OCR
Oxford Cambridge and RSA

GCSE

Mathematics (9-1)

Unit **J560/05:** Paper 5 (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.

   - **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 and applies as a default.
   - **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. In questions with no final answer line, make no deductions for wrong work after an acceptable answer (i.e. **isw**) unless the mark scheme says otherwise, indicated by the instruction 'mark final answer'.

7. In questions with a final answer line following working space,

   (i) if the correct answer is seen in the body of working and the answer given on the answer line is a clear transcription error allow full marks unless the mark scheme says 'mark final answer'. Place the annotation ✓ next to the correct answer.

   (ii) if the correct answer is seen in the body of working but the answer line is blank, allow full marks. Place the annotation ✓ next to the correct answer.

(iii) if the correct answer is seen in the body of working but a completely different answer is seen on the answer line, then accuracy marks for the answer are lost. Method marks could still be awarded. Use the M0, M1, M2 annotations as appropriate and place the annotation × next to the wrong answer.

8. In questions with a final answer line:

(i) If one answer is provided on the answer line, mark the method that leads to that answer.

(ii) If more than one answer is provided on the answer line and there is a single method provided, award method marks only.

(iii) If more than one answer is provided on the answer line and there is more than one method provided, award zero marks for the question unless the candidate has clearly indicated which method is to be marked.

9. In questions with no final answer line:

(i) If a single response is provided, mark as usual.

(ii) If more than one response is provided, award zero marks for the question unless the candidate has clearly indicated which response is to be marked.

10. 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.

11. 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.

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

13. 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.

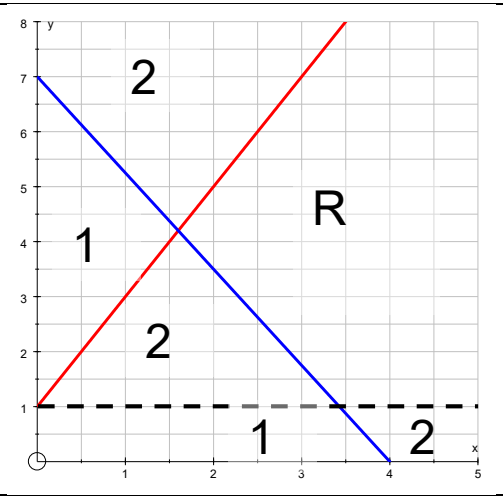
14. Anything in the mark scheme which is in square brackets […] is not required for the mark to be earned, but if present it must be correct.

Question			Answer	Marks	Part marks and guidance	
1	(a)		2	2	**B1** for $\left[\sqrt[3]{64} =\right] 4$ or for **½ oe**	Accept $4^3 = 64$ for B1
	(b)		4.68×10^5 final answer	3	**B2 f**or 468 000 or answer 4.7×10^5 or **B1** for 430 000 or 43×10^4 or 38 000 or 0.38×10^5 **seen** **M1** for figs 468 **oe** in final answer	
2			9 with correct rounded values shown nfww	3	**M1** for two of 600, 0.3 and 20 **M1** for a first correct calculation with one pair of *their* rounded values or **M1** FT for second correct calculation	Condone e.g. 0.300 M1 can be implied by 180, 30, 0.015, 9.09, 9.15
3	(a)		36 and 45	1		
3	(b)		Even and prime are not mutually exclusive **oe** $\frac{8}{12}$ **oe**	1 1		e.g. 2 is both prime and even 2 is counted twice One number is prime and even Do not accept there are only 2 prime numbers
4			4 g/cm^3 or $g\,cm^{-3}$	2 1	**M1** for figs 5 ÷ figs 125	If change of units then allow consistent units with conversion e.g. for 3 marks 0.004 kg/ cm^3

