OCR

Oxford Cambridge and RSA

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Date – Morning/Afternoon

GCSE (9-1) Mathematics
J560/05   Paper 5 (Higher Tier)

PRACTICE PAPER (SET 3) MARK SCHEME

Duration: 1 hour 30 minutes

MAXIMUM MARK   100

Final

Subject-Specific Marking Instructions

1. **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.

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 <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, i.e. incorrect working is seen <u>and</u> 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).
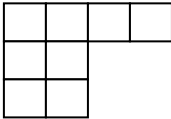
    For questions with FT available you must ensure that you refer back to the relevant previous answer. You may find it easier to mark these questions candidate by candidate rather than question by question.

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			No [correlation]	1	Accept none, zero	Do not accept 'nothing'
			Strong, negative [correlation]	**2** **1 AO2.1a** **1 AO2.3a** **1 AO2.3b**	**B1** for negative Accept good	
2	(a)		600	**2** **2 AO1.3b**	**M1** for $2000 \times \dfrac{5}{100}$ [× 6] **oe soi**	
	(b)		300	**3** **3 AO1.3b**	**M2** for $360 \div \left(\dfrac{100+20}{100} \right)$ **oe** Or **M1** for 360 associated with (100 + 20)[%] **seen**	
3			7	**3** **1 AO1.3b** **2 AO3.1c** **2 AO3.3**	**B2** for $\dfrac{20}{3}$ **oe isw** Or **M1** for $10 \times \dfrac{2}{3}$	Implied by answer 6
4	(a)		48	**2** **2 AO1.3b**	**M1** for 160 ÷ (2 + 5 + 3) [× 3] **oe**	
	(b)	(i)	She has calculated Rebecca's share as a percentage of her share **oe**	**1** **1 AO3.4a**		Accept the fraction is upside down **oe**
		(ii)	$\dfrac{5}{3}$ or $\dfrac{2}{3}$	1		
			66 to 67%	**1** **1 AO1.3a** **1 AO2.5a**		
5	(a)		Constructs angle bisector of angle ABC with two pairs of correct arcs	**2** **1 AO2.3a** **1 AO2.3b**	**B1** for correct bisector with no/incorrect arcs	Use transparency for accuracy (± 2°)

Question			Answer	Marks	Part marks and guidance	
	(b)		Arc or point on angle bisector 3 cm from A inside the triangle	**1** 1 AO2.3b		Accept arc/point in range 2.8 cm to 3.2 cm
6	**(a)**		1.5×10^8	**1** 1 AO1.3a		
	(b)		300 000 seen 150 000 000 ÷ *their* 300 000 **oe** 500 seconds	**B1** **M1** **A1FT**	Condone *their* (a) used here **FT** *their* (a) ÷ *their* 300 000	Accept correct full values used Condone *their* (a) rounded to 1 sf for **M1** and **A1FT**
			Conclusion with comparison of 20 minutes to 500 seconds	**A1** 2 AO1.3b 1 AO3.1d 1 AO3.4b	Must convert correctly or approximately to seconds or minutes to compare	e.g. 20 minutes = 1200 seconds, 500 seconds is between 8 and 9 minutes
7			2.5	**3** 2 AO1.3b 1 AO2.3a	**M2** for 7.5 ÷ (16.5 ÷ 5.5) **oe** Or **M1** for $\dfrac{h}{5.5} = \dfrac{7.5}{16.5}$ **oe** Or **B1** for 3 or $\dfrac{1}{3}$ **oe seen**	Condone 2.5 cm
8	**(a)**			**2** 2 AO2.1a	Allow rotations of multiples of 90° Allow vertical and horizontal reflections **B1** for one error or addition	Condone interior lines not shown
	(b)		50	**2** 1 AO2.1a 1 AO3.1a	**M1** for 4 × 4 × 4 **oe soi**	
9	**(a)**		$x = \dfrac{5y}{2}$ **oe** final answer	**2** 2 AO1.3a	**M1** for correct first step **soi**	

