OCR
Oxford Cambridge and RSA

GCSE

Mathematics (9-1)

Unit **J560/03:** Paper 3 (Foundation Tier)

General Certificate of Secondary Education

Mark Scheme for November 2018

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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 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, i.e. 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.

- **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 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).
- **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 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'.

7 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).

8 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.

9 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.

10 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.

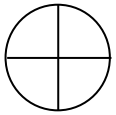
If the answer space is blank but the correct answer is seen in the body allow full marks. Place the annotation ✓ next to the correct answer.

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.

11 Ranges of answers given in the mark scheme are always inclusive.

12 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.

13 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)		4	1		
	(b)		14	1	**FT** 3.5 × *their* **(a)**	
	(c)		 oe	3	**B2** for 32 seen or [8, *their* 14], 6, 4 in correct place or [8,] 22, 28, 32 or **B1** for one of 6, 4 in correct place or 22, 28	Mark intention For 3 marks condone missing cross lines
2			30	1		
3	(a)		[0].375	1		
	(b)		$\frac{21}{50}$ final answer	2	**B1** for $\frac{42}{100}$ or equivalent fraction seen	Condone $\frac{42}{100}$ and $\frac{21}{50}$ on answer line in this order
4			25	2	**M1** for 1 + 4 soi by 5	
5	(a)		Unlikely cao	1		
	(b)		**A, B, B**	2	**M1** for $\frac{2}{5}$ or 2 out of 5 or $\frac{3}{5}$ or 3 out of 5	Accept in any order but must be one letter only per line in diagram
6			0.403 0.41 0.4374 0.438	2	**B1** for 3 in correct order	Use cover up method

Question			Answer	Marks	Part marks and guidance	
7	(a)		Hollow circle at 3 only Line/arrow "pointing" right from 3	1 1	 Marks independent	No other blobs Open line or arrow only and condone mark/blob over 8 or x If line, must reach approx. 8 Condone line/arrow starting closer to 3 than 4
	(b)		$11a - 2c$ final answer	2	**B1** for $11a$ or $-2c$ seen	Accept in any order $11a + -2c$ scores 1 mark
	(c)		6	2	**M1** for $2x = 12$ or $\frac{x}{3} = 2$ or $\frac{x}{1.5} = 4$	If T&I only correct answer scores Must be algebraic method for M1 Do not accept embedded answers
8	(a)		50	2	**M1** for 18×2 soi 36	
	(b)		9.3[0]	4	**B3** for answer 59.3 only or **B1** for 3.6 or 7.2 or 21.6 or 43.2 **B1** for 2.1 or 16.1 **M1** for 2 *their* adult cost + *their* child cost	No FT from *their* (a) If total cost and increase given, ignore total and mark only increase May be increase or total
9	(a)		[LE BP] LE TL LE BM BP TL BP BM TL BM	2	**B1** for 5 of *their* entries correct and no more than one extra or repeat or 4 correct only	Places may be reversed such as TL BP within 6 combinations
	(b)		$\frac{\textit{their LE}}{\textit{their total}}$	1 FT	Strict FT from *their* table with a minimum of three additional entries	Accept decimal and percentage equivalents only. ISW attempts to cancel or convert form Total (number of rows) must include given row

Question			Answer	Marks	Part marks and guidance	
10	(a)		Two correct shapes each with correct name	4	**B1** for each shape **B1 dep** on drawing seen for each correct name	Condone omission of diagonal Mark clear intention Kite or Rectangle must be joined along longest side Parallelogram must be joined along a shorter side Allow as additions to the given triangles
	(b)		30 30 120 60 60 60	2	**B1** for one set	If answer line blank, may be seen on diagram
11	(a)		6	1		
	(b)		1.5 or $1\frac{1}{2}$ or $\frac{3}{2}$ oe	2	**M1** for $18 = 2 \times 6[\times]g$ or better	May be (eg) $\frac{18}{6} = 2g$ or $\frac{18}{2 \times 6}$ etc.
12	(a)		[0].72	1		
	(b)		28	1		
13	(a)		16	2	**M1** for $2 \times 2 \times 2 \times 2$	
	(b)		2	2	**B1** for 25 or 5^2	
14			48	3	**M2** for $360 \div 30 \times 4$ oe or **M1** for one correct step $360 \div 30$ soi 12 or $4 \div 30$ soi 0.13... or $30 \div 4$ soi 7.5 or 360×4 soi 1440	