Question			Answer	Marks	Part marks and guidance	
5	(a)		12	3	**M2** for $\frac{57.8 - 54.2}{0.3}$ **oe** or **M1** for 57.8 – 54.2 or 3.6 **seen** or for repeated subtraction of 0.3 from 57.8 or for repeated addition of 0.3 to 54.2	Minimum of 2 repeats Minimum of 2 repeats
5	(b)		Answer would be bigger **oe**	1		e.g. It would take more days It will take longer
6			No and she can only get 12[.5] strips **nfww** or No and $31\frac{1}{5}$ **oe** [> 30] **oe nfww**	4	**B3** for 12.5 or $\frac{25}{2}$ **oe** or $31\frac{1}{5}$ **oe** or **B2** for $28\frac{4}{5}$ **oe seen** or $1\frac{1}{5}$ **oe** or for $30 \times \frac{5}{12}$ **oe** or $\frac{150}{5} \div \frac{12}{5}$ **oe** or **M1** for $30 \div 2\frac{2}{5}$ **oe** or $13 \times 2\frac{2}{5}$ **oe**	Amount of material used for 12 strips Amount left over from 12 strips For M1 accept attempt for repeated addition of $2\frac{2}{5}$ oe to make 30 (at least 3 repeats) condone 1 error in the addition
7			2000	3	**M2** for 2400 ÷ $\frac{100 + 20}{100}$ **oe** or **M1** for 1.2(0) **oe seen** or for 2400 associated with 120[%]	

Question			Answer	Marks	Part marks and guidance	
8	(a)		Correctly completes graph	2	**B1** for 2 or 3 correct plots or for 4 plots at correct height	Use overlay, mark in 60% zoom For 2 marks, condone points not joined
8	(b)		He is correct **oe** with 60 and 150 shown [= 2 : 5]	2	**M1** for 13 + 20 + 27 **oe** or 45 + 47 + 58 **oe**	
8	(c)		Correct overall comment Correct seasonal comment	1 1	i.e. increasing **oe** e.g. [Sales were] weakest in 1st quarter [Sales were] strongest in 4th quarter	isw extra statements See AG isw extra statements
8	(d)		The trend in his sales will continue [at a similar rate] **oe**	1		Accept any correct relevant comment referring to general trend or 4th quarter trend isw extra statements See AG
9			$y = [\pm]\sqrt{x-7}$	2	**M1** for $x - 7 = y^2$ or for answer $[\pm]\sqrt{x-7}$ or for correct step to answer after incorrect first step shown	e.g. answer $y = \sqrt{x+7}$ after 1st step is $y^2 = x + 7$
10	(a)	(i)	Triangle drawn at (-3, -2), (-5, -2) (-3, -6)	2	**M1** for rotation 180° but wrong centre or 3 correct points not joined	Use overlay condone good freehand, mark intention If triangle B transformed then treat as misread in both parts (i) and (ii)
10	(a)	(ii)	Triangle drawn at (7, -5), (5, -5) (5, -1)	2	**M1** for translation by $\begin{pmatrix}2\\k\end{pmatrix}$ or $\begin{pmatrix}k\\-7\end{pmatrix}$ or 3 correct points not joined	Use overlay condone good freehand, mark intention

Question			Answer	Marks	Part marks and guidance	
10	(b)		Enlargement $\frac{1}{2}$ **oe** (-1, 2)	3	**B1** for each element	Marks spoilt if extra transformations Treat extra descriptors as choice Condone omission of brackets Accept centre as a vector
11			He has subtracted the two percentages **oe** or He used the same price for both percentages **oe** Increase of 4 [%]	1 5	 **B4** for answer 104% or for 1.04 **seen** or **M3** for [k ×] 0.8 × 1.3 **oe** OR **M1** for 0.8 used correctly **oe** **M1** for 1.3 used correctly **oe**	e.g. He does not calculate 30% of the sale price. He calculates 30% of the original price For 5 marks, condone 'increase' omitted Allow method marks if contained in correct method involving any invented starting price e.g. **M3** for 400 × 0.8 × 1.3 **oe**
12			15π	5	**B3** for [angle at centre]= 150 or sector is $\frac{5}{12}$ **oe** of circle or **M2** for $\frac{[360\times]5\pi}{2\times\pi\times6}$ or better or **M1** for $[\frac{\theta}{360}\times]2\times\pi\times6$ **oe** **M1** for $\frac{their\theta}{360}\times\pi\times6^2$ **oe**	 Independent

