OCR
Oxford Cambridge and RSA

F

GCSE (9–1)

Mathematics

J560/02: Paper 2 (Foundation tier)

General Certificate of Secondary Education

Mark Scheme for November 2021

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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 available in RM Assessor. These **must** be used whenever appropriate during your marking.

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
BP	Blank page
SEEN	Seen

For a response awarded zero (or full) marks a single appropriate annotation (cross, tick, M0 or ^) is sufficient, but not required.
For responses that are not awarded either 0 or full marks, you must make it clear how you have arrived at the mark you have awarded and all responses must have enough annotation for a reviewer to decide if the mark awarded is correct without having to mark it independently.

It is vital that you annotate standardisation scripts fully to show how the marks have been awarded.

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. 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**.
   - **soi** means **seen or implied**.
   - **dep** means that the marks are **dependent** on the marks indicated. You must check that the candidate has met all the criteria specified for the mark to be awarded.
   - **with correct working** means that full marks **must not** be awarded without some working. The required minimum amount of working will be defined in the guidance column and **SC** marks given for unsupported answers.

3. 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.

4. Unless the command word requires that working is shown and the working required is stated in the mark scheme, 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.

5. 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. 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.

   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* '52 + 72'). Answers to part questions which are being followed through are indicated by e.g. FT 3 × *their* (a).

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 and incorrect answer given**:

   (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 if there is no other method leading to the incorrect answer. 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. A correct step, value or statement that is not part of the method that leads to the given answer should be awarded **M0** and/or **B0**.

   (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 marks for the poorer response 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 marks for the poorer response 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. If a candidate corrects the misread in a later part, do not continue to follow through, but award **A** and **B** marks for the correct answer only.

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.

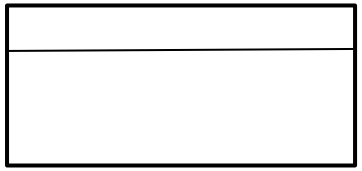
13. For methods not provided for in the mark scheme give as far as possible equivalent marks for equivalent work. If in doubt, consult your Team Leader.

14. If in any case the mark scheme operates with considerable unfairness consult your Team Leader.

Question			Answer	Marks	Part marks and guidance	
1	(a)		5	1		
1	(b)		Cone	1		
1	(c)		Right-angled [triangle]	1		Accept scalene [triangle] or right angled scalene
2	(a)		3	1		
2	(b)		-8	1		
3	(a)		3.02	1		
3	(b)		9[.00..]	2	**M1** for answer figs 9...	
4	(a)		>	1		
4	(b)		<	1		
5	(a)		12	1		
5	(b)		(5 × 7 + 1) ÷ 9 = 4	1		
6	(a)		$\frac{4}{5}$	2	**B1** for $\frac{8}{10}$ or for correct answer seen	
6	(b)		[0]. 8[00..]	1		
7	(a)		$4\frac{1}{3}$	1		

Question			Answer	Marks	Part marks and guidance	
7	(b)	(i)	$\frac{7}{9}$ **oe**	2	**M1** for $\frac{3}{9}$ or $\frac{3k}{9k}$ [+] $\frac{4k}{9k}$ where *k* is a positive integer	For 2 marks **oe** equivalent fractions For M1 may be seen as part of a single fraction eg $\frac{3+4}{9}$
7	(b)	(ii)	9	1		Do not accept $\frac{9}{1}$
8	(a)		35	1		
8	(b)		6	2	**M1** for ÷ 7 and – 3 **soi** or for 63 ÷ 7 = 9 **soi**	
9			72 with correct working	5	**M3** for 500 – 4 × 60 – 44 **oe** or **M2** for 500 – 4 × 60 **oe** or for 4 × 60 + 44 **oe** or **M1** for 4 × 60 or for 500 – 44 or 5[.00] –[0].44 **M1** for *their* 216 ÷ 3 If 0 scored **SC2** for answer 72 or **SC1** for 216 with no working	"Correct working" requires evidence of at least **M2** [216] [260] [284] [240] [456] or [4.56]
10	(a)		3 : 8	2	**M1** for correct partial simplification of 75 : 200	Eg 15 : 40 but not eg 37.5 : 100 1 : 2 $\frac{2}{3}$ scores M1
10	(b)		150	2	**M1** for 18 ÷ 12 × 100 **oe**	