Question			Answer	Marks	Part marks and guidance	
	(b)		$\dfrac{19}{2}$ or $9\dfrac{1}{2}$ or 9.5	**3** 3 AO1.3b	**M2** for $5x - 3x = 13 + 6$ **oe** Or **M1** for $5x - 3x = k$ or $mx = 13 + 6$	
10			Pen £2.50 Notebook £4	**5** 1 AO1.2 1 AO2.3b 2 AO3.1d 1 AO3.3	**M2** for both equations correct Or **M1** for $5p + 8n = 44.50$ or $10p + 3n = 37$ AND **M1** for scaling one/both equations **M1** for correct method to eliminate 1 variable, allow 1 arithmetic error	For method marks, condone use of 4450 and 3700 and use of any consistent variables Answers 250 and 400 imply **M4**
11			8 : 3 **nfww**	**5** 1 AO1.1 1 AO1.3b 2 AO3.1b 1 AO3.2	**B2** for CD = 8 cm Or **M1** for $CD^2 + 6^2 = 10^2$ **oe** AND **B2** for AC = 16 Or **M1** for $\sin 30 = \dfrac{their\ \text{CD}}{\text{AC}}$ **oe** Or **B1** for $\sin 30 = 0.5$ **oe**	Could be on diagram
12	**(a)**		$\dfrac{1}{8}$	**2** 1 AO1.3a 1 AO2.3a	**M1** for 20 and 160	
	(b)		He should be using 150 not 160 **oe**	**1** 1 AO3.4a		Accept answer 37.5 as evidence

Question			Answer	Marks	Part marks and guidance	
	(c)		Tangent at 11am drawn	B1	No daylight at 11am	
			[-]50 to [-]36	B2dep	Dependent on tangent mark awarded Allow integer/integer if in range Or **M1** for rise/run also dependent on tangent drawn or close attempt at tangent. Must see correct or implied calculation from a drawn tangent	Look at the value first and check one unit horizontally for *their* tangent. Absolute value of gradient must be within 4 of your value. If no value then check working – must be correct
			Conclusion e.g. estimate is reasonable	B1dep 2 AO2.1b 1 AO3.1d 1 AO3.4b	Dependent on at least **B2** earned	Accept estimate is unreasonable depending on *their* gradient and dependent on **B2** earned
13	(a)		Sweets are replaced **oe**	1 1 AO3.5		
	(b)		$\dfrac{5}{10} \times \dfrac{4}{9} \times \dfrac{3}{8} + \dfrac{3}{10} \times \dfrac{2}{9} \times \dfrac{1}{8}$ **oe**	M4	**M3** for $\dfrac{5}{10} \times \dfrac{4}{9} \times \dfrac{3}{8}$ or $\dfrac{3}{10} \times \dfrac{2}{9} \times \dfrac{1}{8}$ Or **M2** for $\dfrac{5}{10}, \dfrac{4}{9}$ and $\dfrac{3}{8}$ OR $\dfrac{3}{10}, \dfrac{2}{9}$ and $\dfrac{1}{8}$ **seen** Or **M1** for RRR and BBB identified in tree diagram or elsewhere	For **M4** condone $\dfrac{2}{10} \times \dfrac{1}{9} \times \dfrac{0}{8}$ in addition For **M3** and **M2 isw**
			$\dfrac{66}{720} = \dfrac{11}{120}$ or shows correct cancelling leading to $\dfrac{11}{120}$	A1 3 AO2.4a 1 AO3.1d 1 AO3.3	Dependent on **M4** and no errors seen	
14	(a)		$0.\dot{6}\dot{3}$	2 2 AO1.3a	**M1** for 0.63... or 7 ÷ 11 shown in working	

Question			Answer	Marks	Part marks and guidance	
	(b)		$\dfrac{11}{30}$	**3** 3 AO1.3b	**B2** for $\dfrac{33}{90}$ Or **M1** for 3.66... and 36.66... **seen** or answer $\dfrac{k}{90}$	Allow other correct values to equate decimals for **M1** e.g. 0.366… and 3.66….
15	**(a)**		He could be correct with reference to not knowing the maximum or minimum values for the time so the range could lie between 20 and 50 **oe**	**1** 1 AO3.4b		The maximum could be less than 50 minutes The exact data is not given for times on the histogram
	(b)		37	**3** 1 AO1.3b 1 AO2.1a 1 AO2.3a	**M2** for 10 × 2.1 + 5 × 3.2 **oe** Or **M1** for correct interpretation of vertical scale e.g. 1 cm = 0.5 or area scale e.g. 1 cm² = 2.5 trains or 0.4 cm² = 1 train	e.g. 14.8 × 2.5 **oe** [1 cm^2 = 2.5 trains]
16	**(a)**	**(i)**	$y \le 9$ and $y > x$	**2** 1 AO1.2 1 AO2.3a	**B1** for each	Condone $y \ge x + 1$ instead of $y > x$

