OCR
Oxford Cambridge and RSA

GCSE

Mathematics (9-1)

Unit **J560/04:** Paper 4 (Higher Tier)

General Certificate of Secondary Education

Mark Scheme for November 2018

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

Annotations used in the detailed Mark Scheme.

Annotation	Meaning
✓	Correct
✗	Incorrect
BOD	Benefit of doubt
FT	Follow through
ISW	Ignore subsequent working (after correct answer obtained), provided method has been completed
M0	Method mark awarded 0
M1	Method mark awarded 1
M2	Method mark awarded 2
A1	Accuracy mark awarded 1
B1	Independent mark awarded 1
B2	Independent mark awarded 2
MR	Misread
SC	Special case
^	Omission sign

These should be used whenever appropriate during your marking.

The **M**, **A, B** etc. annotations must be used on your standardisation scripts for responses that are not awarded either 0 or full marks.
It is vital that you annotate these scripts to show how the marks have been awarded.
It is not mandatory to use annotations for any other marking, though you may wish to use them in some circumstances.

Subject-Specific Marking Instructions

1 **M** marks are for using a correct method and are not lost for purely numerical errors.
A marks are for an accurate answer and depend on preceding **M** (method) marks. Therefore **M0 A1** cannot be awarded.
B marks are independent of **M** (method) marks and are for a correct final answer, a partially correct answer, or a correct intermediate stage.
SC marks are for special cases that are worthy of some credit.

2 Unless the answer and marks columns of the mark scheme specify **M** and **A** marks etc., or the mark scheme is 'banded', then if the correct answer is clearly given and is not from wrong working **full marks** should be awarded.

Do not award the marks if the answer was obtained from an incorrect method, i.e. incorrect working is seen and the correct answer clearly follows from it.

3 Where follow through (**FT**) is indicated in the mark scheme, marks can be awarded where the candidate's work follows correctly from a previous answer whether or not it was correct.

Figures or expressions that are being followed through are sometimes encompassed by single quotation marks after the word *their* for clarity, e.g. FT 180 × (*their* '37' + 16), or FT 300 – √(*their* '$5^2 + 7^2$'). Answers to part questions which are being followed through are indicated by e.g. FT 3 × *their* (a).

For questions with FT available you must ensure that you refer back to the relevant previous answer. You may find it easier to mark these questions candidate by candidate rather than question by question.

4 Where dependent (**dep**) marks are indicated in the mark scheme, you must check that the candidate has met all the criteria specified for the mark to be awarded.

5 The following abbreviations are commonly found in GCSE Mathematics mark schemes.

- **cao** means **correct answer only**.
- **figs 237**, for example, means any answer with only these digits. You should ignore leading or trailing zeros and any decimal point e.g. 237000, 2.37, 2.370, 0.00237 would be acceptable but 23070 or 2374 would not.
- **isw** means **ignore subsequent working** (after correct answer obtained).
- **nfww** means **not from wrong working**.
- **oe** means **or equivalent**.
- **rot** means **rounded or truncated**.
- **seen** means that you should award the mark if that number/expression is seen anywhere in the answer space, including the answer line, even if it is not in the method leading to the final answer.
- **soi** means **seen or implied**.

6 Make no deductions for wrong work after an acceptable answer unless the mark scheme says otherwise, indicated for example by the instruction 'mark final answer'.

7 As a general principle, if two or more methods are offered, mark only the method that leads to the answer on the answer line. If two (or more) answers are offered, mark the poorer (poorest).

8 When the data of a question is consistently misread in such a way as not to alter the nature or difficulty of the question, please follow the candidate's work and allow follow through for **A** and **B** marks. Deduct 1 mark from any **A** or **B** marks earned and record this by using the MR annotation. **M** marks are not deducted for misreads.

9 Unless the question asks for an answer to a specific degree of accuracy, always mark at the greatest number of significant figures even if this is rounded or truncated on the answer line. For example, an answer in the mark scheme is 15.75, which is seen in the working. The candidate then rounds or truncates this to 15.8, 15 or 16 on the answer line. Allow full marks for the 15.75.

