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GCSE (9–1)

Mathematics

J560/01: Paper 1 (Foundation tier)

General Certificate of Secondary Education

Mark Scheme for June 2019

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 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.

Subject-Specific Marking Instructions

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

3. 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 <u>not from wrong working</u> **full marks** should be awarded.
   Do <u>not</u> award the marks if the answer was obtained from an incorrect method, ie incorrect working is seen <u>and</u> the correct answer clearly follows from it.

4. 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 − √(*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.

5. 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.

6. 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 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).
   - **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**.

7. 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'.

8. 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).

9.   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.

10. 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.

11. 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.

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	Mark	Guidance
1	(a)		[Irregular] Hexagon	1	Condone poor spelling
	(b)		3	1	
2	(a)	(i)	Any odd number	1	Accept more than 1 if all correct
		(ii)	1, 5 or 25	1	If more than one, all must be correct (condone factor products)
		(iii)	23 or 29	1	Accept both
	(b)		Explanation based on $\sqrt{55}$ or 7^2 and 8^2 eg $\sqrt{55}$ is between 7 and 8 or 55 is between 49 and 64 [so it cannot be a square number] $\sqrt{55}$ [= 7.4..] is not a whole number	2	**B1** for 7.4… or 7^2 = 49 or 8^2 = 64 or 7^2 and 8^2 or 49 and 64 e.g. $\sqrt{55}$ = 7.4
3			[0].25	1	
			7[%]	1	
			$\frac{13}{10}$ oe	1	Allow $1\frac{3}{10}$ oe, do not isw incorrect cancelling
4	(a)	(i)	23	1	
		(ii)	Add 5	1	Need direction and quantity May be on diagram See appendix
	(b)		The terms in the sequence end with 3 or 8	1	See appendix

5	(a)		L N M, M L N, M N L, N M L, N L M	2	No repeats for 2 marks **B1** for 4 or more additional entries including no more than 1 error or repeat or 3 additional entries with no errors or repeats
	(b)		$\frac{4}{6}$ oe isw	1	**FT** *their* table if at least 2 more entries
6	(a)		$12x + 8$ final answer	1	
	(b)		$3(c - 2d)$ final answer	1	Condone last bracket missing and $3(1c - 2d)$
7			42 cao	3	**B1** for 9 for tennis only, in working or diagram **M1** for 8 + 14 + 11 + *their* 9 oe Can be implied from values on diagram or their working and *their* answer. Do not allow 11 + 22 + 8 + 17 = 58
8			411.25	6	Mark the method which leads to the answer. If no final answer, mark to candidate's advantage **M1** for 35 × 9.4 implied by 329 **M1** for 42 – 35 implied by 7 as a time **M1** for $9.4 \times \frac{5}{4}$ oe implied by 11.75 **M1** for *their* (42 – 35) × *their* ($9.4 \times \frac{5}{4}$) implied by 82.25 **M1** for *their* (35 × 9.4) + *their* ((42 – 35) × $9.4 \times \frac{5}{4}$) or *their* (35 × 9.4) + *their* ((42 – 35) × $9.4 \times \frac{1}{4}$) may be implied by adding 16.45 to *their* (35 × 9.4) or answer of 345.45 An alternative method **M1** for 42 × 9.4 implied by 394.8[0] **M1** for 42 – 35 implied by 7 as a time **M1** for $9.4 \times \frac{1}{4}$ oe implied by 2.35 **M1** for *their* (42 – 35) × *their* ($9.4 \times \frac{1}{4}$) soi by 16.45 **M1** for *their* (42 × 9.4) + *their* ((42 – 35) × $9.4 \times \frac{1}{4}$)

9			[£]7 as answer with 7.8[0] <u>and</u> 8.8[0] and either 2.8 oe, 2800 or 3 [L...]	4	All values must be correct for 4 marks **M1** for $7 \times \frac{2}{5}$ implied by 2.8 oe or 2800 or showing he needs to buy 3 litres AND **M2** 4.4 + 2.6 may be implied by 7 and 3 × 2.6 may be implied by 7.8[0] and 2 × 4.4 may be implied by 8.8[0] or **M1** for 3 × 2.6 may be implied by 7.8[0] or 2 × 4.4 may be implied by 8.8[0] AND **B1** for answer of 7
10			3, 4, 6, 7, 12	4	**B1** for 6 or 12 placed in correct position **B1** for 3 in the correct position **M1** for (6.4 × 5) – (12 + 6 + 3) soi by 11 or by 4 <u>and</u> 7 or by any two numbers in the second and fourth positions between 3 and 5 inclusive, and between 6 and 8 inclusive which sum to 11
11	**(a)**		Rotation 90[°] clockwise oe [Centre] (0,0)	1 1 1	Do not accept turn for rotation Condone missing brackets, accept origin or O do not accept $\frac{0}{0}$ or vector More than 1 transformation scores 0
	(b)	**(i)**	Triangle at (–5, 2) (–2, 2) (–2, 4)	2	Red overlay **B1** for reflection in $x = k$ or $y = 0$. Blue overlay or base on green line Condone freehand in both (b)(i) and (ii)

