OCR
Oxford Cambridge and RSA

GCSE

Mathematics

Unit **J560/05**: Higher Tier Paper 5

General Certificate of Secondary Education

Mark Scheme for November 2017

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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.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

1. 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, ie 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, eg FT 180 × (*their* '37' + 16), or FT 300 – $\sqrt{}$(*their* '$5^2 + 7^2$'). Answers to part questions which are being followed through are indicated by eg 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 eg 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 (ie **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)		tangent	1		Ignore spelling providing intention is clear
	(b)		segment	1		Ignore spelling providing intention is clear
2	(a)	(i)	13	1		Ignore subsequent terms
		(ii)	128	1		Ignore subsequent terms
	(b)		$18 - 3n$ **oe**	2	**M1** for $-3n + k$ oe or for $mn + 18$ **oe** ($m \neq 0$)	For 2 or M1, condone eg $n = 18 - 3n$ For 2 or M1, condone use of *other* variable instead of n
3			122 with justification showing 121 or $11^2 + 1$ and 125 or $5^3 - 3$	4	**B3** for answer 122 OR **M1** for at least 5 square numbers (or 5 square numbers + 1) **isw** **M1** for at least 3 cube numbers (or 3 cube numbers – 3) **isw** **M1** for reducing their list to non-primes If 0 scored, **SC1** for answer 5 or 17 or 37 or 61 or 101	 1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144 2, 5, 10, 17, 26, 37, 50, 65, 82, 101, 122, 145 1, 8, 27, 64, 125 5, 24, 61, 122 Implied by any non-prime answer less than 150
4	(a)		$(x – 43)(x + 43)$ final answer	1		Condone omission of final bracket
	(b)		1400	2	**M1** for (57 + 43) (57 – 43) FT *their* quadratic factors in (a) or better or **B1** for 3249 or 1849 **seen**	M1 for FT factors $(x + 43)(x + 43)$ or $(x – 43)(x – 43)$ only

Question			Answer	Marks	Part marks and guidance	
5	(a)		Image at (1, –3), (3, –3), (1, –6)	2	**B1** for reflection in any horizontal line or for reflection in $x = -1$	Use overlay mark intention isw other shapes
	(b)		Enlargement [sf] ½ oe [centre] (5, 7)	3	**B1** for each	More than one transformation given spoils all 3 marks Extra properties treat as choice
	(c)		–1 and (0, 0)	2	**B1** for either	Accept origin for (0, 0)
6			120	5	**B3** for $x = 5$ OR **M1** for $x + 3 + x + 3 + 4x - 5 + 4x - 5$ [= 46] **oe** **M1** for $10x = 46 + 4$ FT *their* linear eqn **M1** for $50 \div 10$ FT *their* $ax = b$ **M1** for $(4 \times$ *their* $x - 5) \times ($*their* $x + 3)$	$10x - 4$ [= 46] oe eg $x + 3 + 4x - 5 = 23$
7			308	5	**M4** for $252 \div 0.9 \times 1.1$ **oe** OR **M1** for $252 \div 0.9$ **oe** **A1** for 280 **M1** for *their* 280×1.1 **oe** **A1FT** for *their* 280×1.1 rot to nearest pound or better	
8	(a)		$180 \div (1 + 2 + 3) \times 3$ [= 90]	2	**M1** for $180 \div (1 + 2 + 3)$ If 0 scored, **SC1** for angles 30, 60, 90	Condone 6 for 1 + 2 + 3
	(b)		7.5	4	**B1** for $\sin 30° = \cos 60° = ½$ **soi** **M2** for $15 \sin 30$ **oe** or **M1** for $x/15 = \sin 30$ **oe**	

