MATHEMATICS (US) **0444/31**

Paper 3 (Core) **May/June 2019**

MARK SCHEME

Maximum Mark: 104

Published

[Turn over

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(a)	$\frac{11}{15}$ [0].749 $\frac{3}{4}$ 76[%]	2	**B1** for 3 in the correct order or 0.75, (0.749) , 0.76, 0.73… or 75%, 74.9%, (76%), 73….%
1(b)	2	1	
1(c)	1 2 3 6 9 18	2	**B1** for 4 or 5 correct factors only or 6 correct factors with one extra or 1×18, 2×9, 3×6
1(d)	4 or 8	1	
1(e)	$\frac{1}{5}$ cao	1	
1(f)	352	2	**M1** for $160 \div 5$ [$\times 11$]
2(a)	6.8[0]	1	
2(b)	4.9[0]	2	**M1** for $3.4[0] + 2 \times [0].85$ soi
2(c)(i)	280.5[0]	1	
2(c)(ii)	379.5[0]	2	**FT** *their* **(c)(i)** $+ 99$ **M1** for $8 \times 1.5 \times 8.25$ soi or $(8 \times 1.5 + 34) \times 8.25$ soi
2(d)	33	2	**M1** for 7.5, 7, 8, 10.5
2(e)	85.20 cao	3	**B2** for 85.1999… OR **M1** for $9395 \div 110.27$ **B1** for *their* answer to at least 3 dp correctly rounded to 2 dp
2(f)	13 891.5[0]	3	**M2** for $12\,000 \times (1 + \frac{5}{100})^3$ oe or **M1** for $12\,000 \times (1 + \frac{5}{100})^2$ oe
3(a)(i)	Correct bar	3	**M1** for 5, 12, 17 or 34 **M1** for $40 - their34$
3(a)(ii)	5	1	

Question	Answer	Marks	Partial Marks
3(a)(iii)	$\frac{12}{40}$ oe	1	
3(b)(i)	86	1	
3(b)(ii)	45	2	**M1** for 18, 27, 31, 45, or 45, 60, 72, 104
3(b)(iii)	51	2	**M1** for $(104 + 18 + 72 + 31 + 27 + 45 + 60) \div 7$ soi $\frac{357}{7}$
3(c)	Correct dot plot	1	
3(d)	Valid explanation e.g. Data which can take on any value oe	1	
4(a)	56	2	**M1** for 180 – 118 soi by 62
4(b)	144	3	**M2** for $180 - (360 \div 10)$ oe **M1** for $360 \div 10$ soi by 36
4(c)	32 58	2	**B1** for each or for *their x* + *their y* = 90 or angle *F* marked as 90
4(d)	28 alternate	2	**B1** for each
4(e)(i)	35	2	**M1** for $21^2 + 28^2$ or better
4(e)(ii)	31.9 or 31.92 to 31.93	3	**M2** for $[SU =] \dfrac{30}{\cos 20}$ or **M1** for $\cos 20 = \dfrac{30}{SU}$ oe
5(a)(i)	18*a* final answer	2	**M1** for $2 \times (7a + 2a)$ oe
5(a)(ii)	14*a*^{2} final answer	2	**M1** for $7a \times 2a$
5(b)	6 9 14	2	**B1** for 2 correct or 5 6 9
5(c)(i)	−4 −6 −12 6 4 3	3	**B2** for 4 or 5 correct or **B1** for 2 or 3 correct
5(c)(ii)	Correct curve	4	**B3FT** for 9 or 10 points correctly plotted or **B2FT** for 7 or 8 points correctly plotted or **B1FT** for 5 or 6 points correctly plotted
5(c)(iii)	Correct ruled line drawn	1	
5(c)(iv)	1.3 to 1.7	1	**FT** *their* curve and *their* line
6(a)	4 points correctly plotted	2	**B1** for 2 or 3 points correctly plotted

Question	Answer	Marks	Partial Marks
6(b)	Positive	1	
6(c)	(40, 20) indicated	1	
6(d)	Ruled line of best fit	1	
6(e)	33 to 42	1	**FT** their positive line
7(a)	Rotation [centre] (0, 0) oe 90[°] clockwise oe	3	**B1** for each
7(b)	Enlargement [centre] (5, −7) [sf=] 3	3	**B1** for each
7(c)	Correct shape plotted with points (6, −1) (8, −1) (6, −3) (8, −3) (6, −5)	2	**B1** for a correct translation of $\begin{pmatrix} 3 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 1 \end{pmatrix}$
7(d)	Correct shape plotted with points (−2, 5) (−6, 5) (−2, 7) (−4, 5) (−4, 7)	2	**B1** for reflection in $y = k$ or $x = 1$
8(a)	$\pi \times 6^2 \times 17$	**M1**	
	1922.6 to 1922.91	**A1**	
8(b)	36.5 or 36.53 to 36.54…	5	**B2** for 100.53 to 100.54… or 32π or **M1** for $[0.5 \times] \pi \times 8^2$ oe and **B2** for 64 or **M1** for $[0.5 \times] 16 \times 8$ oe
9(a)	$6a + 4b$ final answer	2	**B1** for $6a + kb$ or $ka + 4b$
9(b)	30	2	**M1** for $4 \times 3^2 + 3 \times -2$ or better
9(c)(i)	80	1	
9(c)(ii)	7	2	**M1** for $3x = 16 + 5$ or $x - \frac{5}{3} = \frac{16}{3}$ or better
9(c)(iii)	2.2 oe	3	**M1** for $10x + 5 [= 27]$ or $2x + 1 = \frac{27}{5}$ **M1** for second correct step
9(d)	$\dfrac{p+5}{3}$ or $\dfrac{p}{3} + \dfrac{5}{3}$ final answer	2	**M1** for $p + 5 = 3r$ oe or $\dfrac{p}{3} = r - \dfrac{5}{3}$

Question	Answer	Marks	Partial Marks
10(a)	Correct ruled perpendicular bisector with appropriate arcs and correct ruled angle bisector with appropriate arcs and lines intersecting	**4**	**B2** for correct ruled perpendicular bisector with appropriate arcs or **B1** for correct perpendicular bisector drawn with no/incorrect arcs or two pairs of correct arcs with no line drawn **B2** for correct ruled angle bisector with appropriate arcs or **B1** for correct angle bisector drawn with no/incorrect arcs or two pairs of correct arcs with no line drawn If lines do not intersect/meet, maximum 3 marks
10(b)	110°	**1**	**FT** their X