		(ii)	Triangle at (–3, 0) (–3, –2) (0, –2)	2	Red overlay **B1** for $\begin{pmatrix} -5 \\ j \end{pmatrix}$ or $\begin{pmatrix} k \\ -4 \end{pmatrix}$ base on blue line or left side on green line
12			Alex 5.1	3	**M1** for [0].87× 520 implied by 452.4 and **M1** for [0].61 ×750 implied by 457.5 Non calculator methods must be fully correct allow 1 arithmetic error
13			615.7 to 615.832 or 616	2	Accept 196π as final answer for 2 marks **M1** for π × 14² oe
14	(a)	(i)	360 cao	1	
		(ii)	356.1 cao	1	
	(b)	(i)	4	1	Do not accept 3⁴
		(ii)	8	1	Do not accept 6⁸
15	(a)		8 nfww	4	**M3** for $\frac{12}{1.5}$ or $\frac{12}{90} \times 60$ or $\frac{2}{1.5}$ x 6 or $\frac{120}{90} \times 6$ oe or **M2** for $\frac{12}{90}$ or $\frac{2}{1.5}$ or $\frac{120}{90}$ oe OR **B1** for 12 [as a distance] **B1** for 1.5 or $1\frac{1}{2}$ [as a time] **M1** for (2 × 6) ÷ 1.5
	(b)		Correct reason	1	See appendix

16			527	2	**M1** for 0.85×620
17	**(a)**		10	1	
	(b)		Correct continuous ruled line from $x = 0$ to $x = 4$	2	Tolerance 2 mm by eye **B1** for 2 points correctly plotted **FT** *their* table
	(c)		$y = -3x + 11$ oe	3	**B2** for $-3x + 11$ or $y = mx + 11$ ($m \neq -3$ or 0, m does not need to be numeric) or $y = -3x + c$, (c can be 0, c does not need to be numeric) OR **M1** for $\frac{11 - -1}{0 - 4}$ oe OR **B1** for $mx + 11$, (where $m \neq -3$ or 0, m does not need to be numeric) or $-3x + c$ (where $c \neq 11$, c can be 0, c does not need to be numeric).
18			21.6[3...]	3	Accept $6\sqrt{13}$ as final answer for 3 marks **M2** for $\sqrt{12^2 + 18^2}$ soi by $\sqrt{468}$ or **M1** for $12^2 + 18^2$ implied by 468 See appendix
19	**(a)**		$\dfrac{5}{36}$ or equivalent fraction	3	**M2** for $\dfrac{5}{3+4+5} \times \dfrac{1}{3}$ oe implied by e.g. [0].139,

					$[0].1388\ldots$, 13.9%, $13.88..\%$, $\frac{1.\dot{6}}{12}$, $\frac{1.66[6..]}{12}$, $\frac{1.67}{12}$, $\frac{1.7}{12}$, $\frac{5/3}{12}$ or better OR **B1** for $\frac{5}{12}$ or equivalent fraction or $0.41\dot{6}$ or better OR **M1** for ($\frac{3}{3+4+5}$ or $\frac{4}{3+4+5}$) $\times \frac{1}{3}$ oe or $\frac{1}{3} \times 5$ oe, implied by $1.\dot{6}$, 1.66[6…], 1.67 or 1.7 or better
	(b)		4000	**2**	**M1** for 1600 ÷ 8 or (5+7+8) ÷ 8 implied by 200 or 2.5
20	**(a)**		12.8[3....]	**4**	**B1** for at least 3 mid-points seen (from 2.5, 7.5, 15, 30) or implied by products 50,105,165,450 or 770 **M1** for Σmf where *m* is a value within each group. Allow use of boundaries; allow one error in calculation. If no midpoints seen may be implied by *their* mf **M1 dep** on previous **M1** for *their* 770 ÷ 60
	(b)		The highest number may not have been 40 or the lowest number may not have been 0.	**1**	See appendix

| 21 | | | [s=] 15   with correct working
[*j* =] 22 | 5 | Correct answer from trial and improvement scores 5

