OCR
Oxford Cambridge and RSA

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Date – Morning/Afternoon

GCSE (9–1) Mathematics

J560/06 Paper 6 (Higher Tier)

SAMPLE MARK SCHEME

Duration: 1 hour 30 minutes

MAXIMUM MARK 100

DRAFT

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, 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 (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.

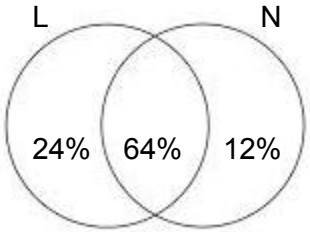
14. Anything in the mark scheme which is in square brackets […] is not required for the mark to be earned, but if present it must be correct.

Question			Answer	Marks	Part marks and guidance	
1	(a)		20	**2** **1 AO1.1** **1 AO2.3a**	**M1** for $D = \frac{M}{V}$ **soi**	Can be implied by an answer of 2
	(b)		$8\frac{1}{7}$ or 8.14[…]	**4** **2 AO1.3b** **2 AO3.1d**	**M1** for 15 or 105 ÷ 7 And **M2** for $\frac{180+105}{\textit{their}(20+15)}$ or $\frac{18+10.5}{\textit{their}\ '(2+1.5)'}$ Or **M1** for some attempt to find $\frac{\text{total mass}}{\text{total volume}}$	
2	(a)	(i)	$x > 3$	**3** **3 AO1.3a**	**M1** for $4x$ **soi** **M1** for 12 **soi**	
		(ii)	2	**1** **1 AO1.3a**		
	(b)		[+]5 ⁻5	**2** **2 AO1.3a**	**M1** for $x^2 = 25$ If zero scored **SC1** for 5 seen as answer	
	(c)		[x =] 2 [y =] ⁻1	**3** **3 AO1.3b**	**M1** for eliminating one variable **M1** for correct substitution of *their* x or y	
3	(a)	(i)	11 13 17	**2** **2 AO1.3a**	**B1** for any two correct	

Question			Answer	Marks	Part marks and guidance	
		(ii)	Any multiple of 11 and its result e.g. 11th term is 121 = 11^2	**2** **1 AO1.3a** **1 AO2.4a**	Accept any correct argument **B1** at least two more evaluated terms	
	(b)		[Correct] e.g. 9 = (1, 3, 9) or 25 = (1, 5, 25) or 49 = (1, 7, 49) [Not correct] e.g. 1 = (1) or 81 = (1, 3, 9, 27, 81)	**2** **2 AO2.4a**	**B1** for each	Factors given must be correct for each number given for **B1**
	(c)		36 and 72	**4** **2 AO1.3a** **2 AO3.1b**	**B1** for common factors of 288 and 360 found, e.g. 2, 3, 6, 8, 9, 12, 18, 24, 36, 72 and **B1** for common multiples of 4 and 6 found, e.g. 12, 24, 36, 48, 60, 72, 84, 96 and **B1** for 36 or 72	
4	(a)		(Account) A (by) 103[p]	**5** **3 AO1.3b** **1 AO3.1d** **1 AO3.3**	**B2** for 10 927.27 and **B2** for 10 926.24 or **B1** for 10 400 or 10 712 If zero scored **M1** for 1.03^3 **oe** used **M1** for 1.04, 1.03 and 1.02 used **oe**	
	(b)		He may not want to leave it there for 3 years	**1** **1 AO2.3a**	Accept any valid reason	

Question			Answer	Marks	Part marks and guidance	
5	(a)		120 to 180	**3** **1 AO1.3a** **1 AO2.1b** **1 AO3.1c**	**M1** for proportion of left-handed between $\frac{1}{7}$ and $\frac{1}{10}$ **M1** for *their* '1250' × *their* proportion	
	(b)		Correct explanation for *their* answer, e.g. 'underestimate because I rounded to 3 out of 30' **oe** or 'overestimate because I rounded to 4 out of 28' **oe** or 'Not possible to tell because we only have a small sample' **oe**	**1** **1 AO3.4b**	**FT** from *their* **(a)**	
	(c)		'He has assumed that the populations of the two schools have approximately the same proportion of left-handers.' **oe** Correct explanation for *their* decision, 'Yes. This is a bigger sample so it should give a more reliable estimate.' **oe** or 'No. The two samples are from different populations, so we can't use Vid's class to infer properties of Lei's school.' **oe**	**2** **1 AO2.5a** **1 AO3.5**	**B1** for identification of assumption **B1** for correct explanation for *their* decision	
6	**(a)**	**(i)**	[Using the scatter diagram] the points slope down/negative correlation	**1** **1 AO2.1a**		
		(ii)	[Using diagrams 1 and 2] 15/24 males have less than 10 so more than half under-estimate, 10/16 females have more than 10 so more than half over-estimate	**2** **2 AO2.1a**	**B1** for 15/24 males estimate less than 10 seconds **B1** for 10/16 females estimate more than 10 seconds	