Question			Answer	Marks	Part marks and guidance	
15			Correct ruled line with two pairs of correct arcs	2	**B1** for correct ruled line but no or wrong arcs or correct intersecting arcs no line	Arcs may be two continuous arcs centred at F and G with two intersections Anchor overlay on G. Line to be within overlay throughout. May be all on one side of FG only
16	(a)		Points plotted at (21, 18) and (7, 8)	1		Tolerance ±1 mm
	(b)		1 : 3	3	**B2** for 3 : 9 oe or answer 3 : 1 or **B1** for 3 [dancers] or 9 [dancers] identified If 0 scored then **SC1** for 4 : 8 seen **and** simplified to 1 : 2	NOT from 4 : 12 May be on graph 4 : 12 simplified to 1 : 3 scores 0
	(c)		The wedges at the front look bigger than those at the back oe	1		Comments should refer to the 3D nature of the pie chart e.g. It's tilted, slanted, seen from an angle etc. Ignore all references to missing angles, not being joined, etc. Mark the best bit unless contradicted

Question			Answer	Marks	Part marks and guidance	
17	(a)		47.5	4	**B1** for at least four of 10, 30, 45, 55, 70 **M1 FT** for Σ*mf* where *m* is a value within each group 10×5 + 30×8 + 45×37 + 55×47 + 70×3 soi by 50+240+1665+2585+210 or 4750 **M1 FT dep** on **M1** for *their* 4750 ÷ *their* (5+8+37+47+3)	May be implied by four correct products or 4750 FT their "midpoints" seen. M1 may be implied by Lower: 0+160+1480+2350+180 (4180) Upper: 100+320+1850+2820+240 (5330) Allow one error in calculation Expect 100
	(b)		Exact speeds for each vehicle are not recorded oe	1		Do not accept, "Because the mid-point is used" or comments on the method used. Accept e.g.: Specific speeds not given or We don't know the speeds The exact speed isn't given

Question			Answer	Marks	Part marks and guidance	
18	(a)		360 ÷ 6 = 60 180 – 60 [= 120]	B1 B1	 **Dep** on first **B1**scored Alternative method: **M2** for $\frac{180\times(6-2)}{6}$ =120 **M1** for attempt to use $\frac{180(n-2)}{n}$	 Accept 180 × 4 as numerator Working must be seen May have incorrect *n* or contain numerical errors
	(b)		12	4	**M3** for 360 ÷ 30 or **M2** for 180 – (360 – 90 – 120) soi 30 or **M1** for 360 – 90 – 120 soi 150	 Allow 120 – 90 or 120 + 90 – 180 May be on diagram
19	(a)		[y =] 3 or (0, 3)	1		Condone missing brackets
	(b)	(i)	$\frac{1}{2}$ or 0.5	2	**M1** for suitable triangle on line with height and base marked with correct length or equivalent fraction to $\frac{1}{2}$ or 2 right, up 1 oe or **B1** for answer $\frac{x}{2}$ only	 (4 right, up 2 etc.) Accept $\frac{1}{2}x$ or 0.5*x*
		(ii)	No with fully correct supporting evidence	3	**M2** for 200 × 0.5 + 1 oe or **B1** for 200, 100 or 101	Working must be shown for M2 For M2 accept 200 right up 100 [so] 100 + 1 or $\frac{101}{200}\neq\frac{1}{2}$ or 0.505 ≠ 0.5 For B1 accept 200 right up 100 or $\frac{101}{200}$ or 0.505 or $\frac{100}{200}$ seen