B4 for 1 correct answer with correct working

OR

M1 for 5*s* + *4j* = 163 oe

M1 for 3*s* + 2*j* = 89 oe

M1 for method to find a common coefficient, allow 1 arithmetic error

M1 for correct method to eliminate 1 variable, allow one arithmetic error – a sign error is not an arithmetic error

If zero scored **SC2** for correct answers with no working |
| 22 | | | 2 602.02 cao | 4 | **B3** for 27 602.02 soi by 2 602[.02…] as final answer

OR

M2 for 25 000 × (1.02)^5 oe implied by 27 602[.02…]
See appendix

OR

M1 for 25 000 × (1.02)^k oe implied by 26 010 (*k* ≠ 5 and *k* ≥ 2)

See appendix |

23	(a)		11.37 [am]	4	**B3** for 11.37 pm OR **B2** for listing the next 3 correct times of both buses. i.e. 8.55, 9.13, 9.31 and 8.57, 9.17, 9.37 OR **B1** for listing the next 3 correct times of one bus i.e. 8.55, 9.13, 9.31 or 8.57, 9.17, 9.37 Alternative method **B3** for 3 [h] (must be sure 3 is not minutes) OR **B2** for [LCM=] 180 or answer 14 37 or 2 37 pm OR **M1** for [18=] 2×3^2 or [20=] $2^2 \times 5$ allow in a tree diagram etc or [LCM=] $180k$ ($k \neq 1$) OR **B1** for listing the next 3 multiples of 18 and 20 i.e. 36, 54, 72 and 40, 60, 80 See appendix for other methods
	(b)		accept any correct assumption e.g. buses keep to the timetable or there are no delays or there are no changes to the timetable or they do not cancel any buses	1	See the appendix for other comments, if there is more than one comment mark the best one providing there are no incorrect comments
24			$2 \times \pi \times 6$ oe implied by 12π	M1	Accept correct alternative methods
			$\frac{50}{360} \times \textit{their}\,(2 \times \pi \times 6)$	M1	
			5.235[…] or 5.236[…] or 5.237 which rounds to 5.24	A1	

| 25 | | | 9
16
32 | 6 | Allow any letter providing use is consistent
this method assumes Ayesha's age = a
B4 for $a + a + 7 + 2(a + 7) = 57$ or better

OR

B1 for [b=] $a + 7$ oe e.g. $a = b - 7$

B1 for $c = 2b$ oe e.g. $\dfrac{c}{2} = b$ or [c=] $2(a + 7)$

B1 for *their* a + *their* b + *their* c = 57 e.g. $a + b + c = 57$ must be algebraic

AND

M1FT for correctly solving *their* linear equation in one variable e.g. $4a = 36$ and $a = 9$

AND

M1 for substituting *their* a into $b = a + 7$ and $c = 2b$ e.g. $a = 8$, $b = 15$ and $c = 30$ implied by *their* answer which must be integers

See appendix for other methods

Mark working first,

if **0** <u>scored</u> then **SC2** for 2 answers correct in the correct place or **SC1** for 1 answer correct in the correct place

or if **1** <u>scored</u> then award the better of 1 or **SC2** for 2 answers correct in the correct place

to a maximum of 5 marks |

APPENDIX

Exemplar responses for Q4(a)(ii)

Response	Mark
18 + 5	**1**
$5n - 2$	**1**
jump each time is 5 and the number before the sequence = –2, check for +5 on diagram, if there award mark	**1**
the difference is 5, check for +5 on diagram, if there award mark	**1**
$5n$	**0**
the difference is 5	**0**
jump each time is 5 and the number before the sequence = –2	**0**
Its going up in 5's but take away 2	**0**
5	**0**
$n + 5$	**0**

Exemplar responses for Q4(b)

Response	Mark
The number only ends in 3 or 8 there is a pattern	**1**
When you carry on the number would be 533 not 534	**1**
Its not in the sequence as there would never be a 4 as a unit	**1**
The terms don't end in 4	**1**
[n =] 107.2 is not a whole number	**1**
[n =] 107.2	**1 bod**
Because it hasn't got 8 or 3 in the number	**0**
Because you can't add 5 to get to 534	**0**
534 is an even number	**0**
Doesn't fit the pattern	**0**