Question			Answer	Marks	Part marks and guidance	
13	(a)		AC = 40sin30 20 and evidence that sin 30 = 0.5	M2 A1	**M1** for $\frac{AC}{40}$ = sin 30 **oe** If 0 scored, **B1** for sin 30 =0.5 **oe**	
13	(b)		$20\left(\sqrt{3}-1\right)$	5	**B4** for $20\sqrt{3}$ - 20 or $\sqrt{1200}$ –20 or **B3** for $\sqrt{1200}$ or $\frac{40\sqrt{3}}{2}$ or **M2** for 40cos30 **oe** or **M1** for cos 30 = $\frac{AB}{40}$ **oe**	Other methods are possible e.g. Pythag e.g. M2 for [AB =]$\sqrt{40^2 - 20^2}$ e.g. M1 for $AB^2 + 20^2 = 40^2$
14				5	**B2** for *y* = 1 broken line or **B1** *y* = 1 solid line AND **B1** for *R* correct side of 7*x* + 4*y* = 28 **B1** for *R* correct side of *y* = 2*x* + 1 **B1** for *R* correct side of *y* = 1	Line long enough to define region If other lines, treat as choice unless labelled See marks on diagram for the final B3 marks (assumes *y* = 1 is drawn) Condone R not labelled if shading (in or out) is clear
15	(a)		22	2	**B1** for [UQ=] 74 or [LQ=] 52	e.g. answer 74 alone scores B0
15	(b)		48 to 49	3	**B2** for 16 **seen** or **M1** for 80 ÷ (4 + 1)	For B2 accept 16/80
16	(a)		45	1		

Question			Answer	Marks	Part marks and guidance	
16	(b)		$5 \times \sqrt{3}^{(n-1)}$ **oe**	3	**M2** for expression of correct form with two correct elements e.g. $5 \times \left(\sqrt{3}\right)^n$ or **M1** for expression of correct form with one correct element e.g. $3 \times \left(\sqrt{3}\right)^n$	
17			3 : 2 **nfww**	4	**B3** for 15 [shaded] and 10 [unshaded] or **M2** for $5^2 - 4^2$ **oe** or $4^2 - 1^{[2]}$ **oe** or **M1** for 4^2 or 5^2 **oe seen**	
18	(a)	(i)	$(x + 2)^2$ final answer – 20 final answer	1 2	 **FT** *their* $(x + 2)^2$ final answer **M1** for after $(x + a)^2$ shows $-16 -$ *their* a^2	

Question			Answer	Marks	Part marks and guidance	
18	(a)	(ii)	$-2 \pm 2\sqrt{5}$	4	**B3FT** *their* (a)(i) for $-2 + \sqrt{20}$ or $-2 - \sqrt{20}$ or better or **M2** for $x + 2 = (\pm)\sqrt{20}$ FT *their* (a)(i) or **M1** for $(x + 2)^2 = 20$ FT *their* (a)(i) OR **Alternative method** **B3** for $\frac{-4 \pm 4\sqrt{5}}{2}$ or **M2** for $\frac{-4 \pm \sqrt{80}}{2}$ **oe** or **M1** for $\frac{-4 \pm \sqrt{4^2 - 4 \times 1 \times -16}}{2 \times 1}$ **oe**	FT dep on expression in form $(x + a)^2 - b$ in part (a)(i) Condone 1 slip e.g. 1 sign error, 1^2 for 1, short fraction line, short root
18	(b)		U shaped parabola with turning point in 3rd quadrant indicated at (–2,–20) **soi**	1 2	 **B1FT** for turning point at (k, –20) or (–2, k) **soi** FT *their* (a)(i)	Be generous for the U shape condone broken line Values must be shown but could be marked on axes. Mark intention Accept turning point = (–2, –20) written in working provided no contradiction on sketch If point (–2, –20) only plotted on graph in 3rd quadrant and no sketch then award 2 marks
19	(a)		66	2	**M1** for 180 – 2 × 57 or **B1** for angle OCD = 57	Could be on diagram

