	$7\sqrt{3}$	**2**	**B1** for $4\sqrt{3}$ or $3\sqrt{3}$ seen

Question	Answer	Marks	Partial Marks
15	$\dfrac{3}{10}$ cao	3	**M1** for $\dfrac{7}{4}$ or $\dfrac{k}{4} \times \dfrac{6}{35}$ where $k > 4$ **A1** for $\dfrac{42}{140}$ or $\dfrac{21}{70}$ or $\dfrac{6}{20}$
16	$[\sin =]10 \times \dfrac{0.6}{12}$	**M2**	**M1** for $\dfrac{12}{0.6} = \dfrac{10}{\sin x}$ oe or 0.5
	30	**A1**	
17	9	3	**M1** for $y = k(x-1)^2$ **M1** for $[y =]$ *their* $k(7-1)^2$ OR **M2** for $\dfrac{4}{(5-1)^2} = \dfrac{y}{(7-1)^2}$ oe
18(a)	[Amplitude =] 3 [Period =] 180	2	**B1** for each **SC1** for answers reversed
18(b)	$9\sin(2x)$	1	
19	$\dfrac{5x-17}{x-3}$	3	**B1** for common denominator $x - 3$ oe **B1** for $5(x - 3) - 2$ or better
20	840	3	**M2** for $\dfrac{672}{0.8}$ oe or **M1** for recognising 672 as 80%
21	$[y =] \dfrac{1}{2}x + 2$	3	**B2** for gradient perpendicular $= \dfrac{1}{2}$ OR **B1** for $kx + 2$ OR **M1** for [gradient of *AB* =] $\dfrac{2-0}{0-1}$ oe or **M1** for gradient $= \dfrac{-1}{their \text{ gradient of } AB}$
22	16 nfww	3	**M1** for $\dfrac{90}{360} \times \pi \times 2r = 4\pi$ oe or better **M1** for $\dfrac{90}{360} \times \pi \times (their\,r)^2$ $[=k\pi]$ oe or $\dfrac{1}{4}(their\,r)^2$

Question	Answer	Marks	Partial Marks
23	6	4	**M3** for $\dfrac{4\sqrt{3}\sqrt{3}}{2}$ **M2** for $\dfrac{PQ}{4\sqrt{3}} = \dfrac{\sqrt{3}}{2}$ **M1** for $\dfrac{PQ}{4\sqrt{3}} = \cos 30$ or $\sin 60$ or $[\cos 30 =] \dfrac{\sqrt{3}}{2}$ or $[\sin 60] = \dfrac{\sqrt{3}}{2}$ ALT METHOD **M3** for $\sqrt{\left(4\sqrt{3}\right)^2 - \left(2\sqrt{3}\right)^2}$ **M2** for $PQ^2 + \left(2\sqrt{3}\right)^2 = \left(4\sqrt{3}\right)^2$ **M1** for $RP = 2\sqrt{3}$ or $\cos 60 = \dfrac{1}{2}$ or $\sin 30 = \dfrac{1}{2}$
24(a)	10 nfww	2	**B1** for UQ = 30 or LQ = 20 clearly identified
24(b)	4	2	**B1** for 116 indicated
25(a)	$\dfrac{8}{15}$	1	
25(b)	$\dfrac{168}{210}$ oe	3	**M2** for $1 - \dfrac{7}{15} \times \dfrac{6}{14}$ oe or $3\left(\dfrac{7 \times 8}{15 \times 14}\right)$ oe or **M1** for $\dfrac{7}{15} \times \dfrac{6}{14}$ or $\dfrac{7}{15} \times \dfrac{8}{14}$ or $\dfrac{8}{15} \times \dfrac{7}{14}$ oe

Question	Answer	Marks	Partial Marks
26	$y \geqslant 1.5$ oe $y \geqslant \dfrac{3}{4}x$ oe $y < -\dfrac{1}{2}x + 3$ oe	4	**SC3** for $y > 1.5$ oe and $y > \dfrac{3}{4}x$ oe and $y \leqslant -\dfrac{1}{2}x + 3$ oe or **B3** for any two correct inequalities or **B1** for $y \geqslant 1.5$ oe and **B2** for $y \geqslant \dfrac{3}{4}x$ oe **or** $y < -\dfrac{1}{2}x + 3$ oe or $y = \dfrac{3}{4}x$ oe **and** $y = -\dfrac{1}{2}x + 3$ oe or with incorrect inequality signs or **B1** for $y = \dfrac{3}{4}x$ oe OR $y = -\dfrac{1}{2}x + 3$ oe or with incorrect inequality signs
27(a)	1.7	3	**M1** for Σfx allow one error or omission **M1dep** for $\dfrac{their\ 34}{20}$
27(b)	54	2	**M1** for $\dfrac{3}{20}$ or $\dfrac{360}{20}$