MATHEMATICS **0626/02**

Paper 2 (Extended) **For Examination from 2017**

SPECIMEN MARK SCHEME

1 hour

MAXIMUM MARK: 60

This document consists of **8** printed pages.

Marking instructions

MARKING - GENERAL

1. Where a candidate has crossed out a complete part of a question, it should be marked provided that it has not been replaced.

2. If two or more methods are offered, mark the method that leads to the answer on the answer line.

3. Method marks are for a full correct method but may be lost if subsequent incorrect method is shown.

4. Unless a particular method has been specified in the question, full marks may be awarded for any correct method. However, if a calculation is required then no marks will be awarded for a scale drawing.

5. Where the answer in the answer space is incorrect because of a clear transcription error, then marks may be awarded.

6. Occasionally a candidate will misread a number in a question and use that value consistently throughout. Provided that number does not alter the difficulty or method required, award all marks earned and penalise 1 mark. **M** marks are still awarded in any case. Record this by using the **MR** annotation.

7. Unless specified in the question, answers may be given as fractions, decimals or in standard form. Ignore superfluous zeros provided that the degree of accuracy is not affected.

8. Allow any sensible notation. Watch out for commas being used for decimal points and dots being used for products. Brackets may be seen to represent inequalities.

9. Anything in the mark scheme which is in square brackets […] is not required for the mark to be earned, but if present it must be correct.

10. FT – A correct answer will score or follow through after an error.
    Strict FT – you must follow through from their error. These will be indicated in the mark scheme.

ABBREVIATIONS IN MARK SCHEME

Abbreviation	Meaning
M	Method marks – for a correct method applied to appropriate numbers
A	Accuracy marks – depend on M marks. Hence M0 A1 is not possible
B	Independent of method marks – for a correct final answer or intermediate stage
SC	Marks given in special cases only when indicated in mark scheme
FT	Work can be followed through after an error
isw	Ignore subsequent working (after correct answer obtained)
cao	Correct answer only
nfww	Not from wrong working
oe	Or equivalent
soi	Seen or implied
eeo	Each error or omission
dep	Dependent on the previous mark(s)

ACCURACY

1. If a question asks for a particular level of accuracy then the mark scheme will include specific details.

2. In other cases, the following apply:
    - More than 3 sf in the answer but correct (either rounded or truncated to 4 or more figure accuracy) – allow full marks.
    - Less than 3 sf in the answer but correct to 3 or more sf seen in the working – allow full marks even if rounded incorrectly.
    - 3 sf incorrect in the answer but 3 or more correct seen in the working – allow full marks.
    - If the third sf is zero after the decimal point (e.g. 15.0) then allow marks for 2 sf answers providing no wrong working is seen.

3. General principles are:
    - 2 sf answers will not imply method in most cases.
    - If the final answer on the answer line has clearly been spoiled from the 3 sf or more answer seen in the working (more than just rounding errors) don't allow the marks.
    - Mark at most accurate which is usually where the answer is first seen.
    - If the most accurate answer is incorrect then it scores zero, even if it has been correctly rounded into a correct answer.
    - If this answer is then used in another part of the question then any **M** marks are available.
    - If an accuracy FT is also available in the new part, then give the FT mark for a correct follow through from a value which has lost the accuracy mark in the first part.
    - However, a correct value from the first part may have been given the accuracy mark but has then been rounded incorrectly and this has been condoned. If the wrongly rounded value is used in the new part and leads to an incorrect answer, even if correctly followed through, then this should not receive the accuracy mark here and should not be treated as a FT case.

4. **Exact answers involving π and $\sqrt{}$**

- Exact answer 2.345 π   Unless question is set in context (where some appreciation of appropriate accuracy is required),
allow **A1** for 2.345 π on the answer line,
allow **A0** for 2.35 π.
Mark scheme will indicate in final column if marks to be allowed.

- Exact answer √23   Scores **A1** if the question is not set in context and the √(prime number) is given on the answer line.
Scores **A0** if the question is set in context (where some appreciation of appropriate accuracy is required).
Surd answers which simplify need not be implied e.g. √12 or 2√3 are acceptable but not irrational denominators – if simplified, mark the simplified answer i.e. not isw.
Mark scheme will indicate in final column if marks to be allowed.