10 If the correct answer is seen in the body and the answer given in the answer space is a clear transcription error allow full marks unless the mark scheme says 'mark final answer' or 'cao'. Place the annotation ✓ next to the correct answer.

If the answer space is blank but the correct answer is seen in the body allow full marks. Place the annotation ✓ next to the correct answer.

If the correct answer is seen in the working but a completely different answer is seen in the answer space, then accuracy marks for the answer are lost. Method marks would still be awarded. Use the M0, M1, M2 annotations as appropriate and place the annotation × next to the wrong answer.

11 Ranges of answers given in the mark scheme are always inclusive.

12 For methods not provided for in the mark scheme give as far as possible equivalent marks for equivalent work. If in doubt, consult your Team Leader.

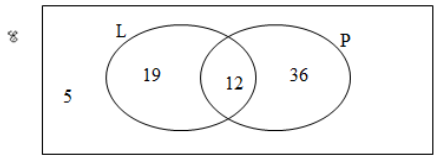
13 Anything in the mark scheme which is in square brackets […] is not required for the mark to be earned, but if present it must be correct.

Question			Answer	Marks	Part marks and guidance	
1			8 cao	4	**M3** for $\frac{their60\times2.25-125}{125}$ soi [0].08 or **M2** for *their* 60×2.25 – 125 soi 10 or **M1** for 60×2.25 soi 135	allow work in £ or p, alt method : **M3** for $\frac{their60\times2.25}{125}-1$ soi [0].08 or **M2** for *their* 135 ÷ 125 soi by 1.08 or 108% or **M1** for 60×2.25 soi 135 OR **M3** for $\frac{2.25-their125\div60}{their125\div60}$ soi[0].08 or **M2** for 2.25 – *their* 125 ÷ 60 soi 0.16[6…] or 0.17 or **M1** for 125 ÷ 60 soi 2.08[3…]

Question			Answer	Marks	Part marks and guidance	
2	(a)		a correct distance conversion e.g. 400 ÷ 1000 or [0].4 or 5 × 1000 or 5000 a scale factor e.g. 5[000] ÷ 400 soi figs 125 or 840 ÷ 66 soi 12.727… or 12.73 or figs 127 correct time conversion e.g. 14 × 60 or 840 or 66 ÷ 60 or 1[m] 6[s] or 1.1 or 825 ÷ 60 correct figures e.g. 13.75 or 13.7 or 13.8 [14] 5.09… or 5.1 [5] 5090[. …] or 5100 5000 825 840 12.5 12.7… 5.95 or 5.9 or 6 6.06… or 6.1	**M1** **M1** **M1** **A1**	accept any correct method Dep on **M3**	
	(b)		an acceptable response e.g. [he will not maintain this rate because] he will get tired	**1**		Accept any correct reason must not be contradicted.
3			an acceptable response e.g. it is not a right-angled triangle	**1**	Accept any correct response e.g. they should use the sine rule or cosine rule	

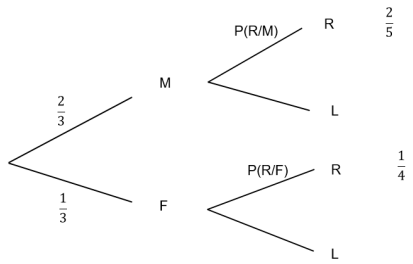
Question			Answer	Marks	Part marks and guidance	
4			15.38 cao	6	**M2** for 6400×1.025^8 oe soi 7797.78 or **M1** for 1.025^k (k>1) oe soi 6724 AND **M2** for 6400 + 6400 × [0].027 × 8 oe soi 7782.4 or **M1** for 6400 × [0].027 oe soi 172.8 or 1382.4 AND **M1** for subtracting *their* two totals or *their* two interests e.g. *their* 7797.7785… − *their* 7782.4 or *their* 1397.78 – *their* 1382.4	
5			28 or [£][0] .28	5	**B1** for $7r + 15c = 7[00]$ or $[r =] c + [0.]12$ **M1** for $7(c + [0.]12) + 15c = 7[00]$ or better oe or $r – c = [0.]12$ **M1** for $7c + 84 + 15c = 7[00]$ or better oe or $7r – 7c = [0.]84$ **M1** for $15c + 7c = 7[00] – [0.]84$ or better	Allow any pair of letters, see AG Trial-and-improvement will score 0 or 5 only allow work in pence or pounds i.e. removing brackets i.e. rearranging their equation
6			14.79 to 14.8	5	**M2** for $\pi \times 12^2 \times 30$ soi by 13 564 to 13 574 or **M1** for $\pi \times 12^2$ soi 452 to 453 **B1** for $\frac{4}{3}\pi r^3$ = *their* 13 571 **M1** for *their* 13 571 ÷ $\frac{4}{3}\pi$ or 3240	