Question			Answer	Marks	Part marks and guidance	
9			80	4	**M3** for 250 ÷ (8*k* +10*k* + 7*k*) × 8*k* **oe** or **M2** for 250 ÷ (8*k* +10*k* + 7*k*) **oe** or **M1** for two ratios with a common number of women implied by 8*k* (men) **and** 7*k* (children) seen, *k* > 0 or for 8 : 10 [:7] or [4:] 5 : 3.5 seen	M3 implied by 80 , 100, 70 with 80 not selected e.g. 0.8 and 0.7, 4 and 3.5
10			AD = AB [given] **oe** CD = CB [given] **oe** AC = AC (common) **oe** Congruent SSS Angle ADC = angle ABC	M3 A1	**M2** for 2 correct statements with reason[s] or 3 correct but no/incorrect reason[s] **M1** for 1 correct statement with reason or 2 correct but no/incorrect reasons If 0 scored, **SC1** for AC is a line of symmetry **oe** or for triangle ADC is congruent to triangle ABC **oe**	Accept vertical line of symmetry or reflection see diagram as well if unsure
11	(a)	(i)	16 000	1		
		(ii)	25	1		
		(iii)	16 000 × 0.75^2 **oe** with no subsequent error	M2	**M1** for 16 000 × 0.75^2 with subsequent error or 16 000 × 0.75 **oe** or for *their* 12 000 × 0.75	M1 implied by 12000
	(b)		Equation does not give a straight line **oe isw**	1		Accept 'There is not a constant decrease' oe isw See AG

Question			Answer	Marks	Part marks and guidance	
	(c)		If you calculate a value for a 20 year-old car it is greater than 0 **oe**	1		Accept 'the graph will never reach the *x*-axis' oe, It will have scrap value The answer is always positive etc Condone additional 'opinion based' information
12	(a)		$0.8\dot{3}$	2	**M1** for division attempt leading to 0.8.....	Accept 0.833[3]…..
	(b)		$\frac{19}{150}$ as final answer	3	**B2** for $\frac{114k}{900k}$ **oe** or **M1** for 126.66... and 12.66... or better or fraction $\frac{k}{900}$ or $\frac{k}{9900}$ **seen**	Sets up a 'pair' to eliminate the recurrence Accept eg 12.666.. and 0.126…
13	(a)		27	2	**M1** for 1350 ÷ 50 If 0 scored **SC1** for answer figs 27	
	(b)		30	5	**B1** for 1350 **M3** for 1350 = 40*k* + ½ ×10×*k* **oe** or **M2** for 40*k* + ½ ×10×*k* **oe** or **M1** for any attempt to find any relevant area under the graph	Condone figs 135 for M3 and variable other than *k*
	(c)	(i)	–3	1FT	FT (–*their* (b) ÷ 10)	
		(ii)	[Constant] deceleration **oe** m/s^2	1 1		Condone acceleration The rate at which the speed changes

Question			Answer	Marks	Part marks and guidance	
14	(a)		It should have been $\frac{5}{10}\times\frac{4}{9}$ **oe isw**	**2**	**M1** for showing $\frac{5}{10}\times\frac{5}{10}$ or $\frac{1}{2}\times\frac{1}{2}$ or for explaining that he did not take account that there was one less sweet for the second choice **oe**	
	(b)		$\frac{58}{90}$ **oe**	**4**	**M3** for $\left(\frac{5}{10}\times\frac{5}{9}\right)+\left(\frac{4}{10}\times\frac{6}{9}\right)+\left(\frac{1}{10}\times\left\lfloor\frac{9}{9}\right\rfloor\right)$ **oe** or **M2** for the sum of any 2 of the above products **oe isw** or **M1** for any correct product from above **oe isw** If 0 scored, **SC1** for 58 different options **soi**	oe $2\left(\frac{5}{10}\times\frac{4}{9}\right)+2\left(\frac{4}{10}\times\frac{1}{9}\right)+2\left(\frac{5}{10}\times\frac{1}{9}\right)$ or $1-\left(\frac{5}{10}\times\frac{4}{9}\right)-\left(\frac{4}{10}\times\frac{3}{9}\right)$ accept equivalents over 90 throughout for method and grouping of products or M2 for the sum of any 4 of the above products oe isw or M1 for any the sum of any 2 of the above products oe isw Implied by $\frac{58}{100}$
15	**(a)**	**(i)**	90	**1**		
		(ii)	22	**2**	**M1** for [UQ =]100 or [LQ =] 77 to 79	Accept 21 to 23