Question			Answer	Marks	Part marks and guidance	
	(b)		No; it is a very small sample, so it doesn't represent the population very well	**2** **1 AO2.1a** **1 AO3.4a**	**B1** for any relevant comment, e.g. small sample, more men than women, John's work may involve estimating time so the sample is biased, etc. **B1** for "No"	
7			$\left(64^{\frac{1}{3}}\right)^2$ $= 4^2 = 16$	**2** **2 AO2.2**	**B1** for $\left(64^{\frac{1}{3}}\right)^2$, 4^2 or $\sqrt[3]{4096}$ **oe**	Condone $\left(64^2\right)^{\frac{1}{3}}$ and $(4096)^{\frac{1}{3}}$ for **B1**
8	**(a)**		x, $x + 1$, $x + 2$, $x + 3$ $x + (x + 1) + (x + 2) + (x + 3)$ or $4x + 6$ $2(x + 3)$	**1** **1** **1** **3 AO2.4b**	accept correct alternatives	
	(b)		e.g. 1 + 2 + 3 + 4 $4x + 6$ is not a multiple of 4	**1** **1** **2 AO2.4a**	Allow e.g. 1 + 2 + 3 + 4 = 10 is not a multiple of 4	
9			Alexander = 120 (minutes) Reiner = 180 (minutes) Wim = 90 (minutes)	**4** **2 AO1.3b** **1 AO3.1d** **1 AO3.3**	**M1** for any two correct expressions, e.g $r = 2w$, $a = w + 30$, $a + r + w = 390$ **M1** for equating one variable, e.g. $w + 30 + 2w + w = 390$ **oe** **A1** for solving for one variable, e.g. $w = 90$ **oe**	
10	**(a)**		7.1 to 7.2	**2** **2 AO1.3b**	**M1** for $(47 – 4) \div (8 – 2)$, allow one error	

Question			Answer	Marks	Part marks and guidance	
	(b)		7.5 to 8.5	**4** **1 AO1.3a** **2 AO2.1b** **1 AO2.3a**	**M1** for an attempt to draw a tangent drawn at 6 and **M2** for *their* distance ÷ *their* time e.g. (40 – 2) ÷ (8 – 3) with a time gap of at least two seconds or **M1** for an inaccurate attempt at distance ÷ time (**FT** *their* tangent)	Accuracy ±1 mm
	(c)		Agreement, with correct reasoning	**2** **1 AO2.3a** **1 AO3.4b**	**B1** for agreement, with partial reasoning	
11	**(a)**			**3** **1 AO2.3a** **2 AO2.3b**	**B1** for 24% in L and **B1** for 12% in N and **M1** for 100 – (*their* '12' + *their* '24') in overlap	Condone universal set missing
	(b)	**(i)**	$\frac{64}{88}$ **oe**	**2** **2 AO1.3a**	**M1** for 64 or 88	**FT** *their* Venn diagram
		(ii)	$\frac{24}{36}$ **oe**	**2** **2 AO1.3a**	**M1** for 24 or 36	**FT** *their* Venn diagram