Question			Answer	Marks	Part marks and guidance	
7	(a)		acceptable bisector of angle A with two pairs of supporting arcs	2	**B1** for acceptable bisector of angle A with no or incorrect arcs	Tolerance ± 2° Use overlay
	(b)		acceptable perpendicular bisector of AC with supporting arcs	2	**B1** for acceptable perpendicular bisector of AC with no or incorrect arcs	Tolerance ± 2 mm Use overlay
	(c)		*their* correct region shaded	1	Dep on at least **(a) B1** and **(b) B1**	
8	(a)	(i)	13 860 000 oe	2	**M1** for $2^5 \times 3^2 \times 5^4 \times 11 \times 7$ with at most one error	condone $2^5 \times 3^2 \times 5^4 \times 11 \times 7$ for **2** marks
		(ii)	$2^2 \times 3 \times 5 \times 11$ isw	2	**M1** for answer one step away	
	(b)	(i)	$2 \times 3^2 \times 5^2$	3	**B2** for answer one step away or a correct diagram e.g. factor tree or **B1** for 2, 3 and 5 identified e.g. could be in a factor tree	
		(ii)	90	3	**M2** for [270 =] 2 × 3 × 3 × 3 × 5 oe or **M1** for 2, 3 and 5 as factors of 270 or for an answer of 2, 3, 5, 6, 9, 10,15, 18, 30 or 45	Accept in factor tree or a division spine, allow **M1** if one step away

Question			Answer	Marks	Part marks and guidance	
9	(a)			3	**B2** for three correct entries, ignore labels or **B1** for one element in the correct place	
	(b)		$\frac{36}{72}$ oe	2	**FT** *their* labelled Venn diagram (2 sets) for **2** marks e.g. $\frac{their36}{72}$ **B1** for $\frac{k}{72}$ where k < 72	isw cancelling and conversion, accept 50% for **2** marks
10			−3 2	2	**B1** for each	
11	(a)		7.5 oe	2	**B1** for input to B as 19	Could be in diagram
	(b)		3(2*x* + 3) oe	2	**B1** for output from A as 2*x* + 4 oe	Could be in diagram
12			correct bar width and 'height' of 0.6	5	**M2** for 15 × 0.8 + 10 × 0.9 + 15 × 0.2 or better e.g. 12 + 9 + 3 or 24 or **M1** for two correct frequencies calculated from 12, 9 and 3 AND **M1** for 30 – *their* 24 soi 6 **M1** for *their* 6 ÷ 10 soi 0.6	
13			accept any correct answer e.g. he did not factorise fully [as 2*x* is the full common factor]	1		

Question			Answer	Marks	Part marks and guidance	
14			$y = \frac{120}{\sqrt{x}}$ oe	3	**M1** for $y = \frac{k}{\sqrt{x}}$ oe **B1** for [k =] 120	e.g. condone $y = \frac{k}{\sqrt{9}}$ for **M1**
15	(a)		Correct box plot	2	**B1** for at least 3 correct elements	See overlay
	(b)	(i)	Peter and has a larger median oe	1		Condone average for median
		(ii)	David and has a smaller IQR oe	1		Condone "neither as they have the same range"
16			$(2x + 3)(x - 11)$ -1.5 oe 11	**M2** **B1**	**M1** for two brackets which give two correct terms correct or **FT** *their* two linear brackets	
17			[a=] 3 [b=] 4 [c=] -5	4	**B2** for a = 3 or **M1** for second differences = 6 **M1** for revised terms of -1 3 7 11 or **B1** for b= 4 or c = -5	
18			$y = -\frac{1}{2}x - 1$ oe	5	**B2** for gradient 2 or **M1** for $\frac{\pm(9--1)}{\pm(5-0)}$ or gradient of -2 AND **M1** for 'm' = $\frac{-1}{their\,2}$ **B1** for $-\frac{1}{2}x - 1$, $y = -\frac{1}{2}x + c$ or $y = mx - 1$ or $y = (their\ m)x + c$ as answer	