Question			Answer	Marks	Part marks and guidance	
	(b)		No with 18 to 20 and 30 OR No with 8% to 10% [and 15%] OR No with [£] 110 to112 [which is less than 120] OR No with 170 and 180 to 184	2	**M1** for 18 to 20 or 8% to 10% or 110 to 112 or for 30 or 170 or 180 to 184	Could be written on graph for M1
	(c)		Families in the south spent less on average as their median was lower **oe**	2	**Strict FT** their median in (a)(i) **M1** for Families in the South spent less **oe nfww**	Allow either way around but do not allow M1 if wrong reason given e.g. in first reason mentions IQR for spending less Ignore ref to figures
			Families in the south were more spread in their spending as their IQR was larger **oe**	2	**Strict FT** their IQR in (a)(ii) **M1** for Spending varies more in the South **oe nfww**	For M1 allow spread oe associated with IQR without comparison
16	(a)		$7\sqrt{3}$	3	**M2** for $2\sqrt{3}$ and $5\sqrt{3}$ or **M1** for $\sqrt{4\times3}$ or better or $\sqrt{25\times3}$ or better	
	(b)		$\frac{1}{8}$ **oe** final answer	3	**M1** for fourth root **soi** **M1** for cube **soi** **M1** for reciprocal **soi**	Each step must be correctly evaluated but FT previous step Allow method marks in any order 2 implies M1, ½ implies M1M0M1 8 implies M1M1M0, 4096 implies M0M1M0

Question			Answer	Marks	Part marks and guidance	
17			$-1 \leq x \leq 6$ oe	4	**M2** for $(x - 6)(x + 1)$ [≤ 0] **oe** Or **M1** for $(x + a)(x + b)$ [≤ 0] where $ab = -6$ or $a + b = -5$ **B1** for -1 and 6 **soi**	For M2 or M1, condone [= 0] M2 for correct formula or complete square condone 1 error M1 for $(x - 2.5)^2$ oe seen or for correct formula with 2 errors Could be seen as roots on sketch of graph or in wrong inequality
18			$(x + 1)^2 - x^2$ **oe**	M2	**M1** for x and $x + 1$ shown **oe**	For M2 or M1 Condone any two consecutive expressions written algebraically and condone reversal
			Expands all brackets correctly for their expression eg $x^2 + 2x + 1 - x^2$	M1		If reversed then brackets needed or all signs need to be correct
			$2x + 1$ is always odd **oe**	A1	With no errors seen and brackets expanded for their expressions If 0 scored, **SC1** for 2 correct numeric examples or correct reasoning with consecutive odds and evens	Condone $-2x - 1$ for reversal FT from *their* correct consecutive square expressions eg square numbers 1, 4, 9, 16, go odd, even, odd etc, odd – even = odd, even – odd = odd

Question			Answer	Marks	Part marks and guidance	
19			$x = ½$ **oe** $y = 1$ $x = 5$ y = 19 **nfww**	6	**M1** for $2x^2 - 7x + 4 = 4x - 1$ **oe** **M1** for $2x^2 - 11x + 5$ [= 0] **oe** 3 term eqn **M2** for $(2x - 1)(x - 5)$ [= 0] or **M1** for $(2x + a)(x + b)$ [= 0] where $ab = 5$ or $2b + a = -11$ **A1** for $x = ½$ **oe** and $x = 5$	Implies previous M1 FT *their* 3 term quadratic equation M2 for complete the square or for formula condone 1 error M1 for $\left(x - \frac{11}{4}\right)^2$ oe or for correct formula used with 2 errors

APPENDIX

Exemplar responses for Q11b

Response	Mark
The graph should be a [decreasing] curve	**1**
It is 4000 for the first year and 3000 for the second year …	**1**
Because it would not be a steady decline	**1**

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