Exemplar responses for Q15(b)

Response	Mark
The stopping time would have been counted as it's an average for the whole race	1
If she hadn't stopped her time would have been less than 2 hours which would change her speed	1
Average running speed is not the same thing as average speed	1
She was running for less than 2 hours	1
12 ÷ (a time <2) >6 oe	1
If she'd carried on she would have done it in 90 mins	0
Because she stopped her running speed slowed down	0
She could have stopped for a long time	0
She slowed down to stop (**no concept of average)**	0
Because she kept herself hydrated/gave herself energy	0
She had a rest so she could run faster	0

Exemplar responses for Q20(b)

Response	Mark
Because you don't know the exact biggest and smallest numbers of people	1
Exact number of people is not known, they are just boundaries where they could be	1
No exact numbers given/don't have exact values	1
40 – 5 = 35 so he could be wrong	1
You don't know the exact **weight**	0
Not exactly 40 people visited the office	0
Because we are using midpoints so won't get accurate result	0
40 – 5 = 35 therefore he is wrong	0
There could be less than 40	0

Exemplar responses for Q23(b)

Response	Mark
buses keep to the timetable	**1**
buses arrive/leave on time	**1BOD**
there are no delays	**1**
there are no unexpected stops	**1**
they follow the same routes each time	**1**
there are no changes to the timetable/ they keep to the timetable	**1**
they do not cancel any buses	**1**
no buses break down	**1**
there is no bad/heavy traffic	**1**
there is no traffic	**0 not enough**
buses are travelling at constant speed	**0**
buses stop to recharge/ refuel or collect passengers	**0**

Q18 Alternative

M1 for $\tan\Theta = \frac{12}{18}$ $\Theta = 33.69..$ and

M1 for $x = \frac{18}{\cos\emptyset}$ or $x = \frac{12}{\sin\theta}$

OR

M1 for $\tan\alpha = \frac{18}{12}$ $\alpha = 56.3099$ and

M1 for $x = 12 \div \cos\alpha \ \frac{12}{\cos\alpha}$ or $x = 18 \div \sin\alpha \ \frac{18}{\sin\alpha}$

Question 22

Year on year method

working	total	interest	year
25000 × 1.02	25500	500	year 1
25500 × 1.02	26010	510	year 2
26010 × 1.02	26530.2	520.2	year 3
26530.2 × 1.02	27060.804	530.604	year 4
27060.806 × 1.02	27602.020085	541.216	year 5

Q23

Alternative method
B1 for $18x = 20y$
B1 for $x = 10$ $y = 9$

M1 for $[837 +] \frac{10 \times 18}{60}$

e.g. assumes Bennie's age = b

B4 for $b - 7 + b + 2b = 57$ or better

OR

B1 for $[a =]$ $b - 7$ oe e.g. $b = a + 7$

B1 for $[c =]$ $2b$ oe e.g. $\dfrac{c}{2} = b$ or $c = 2(a + 7)$

B1 for *their 'a'* + *their 'b'* + *their 'c'* = 57 e.g. $a + b + c = 57$ must be algebraic

AND

M1FT for correctly solving *their* linear equation in one variable e.g. $4b = 64$ and $b = 16$
AND

M1 for substituting *their b* into $a = b - 7$ and $\dfrac{c}{2} = b$ e.g. $a = 8$, $b = 15$ and $c = 30$ implied by *their* answer which must be integers

e.g. assumes Chloe's age = c

B4 for $\dfrac{c}{2} - 7 + \dfrac{c}{2} + c = 57$ or better

OR

B1 for $[a=]$ $\dfrac{c}{2} - 7$ oe e.g. $c = 2(a + 7)$

B1 for $[b=]$ $\dfrac{c}{2}$ oe e.g. $c = 2b$ or $b = (a + 7)$

B1 for *their 'a'* + *their 'b'* + *their 'c'* = 57 e.g. $a + b + c = 57$ must be algebraic

AND

M1FT for correctly solving *their* linear equation in one variable e.g. $2c = 64$ and $c = 32$
AND

M1 for substituting *their c* into $b = \dfrac{c}{2}$ and $a = \dfrac{c}{2} - 7$ e.g. $a = 8$, $b = 15$ and $c = 30$ implied by *their* answer which must be integers

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