Question			Answer	Marks	Part marks and guidance	
19			8.1 or 8.14	5	**M1** for [vol sf] = 2400 ÷ 750 or 3.2 **M1** for $\sqrt[3]{their 3.2}$ or 1.47… **M1** for 12 ÷ *their* 1.47… **A1** for 8.143… if **A0** award **B1** for *their* answer to at least 4 figures correctly rounded to 2 or 3 s.f.	Also 750÷2400 or 0.3125 $\sqrt[3]{their 0.3125}$ or 0.6786… 12×*their* 0.6786 *their* 1.47 and *their* 0.6786 must be roots
20			20.9 or 20.89 or 20.886… or 21 with correct working	6	**B1** for triangle AFB indicated e.g. drawn on diagram and **M2** for [BF=] $\sqrt{(25^2 + 40^2)}$ or 47.16[9…] or 47.17 or 47.2 or [AF=] $\sqrt{(25^2 + 40^2 + 18^2)}$ or 50.48… or 50.5 or **M1** for $25^2 + 40^2$ [$+18^2$] and **M2** for e.g. $\tan^{-1}(18 \div$ *their* 47.169…) or $\sin^{-1}(18 \div$ *their* 50.48…) or **M1** for [tan=] 18 ÷ *their* 47.169…) or [sin=] 18 ÷ *their* 50.48…)	*their* 47.169 should be an attempt at BF and *their* 50.48 should be an attempt at AF
21	(a)		[0].88 or [0].89 1.7[4]	2	**B1** for each	
	(b)		Correct curve	2	**B1** for 3 or 4 correct points plotted **FT** *their* table	tolerance ± $\frac{1}{2}$ square
	(c)		2021 or 2022	2	**B1** for *x* = 11 to 12	

Question			Answer	Marks	Part marks and guidance	
22			accept any correct method e.g.  	B1	Could be table or the correct probability notation e.g. $P(R \cap M) = P(R/M) \times P(M)$	If they use a table see appendix based on 100 Award **B3** for all red elements in table correct, **B2** for 3 or 4 correct, **B1** for 2 correct **M1** for Prop.(F) = 25÷33.333 or 0.75 **M1** for Prop.(M) = 40÷66.666 or 0.6
			$\frac{2}{3} \times P(R/M) = \frac{2}{5}$ $P(R/M) = \frac{2}{5} \div \frac{2}{3} = \frac{3}{5}$	M1 M1	Correct method to find the probability that a male is right-handed	
			$\frac{1}{3} \times P(R/F) = \frac{1}{4}$ $P(R/F) = \frac{1}{4} \div \frac{1}{3} = \frac{3}{4}$	M1 M1	Correct method to find the probability that a female is right-handed	
			$\frac{3}{4} = 0.75 > \frac{3}{5} = 0.6$	A1	Must be two figures which can be compared	

APPENDIX

Q22 tables based on 100 and 300.

	M	F	Total
R	40	25	65
L	26.6[6..]	8.3[3..]	35
Total	66.6[6..]	33.3[3..]	100

Accept 26.7 and 66.7

	M	F	Total
R	120	75	195
L	80	25	105
Total	200	100	300

OCR (Oxford Cambridge and RSA Examinations)
The Triangle Building
Shaftesbury Road
Cambridge
CB2 8EA

OCR Customer Contact Centre

Education and Learning
Telephone: 01223 553998
Facsimile: 01223 552627
Email: general.qualifications@ocr.org.uk

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Facsimile: 01223 552553