Question			Answer	Marks	Part marks and guidance	
	(a)	(ii)				Condone lines broken/solid Ignore any labels on lines All lines fit for purpose to enclose correct region
			$x = 4$ ruled $y = 9$ ruled	1 1		
			$y = x$ broken line	1		Passes within 1 mm of (0, 0) and (9, 9), extended if necessary Condone $y = x + 1$ ruled only after $y \geq x + 1$ in part (a)(i) <u>Ignore additional incorrect lines drawn (as working possibly for part (b))</u>
			Correct region left unshaded	1 **2 AO1.3b** **1 AO2.3a** **1 AO2.3b**		
	(b)		5 apples and 6 oranges	**2** **1 AO2.1b** **1 AO3.1c**	**M1** for a calculation shown of the form $[0.]45x + [0.]3y$ where (x, y) is clearly in *their* region and both x and y are integers	
17	(a)	(i)	$6\sqrt{3}$	**2** **2 AO1.3b**	**M1** for $3\sqrt{12}$ **seen**	
		(ii)	$3\sqrt{2}$	**2** **2 AO1.3b**	**M1** for $\dfrac{6}{\sqrt{2}} \times \dfrac{\sqrt{2}}{\sqrt{2}}$ or better	
	(b)		$[\pm]\,4$	**1** **1 AO1.2**		

Question			Answer	Marks	Part marks and guidance	
18	(a)		$a = 1$ $b = 3$ $c = {}^-9$	**1** **1** **3** 1 AO1.1 1 AO1.3b 1 AO2.1a 2 AO3.1b	**M2** for $b^2 - 4ac = 45$ Or **M1** for $\sqrt{b^2 - 4ac} = 3\sqrt{5}$	
	(b)		There will be other values of a, b, c for a quadratic function that will give the same roots	**1** 1 AO3.4b		e.g. there are many parabolas that can be drawn through ($^-$1.5 – 1.5$\sqrt{5}$, 0) and ($^-$1.5 + 1.5$\sqrt{5}$, 0)
19	(a)		Incorrect as 6.25 > 5 **oe**	**2** 2 AO2.5a	**M1** for $2^2 + 1.5^2$	
	(b)		Gradient of tangent = 2 **soi**	**M2**	**M1** for gradient of OP = $^-\dfrac{1}{2}$ After B0 allow **M1** for gradient of tangent is negative reciprocal of *their* gradient of OP	
			Equation of tangent: $y = 2x + 5$ **oe**	**M2**	**M1** for equation $y = 2x + c$ or for substitution of ($^-$2, 1) into *their* $y = mx + c$	
			[Area APO = (base × height) ÷ 2 =] (5 × 2) ÷ 2 = 5	**A2** 1 AO1.3b 1 AO2.2 2 AO3.1b 2 AO3.2	**B1** for OA = 5 or A is (0, 5) If 0 scored, **SC1** for recognition that method involves finding equation of tangent	