Qu.		Answers	Mark	Part Marks	Notes
1	(a)	180	2	**M1** complete or partial factorisation of 30 and 36 or at least 3 multiples of 30 and 36 If zero award **B1** for 180k (k an integer)	
	(b)	$2 \times 2 \times 3 \times 3 \times 7$ oe	2	**M1** for 2, 3 and 7 as the only prime factors	
2		Positive	1		Allow abbreviations e.g. +ve
3		$3x - 2$ oe final answer	3	**B1** for $3x + j, j \ne 5$ and **B1** for $kx - 2, k \ne 0$	
4		10.8 or $10\frac{30}{37}$	3	**M1** figs 10 ÷ time **M1** 10 ÷ 0.925 or 37/40	
5		18.5	2	**M1** for $\sin 30 = \dfrac{x}{37}$	
6	(a)	$(x + 8)(x - 8)$	1		
	(b)	$(x + 6)(x + 5)$	2	**M1** for $(x + a)(x + b)$ where $ab = 30$ or $a + b = 11$	
7		44 Angle [in a] semicircle [is 90]	1 1		
8		[$x =$] 4 [$y =$] −1	3	**M1** for correctly eliminating one variable **A1** for [$x =$] 4 **A1** for [$y =$] −1 If 0 scored **SC1** for correct substitution and evaluation to find the other variable **SC1** for no working shown, but two correct answers given	
9		−6.9	1		Accept −6.85 to −6.95 and 2.85 to 2.95
		2.9	1		

Qu.	Answers	Mark	Part Marks	Notes
10	$\dfrac{1}{9}, \dfrac{1}{4}$	**M1**	Both fractions seen	
	$\left[\dfrac{1}{9} + \dfrac{1}{4} =\right] \dfrac{4}{36} + \dfrac{9}{36} = \dfrac{13}{36}$	**M1**	Both fractions over a common denominator and added to give $\dfrac{13}{36}$	
11	2 correct reasons given	**2**	**B1** for each	e.g. Negative value e.g. Extrapolation outside sample range
12	4.5[%] nfww	**2**	**M1** for $\dfrac{19750.50\,[-18900]}{18900} \times 100$ or $\dfrac{19750.50 - 18900}{18900}$	
13	A | C | D	**2**	**B1** for each	
14 (a)	55 alternate segment	**1** **1**		
(b)	115 cyclic quadrilateral	**1** **1**		
15	$\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$	**2**	**SC1** for one correct column	

Qu.		Answers	Mark	Part Marks	Notes
16		$(-2, -7)$ with correct method shown	4	**M1** for $(x+2)^2$ or $x^2 + 2ax + a^2 - b$ and **M1** for $-3 - (their\ 2)^2$ or $a^2 - b = -3$ or $2a = 4$ and **A1** for $(x+2)^2 - 7$ or $a = 2$ and $b = 7$ **or** **M1** for $\dfrac{dy}{dx} = 2x + 4$ **M1** for *their* $2x + 4 = 0$ **A1** for $x = -2$ After **0** scored, **SC1** for $x = -2,\ y = -7$ from no working	Accept correct alternative methods
17		$11 - 8x^2 = 11x$	**B1**		
		$8x^2 + 11x - 11 = 0$	**B1**		
		$\sqrt{11^2 - 4(8)(-11)}$	**M1FT**	Seen anywhere or for $\left(x + \dfrac{11}{16}\right)^2$	
		$\dfrac{-(11) + \sqrt{...}}{2(8)}$ or $\dfrac{-(11) + \sqrt{...}}{2(8)}$	**M1FT**	Must be in this form or **B1** for $\sqrt{\dfrac{11}{8} + \left(\dfrac{11}{16}\right)^2} - \dfrac{11}{16}$	FT is from *their* $8x^2 + 11x - 11 = 0$ must be in the form $ax^2 + bx + c = 0$
		$0.67, -2.05$ final answers	**B1 B1**	**SC1** for 0.7 or 0.671 to 0.672 **and** -2.0 or -2.047 to -2.046 or **SC1** for answers -0.67 **and** 2.05	
18	**(a)**	$x^2 + y^2 = 25$	3	**M1** for $3^2 + 4^2 = r^2$ **A1** for $r^2 = 25$ or better If **0** scored, **SC1** for answer $x^2 + y^2 = k$	
	(b)	$3x + 4y = 25$ oe or $y = -\dfrac{3}{4}x + \dfrac{25}{4}$ oe	4	**B3** for $y = -\dfrac{3}{4}x + c$ or $-\dfrac{3}{4}x + \dfrac{25}{4}$ or **B2** for tangent gradient $= -\dfrac{3}{4}$ soi or **B1** for gradient $OP = \dfrac{4}{3}$	

Qu.		Answers	Mark	Part Marks	Notes
19	**(a)**	70.5 And 289.5	**4**	**B3** for one correct value or 2 correct values not rounded to 1 dp **or M2** for $\cos^{-1}\left(\frac{1}{3}\right)$ oe **or M1** for $\cos x = \frac{1}{3}$ If 0 scored **SC1** for two solutions which sum to 360°	
	(b)		**2**		