Question			Answer	Marks	Part marks and guidance	
10	(c)		Answer of 54	4	**M3** for 225 ÷ 50 × 12 **oe** or **B2** for 60 or 9 [eggs] **and** 225 or **M1** for 225 ÷ 50 or 10 ÷ 2 **soi**	For M3 allow a table with just one error
11	(a)		A B R S A R B S R A B S R B A S B R A S B A R S	2	**B1** for at least 3 additional correct arrangements	For 2 marks no repeats or extras apart from A B R S
11	(b)		$\frac{2}{6}$ **oe** isw	2	**FT** *their* table **M1** for correct numerator or denominator **FT** *their* table	For 2 marks or M1 denominator < 11 Not ratio or words isw cancelling/conversion to other forms
12			40 nfww	4	**B2** for length of rectangle = 10 or **M1** for 4 ÷ 2 × 5 **M1** for 5 × 4 + 2 × *their* length **oe**	
13	(a)		[No,] answer is not in index form **oe**	1		Accept it should be $2^2 \times 5$ but do not isw if with an incorrect statement
13	(b)		-3	1		
13	(c)		72	3	**B1** for [$\sqrt{81}$ =] 9 **B1** for [2^3 **oe** =] 8	For 3 marks condone ±72 or -72 For B1 condone ±9 or -9

Question			Answer	Marks	Part marks and guidance	
14			5000 [ml] or 0.45 [L] soi	B1		Correct conversion at any stage
			9 × 450 **oe**	M1		Alternate approaches are possible
			Correct attempt to find 80% or 20% of 5000 **oe**	M1	or $\frac{9\times450}{5000}[\times100]$ **oe** or $\frac{5000-9\times450}{5000}[\times100]$ **oe**	M1 may be implied by 4000 or 1000 or 81% or 19% seen
			4050 and 4000 or 950 **and** 1000 **and** [They are] correct **oe**	A2	or 81% [and 80%] or 19% [and 20%] If A0 scored **B1** for 4050 or 4000 or 950 or 1000	For A2 accept in other correct consistent units for comparison eg 4.05[L] and 4[L] and must have no incorrect statement For B1 accept eg 4.05[L] or 4[L]
15			$x < 3$	3	**M1** for $2x + 10 < 16$ or $x + 5 < 8$ **M1** for next correct productive step FT *their* first step	For method marks condone incorrect inequality sign or 'equals'
16	(a)		C	1		
16	(b)		D	1		
17	(a)		Rectangle 8 by 6 with one internal line 2 cm from longer edge 	3	**B1** for a rectangular base **B1** for 8 by 6 or for any rectangle with one line drawn inside parallel to longer edge	Accept in any orientation eg 8 by 6 scores B1B1 8 by 6 with wrong line scores B1B1 8 by 5 scores B1B0 8 by 5 with one line scores B1B1

Question			Answer	Marks	Part marks and guidance	
17	(b)		6 × 3 × 8 ÷ 2 [=72]	M2	**M1** for 6 × 3 ÷ 2 **oe** or for their area or cross section × 8	May be done in stages
17	(c)		6	3	**M2** for $\sqrt{\frac{72}{2}}$ **oe** or **M1** for *l* × *l* × 2 = 72 **oe** or for 72 ÷ 2	
18	(a)		Four correct plots (70, 86) (44, 60) (37, 48) (38, 50)	2	**B1** for 2 or 3 correct plots	Overlay gives guidance, tolerance ±½ small square
18	(b)		Positive	1		Ignore embellishments
18	(c)	(i)	Circles (30, 66) only	1		Accept any clear indication
18	(c)	(ii)	120	3	**M2** for $\frac{66-30}{30}[\times 100]$ **oe** or for $\frac{66}{30}\times 100$ [–100] **oe** or **M1** for $\frac{66}{30}$ **oe** or for 66 – 30 **oe**	For M2 and M1 FT *their* (c)(i), point must be chosen for FT (table or graph) M2 implied by 1.2 or 220 M1 implied by 2.2 or 36
18	(d)		No and line of best fit should not extend beyond data provided **oe**	1		eg only have data up to 70 marks, No one scored that high [so the trend may not continue] He would need to extrapolate beyond the line of best fit Do not accept eg the graph only goes up to 90 for the second test