Question	Answer	Marks	Part marks and guidance	
20	$\overrightarrow{OB} = \mathbf{b} + \mathbf{a}$ or $\overrightarrow{BO} = -\mathbf{a} - \mathbf{b}$	**B1**		Condone poor vector notation e.g. arrows omitted throughout
	$\overrightarrow{OL} = \dfrac{2}{3}\mathbf{a} + \dfrac{2}{3}\mathbf{b}$ or $\overrightarrow{LO} = -\dfrac{2}{3}\mathbf{a} - \dfrac{2}{3}\mathbf{b}$ or $\overrightarrow{LB} = \dfrac{1}{3}\mathbf{a} + \dfrac{1}{3}\mathbf{b}$ or $\overrightarrow{BL} = -\dfrac{1}{3}\mathbf{a} - \dfrac{1}{3}\mathbf{b}$	**B3**	Implies previous **B1** **B1** for $\overrightarrow{CM} = -\dfrac{1}{2}\mathbf{b} + \mathbf{a}$ or $\overrightarrow{MC} = -\dfrac{1}{2}\mathbf{b} - \mathbf{a}$ **M1** for any correct route to find $\overrightarrow{OL}$, $\overrightarrow{LO}$, $\overrightarrow{LB}$ or $\overrightarrow{BL}$	
	$\overrightarrow{OL} = 2\overrightarrow{LB}$ **oe**	**A1** **2 AO2.4b** **2 AO3.1b** **1 AO3.3**	Dependent on **B1** and **B3** Allow use of BO, LO and BL also in conclusion	

APPENDIX

Question 16(a)(ii) solution
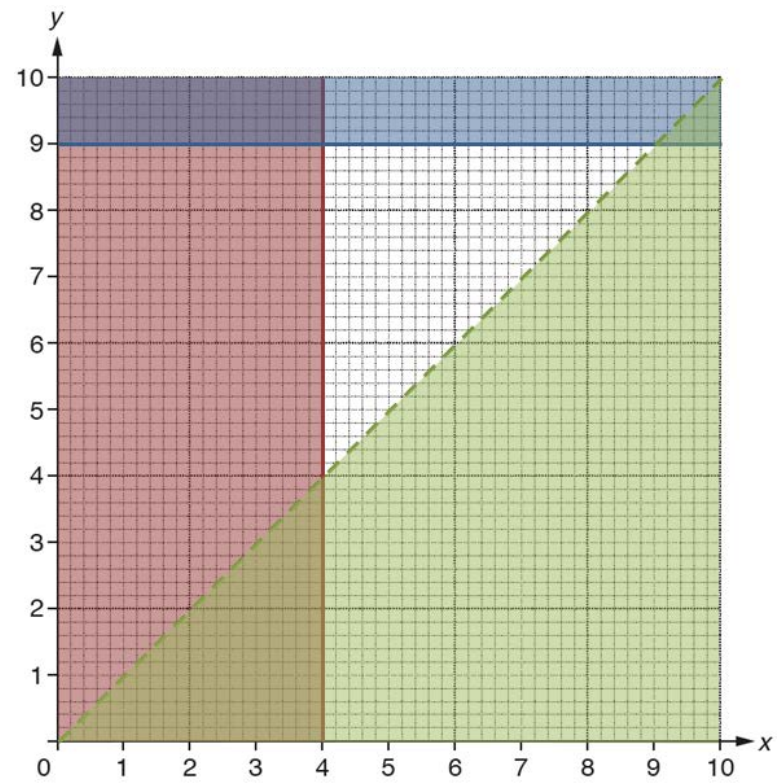
Assessment Objectives (AO) Grid

Question	AO1	AO2	AO3	Total
1	0	3	0	3
2(a)	2	0	0	2
2(b)	3	0	0	3
3	1	0	2	3
4(a)	2	0	0	2
4(b)(i)	0	0	1	1
4(b)(ii)	1	1	0	2
5(a)	0	2	0	2
5(b)	0	1	0	1
6(a)	1	0	0	1
6(b)	2	0	2	4
7	2	1	0	3
8(a)	0	2	0	2
8(b)	0	1	1	2
9(a)	2	0	0	2
9(b)	3	0	0	3
10	1	1	3	5
11	2	0	3	5
12(a)	1	1	0	2
12(b)	0	0	1	1
12(c)	0	2	2	4
13(a)	0	0	1	1
13(b)	0	3	2	5
14(a)	2	0	0	2
14(b)	3	0	0	3
15(a)	0	0	1	1
15(b)	1	2	0	3
16(a)(i)	1	1	0	2
16(a)(ii)	2	2	0	4
16(b)	0	1	1	2
17(a)(i)	2	0	0	2
17(a)(ii)	2	0	0	2
17(b)	1	0	0	1
18(a)	2	1	2	5
18(b)	0	0	1	1
19(a)	0	2	0	2
19(b)	1	1	4	6
20	0	2	3	5
Totals	**40**	**30**	**30**	**100**