Question			Answer	Marks	Part marks and guidance	
12			The area scale factor is $\frac{80}{180}=\frac{4}{9}$ [So the length scale factor is $\sqrt{\frac{4}{9}}=\frac{2}{3}$] and the volume scale factor is $\left(\frac{2}{3}\right)^3=\frac{8}{27}$ So the volume of B is $810\times\frac{8}{27}=240$	**5** **1 AO1.3b** **4 AO2.2**	**M1** for finding area scale factor and **M1** for square root of area scale factor **soi** and **M1** for cubing length scale factor and **M1** for 810 × *their* volume scale factor	Allow any equivalent argument, for example by ratios
13			9.2(0)	**5** **3 AO1.3b** **2 AO3.1b**	**M1** for $\frac{6.3}{\sin 33}$ **A1** for 11.567(…) **soi** **M1 dep** *for evidence of cosine rule used **M1** for *their* '11.6'^{2} + 8.4^2 – 2 × *their* '11.6' × 8.4 × cos 52	**rot** to 3 or more sf *Dep on 1st M1 84.7(…) seen implies 4
14			2	**3** **1 AO1.3a** **2 AO3.1b**	**M1** for any correct $\frac{\text{change in } y}{\text{change in } x}$ **M1** for $\frac{s-q}{r-p}=\frac{4}{2}$ If zero scored **SC1** for $\frac{\text{change in } x}{\text{change in } y}=\frac{1}{2}$	

Question			Answer	Marks	Part marks and guidance	
15			Correct solutions, e.g. $\frac{1}{4} = \frac{1}{6} + \frac{1}{12}$ $\frac{1}{5} = \frac{1}{6} + \frac{1}{30}$ $\frac{1}{6} = \frac{1}{9} + \frac{1}{18}$	**3** **1 AO1.1** **2 AO3.1a**	**B1** for each Allow any correct example, e.g. $\frac{1}{4} = \frac{1}{5} + \frac{1}{20}$ $\frac{1}{6} = \frac{1}{7} + \frac{1}{42}$	
16	(a)	(i)	70.71[0678…]	**3** **1 AO1.1** **2 AO3.1a**	**M2** for $8 \times \frac{1}{2} \times 5 \times 5 \times \sin 45$ or **M1** for $\frac{1}{2} \times 5 \times 5 \times \sin 45$	
		(ii)	85 – 85.4	**5** **2 AO1.3b** **3 AO3.1b**	**M4** for $(2 \times 5 \cos 22.5)^2$ or $(2 \times 5 \sin 67.5)^2$ or **M3** for $2 \times 5 \cos 22.5$ or $2 \times 5 \sin 67.5$ or **M2** for $5 \cos 22.5$ or $5 \sin 67.5$ or **M1** for $\cos 22.5 = \frac{x}{5}$ or $\sin 67.5 = \frac{x}{5}$	9.238… 4.619…
	(b)		64 : 1 or 1 : $\frac{1}{64}$	**2** **2 AO3.2**	**M1** for making the link to, and using, enlargement eg $(\frac{1}{8})^2$ or 8^2 **soi**	

Question			Answer	Marks	Part marks and guidance	
17			$-\frac{1}{6}$ with working shown including explanation for discounting $w = -3$	**6** **1 AO1.3b** **1 AO2.4a** **4 AO3.1b**	**B1** for $x^2 = (w + 1)$ **M1** for $y = 6(\textit{their } x^2)^2 + 7(\textit{their } x^2)$ **M1** for *their y* = 10 and make = 0 **M1** for solving a three term quad with $a \neq 1$ **B1** for discounting a value of *w* less than -1	$w = -\frac{1}{6}$ and -3 **OR** $w = -3$ implies 5 marks

Assessment Objectives (AO) Grid

Question	AO1	AO2	AO3	Total
1(a)	1	1		2
1(b)	2		2	4
2(a)(i)	3			3
2(a)(ii)	1			1
2(b)	2			2
2(c)	3			3
3(a)(i)	2			2
3(a)(ii)	1	1		2
3(b)		2		2
3(c)	2		2	4
4(a)	3		2	5
4(b)		1		1
5(a)	1	1	1	3
5(b)			1	1
5(c)		1	1	2
6(a)(i)		1		1
6(a)(ii)		2		2
6(b)		1	1	2
7		2		2
8(a)		3		3
8(b)		2		2
9	2		2	4
10(a)	2			2
10(b)	1	3		4
10(c)		1	1	2
11(a)		3		3
11(b)(i)	2			2
11(b)(ii)	2			2
12	1	4		5
13	3		2	5
14	1		2	3
15	1		2	3
16(a)(i)	1		2	3
16(a)(ii)	2		3	5
16(b)			2	2
17	1	1	4	6
Totals	**40**	**30**	**30**	**100**