Question			Answer	Marks	Part marks and guidance	
19			Shows actual increase is 21 [%] with correct working	**5**	**M3** for [*k* ×] 1.1 × 1.1 **oe** **A1** for answer 121[%] or for 1.21 OR **M1** for 1.1 **oe soi** **A1** for a correct evaluation of the first stage with *their* value If 0 scored **SC2** for answer 21[%] or **SC1** for 121% or 1.21 with no working	"Correct working" requires evidence of at least **M3** or alternate convincing approach Allow method marks if contained in correct method involving any invented starting price e.g. **M3** for 100 × 1.1 × 1.1 **oe** e.g. for M1A1 uses 80 as value then gives 88 in working
20			10 nfww	**4**	**M1** for 5 × 4 **M1** for 200 or 199 used **M1dep** for *their* 200 ÷ *their* area, dep on first M1	nfww for 4 marks no errors in calculating values and at least one of 5, 4, 200 or 199 used Allow for 20 or for 4.9 × 4.1 [20.09] or with one unrounded value [19.6 or 20.5] Allow for 198.5 ÷ (4.9 × 4.1)

Question			Answer	Marks	Part marks and guidance	
21	(a)		6 and – 3	2	**B1** for each	
21	(b)		Correct curve	3	**B2FT** for 6 or 7 correct plots **B1FT** for 4 or 5 correct plots	Tolerance ±1 small square for plotting and curve through correct points. Condone slight feathering – must not be ruled If large blob for plot, check centre of blob
21	(c)		-2.3 to -2.2 and 2.2 to 2.3	2FT	**Strict FT** **B1** for either FT *their* graph	Tolerance ± ½ a small square Do not allow exact answers or answers with no graph Do not FT from a straight line graph If more than 2 intersections, B1 for each correct intersection on the answer line. If more than 2 answers, mark the worst.
22	(a)		Correct reason	1	e.g. all could be children **oe** all could be adults **oe** too small a sample vary the time various age groups	See Appendix
22	(b)		Any three from: Larger sample size Vary the time of day/day Ensure equal numbers [of older and younger people are asked] Vary the location	3	**B1** for each	isw incorrect reasons See Appendix

Question			Answer	Marks	Part marks and guidance	
23			40 with correct working	**6**	**M1** for $x + 85 = 2x + 30$ **M1dep** for $\pm x = k$ or $kx = \pm 55$ $(k \neq 0)$ **A1** for $x = 55$ or **M1** for at least two trials of $x + 85$ or evaluated for x = 55 **M1** for at least two trials of $2x + 30$ or evaluated for $x = 55$ **A1** both expressions evaluated as 140 when x = 55 AND **M1** for *their* $x + 85$ or $2 \times$ *their* $x + 30$ **M1** for $y = 180 - ($*their* $x + 85)$ **oe** If 0 scored **SC2** for answer 40 with no working or insufficient working or **SC1** for $x = 55$ with no or insufficient working	"Correct working" requires evidence of at least **M1** AND **M1** ie we expect to see a minimum of an equation or trials leading to x = 55 and the substitution

Appendix

Exemplar responses Q22a

Response	Mark
School starts at 9am	**1**
There might be no one below 15	**1**
Because he could ask more people that are 15 than people aged more than 15	**1**
The first 20 might all be the same age	**1BOD**
People under the age of 15 will at school and most over the age of 15 may be at college or work	**1BOD**
People leaving a particular shop	**1BOD**
Not diverse enough	**0**
Not everybody may be out at the time the survey is taken	**0**
How do we know they all played games	**0**
Won't know what age they'll be	**0**

Exemplar responses Q22b

Response	Mark
Use statistics from other days	**1**
Make the survey available online *implies more people **and** different age groups*	**1**
Go to the schools and ask individually every person, confirm ages, equal amounts of both under and over 18	**0, 0, 1BOD**
Make sure you ask their age	**0**
It should be a closed question	**0**
The journalist should be unbiased	**0**
Go to school in a certain year and ask 20 students	**0**
Go to a game shop	**0**
have a wider time range *as there is no time range/limit*	**0**
Do it on a Tuesday *as just on a different day of the week would make no difference*	**0**
Asking people of all ages *not the same as ensuring equal numbers*	**0**
Ask female. And male *not relevant to data required*	**0**

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