Question			Answer	Marks	Part marks and guidance	
19	(b)		49	3	**M2** for angle ADO = 180 – 82 – 57 **oe** or **M1** for angle ADC =180 – 82 **oe** or **M1** for angle ODF = 90 **soi**	41 angles could be on diagram 98 e.g. Angle CDF = 33
20	(a)		[(2x + 1)(3x + 2) =] 6x^2 + 3x + 4x + 2 or better [x(3x + 5) =] 3x^2 + 5x 9x^2 + 12x + 4 (3x + 2)^2 which is a perfect square	**M2** **M1** **M1** **A1** **A1**	**B1** for 3 out of 4 terms correct **FT** *their* expansions dep on 3 term quadratic	6x^2 + 7x + 2 , 7x counts as 2 terms For B1 accept terms on a grid Condone if expression '= 0' For A1 accept (3x + 2)(3x + 2)
20	(b)		Cannot square root a negative value **oe** or for 9x^2 + 12x + 4 [= 0] and $b^2 - 4ac < 0$ with a, b, c substituted or values shown **oe**	1		

APPENDIX

Exemplar responses for Q8c

Response	Mark
He sells more at the end of the year He always sells the least at the start of the year	**Seasonal 1** **Overall 0**
Tom sells more in the 4th quarter each year. Tom sold more in 2017 than 2015	**Seasonal 1** **Overall 0**
In quarter 2 2015 he sold about the same as in quarter 2 2016 He sells more each year	**Seasonal 0** **Overall 1**
Sold more computers in 2017 than the other 2 years Sales drop in the 3rd quarter each year	**Overall 0** **Seasonal 1**
Each quarter saw a difference in sales some higher some lower *not specific – which quarters* The number of computers sold each year has increased	**Seasonal 0** **Overall 1**
At the end of each year his sales have increased In quarter 3 in each year his sales drop	**Seasonal 1** **Overall 0**
His sales are rising on every 4 quarter during the year His sales fluctuate but are slowly rising	**Seasonal 1** **Overall 1**
Quarter 3 in 2016 has a decrease in sales on quarter 3 in 2015 2017 had the highest sales	**Seasonal 0** **Overall 0**
As the years went on the number of computers sold increased in quarter 4 Quarter 1 in 2015 was his lowest ever amount of sales	**Seasonal 1** **Overall 0**
The results seem to vary between each quarter They have increased	**Seasonal 0** **Overall 1**
The first quarter always has the lowest result It's inconsistent in 2017	**Seasonal 1** **Overall 0**
Every year quarter 1 increased by 7 He sold more computers in 2017	**Seasonal 1 BOD** **Overall 0**
In 2017 in quarter 4, Tom's number of computers that were sold was the highest Tom sold the least amount of computers in quarter 1 in 2015	**Seasonal 0** **Overall 0**

Exemplar responses for Q8d

Response	Mark
The number of computers he sells in the 4th quarter increases every year	**1**
Because in every 4th quarter he sells more than the year before	**1**
He assumes sales will continue to increase	**1**
The rate of number of sales has increased in quarter 4	**1**
That the sales continue to go up as they have previously	**1**
That his sales will continue to rise and beat the last 4th quarter sale which was 58	**1**
Sales will continue to rise [at a constant rate]	**1**
He has seen improvement in his graph	**0**
His sales will have a positive correlation between the year and amount sold	**0**
That he will sell more	**0**
That his figure in 2018 will be better than his figure in 2017	**0**

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