Question			Answer	Marks	Part marks and guidance	
20	(a)		6	4	**M3** for $\frac{2\times7.5\times10}{10+15}$ or **M2** for speed = distance ÷ time correctly applied or **M1** for 7.5 × 10 soi 75 or If 0 scored **SC2** for answer 6.25	May be in stages: 7.5 × 10 = 75 → 75 × 2 = 150 → 10 + 15 = 25 → 150 ÷ 25 [= 6] Mark overall process ignoring numerical errors Distances: 75, 150, 112.5, 187.5 m Times: 10, 20, 15, 25 s
	(b)		[Average] speed [may be] greater oe	1		Time is longer ... scores 0 Mark the best bit unless contradictory. E.g. It might have gone faster or slower. Do not accept "It (or distance) will be longer". Must go on to say "so the bee flies faster" oe Condone "It will be bigger"
21			3.488 to 3.489 or 3.49 or 3.5	3	**M2** for 10.2 × sin20 or any complete correct method or **M1** for sin 20 = $\frac{x}{10.2}$	Cos70 × 10.2 or 10.2 × cos 20 and $\sqrt{(10.2^2-(10.2\times\cos 20)^2)}$ Allow 10.2 × cos 20 **with** attempt at Pythagoras for M1

Question			Answer	Marks	Part marks and guidance	
22			1.3×10^{14}	5	**B4** for 1.30×10^{14} or $1.29[6\ldots] \times 10^{14}$ or 130 000 000 000 000 as final answers or **B3** for 1.3×10^{n} ($n \neq 0$) or $1.29[6...] \times 10^{14}$ written in full or **M3** for $3500 \div (2.7 \times 10^{-11})$ oe or **B2** for $1.29[6...] \times 10^{n}$.($n \neq 0$) or figs 13 OR **M1** for figs 35 ÷ figs 27 soi by figs 129[6…] **B1** for 3500 or 2.7×10^{-14} oe or 3.5×10^{3} seen	For 5 marks and M marks, condone use of correctly rounded values in correct calculations E.g. 129 600 000 000 000 0.000 000 000 000 027

Question			Answer	Marks	Part marks and guidance	
23	**(a)**		180 ÷ 3.5 × 11.2 = 576 or 180 ÷ 3.5 = 51.4[…] **and** 576 ÷ 11.2 = 51.4[…] or 576 ÷ 180 = 3.2 **and** 11.2 ÷ 3.5 = 3.2	**3**	**M2** for 180 ÷ 3.5 × 11.2 or 180 ÷ 3.5 **and** 576 ÷ 11.2 or 576 ÷ 180 **and** 11.2 ÷ 3.5 or **M1** for 180 ÷ 3.5 soi 51.4[…] or 576 ÷ 11.2 soi 51.4[…] or 576 ÷ 180 soi 3.2 or 11.2 ÷ 3.5 soi 3.2	For M marks allow figs used eg **M2** for 18 ÷ 350 × 112 If in two stages: For full marks, condone premature rounding if accurate and answer is stated as 576. e.g. **3** marks for 180 ÷ 3.5 = 51.4 and 51.4 × 11.2 [= 575.68 or 575.7] **= 576 (required)** eg **M2** for 180 ÷ 3.5 = 51.5 and 51.5 × 11.2 = 576 Accept equivalent methods eg divisions inverted or correct use of lengths in other units.
	(b)		No oe and correct explanation	**2**	**B1** for 180 ÷ *k* × 11.2 where *k* > 3.5 leading to answer <576 or [180 ÷ 3.5 =] 51.4… **and** 180 ÷ *k*, *k* > 3.5 leading to answer <51.4(…) or Each cm on the map will be worth fewer km in real life oe	For full marks, clear conclusion and an explanation earning **B1** is needed [180 ÷ 3.5 =] may be referred to in (a)
	(c)		7500 cao	**2**	**M1** for figs 18 ÷ figs 24 soi figs 75	If units included in answer max M1
24	**(a)**		A	**1**		
	(b)		C	**1**		

Question			Answer	Marks	Part marks and guidance	
25			[Area of square =] $9x^2$	B1		Accept alternative methods
			[Shaded area =] $2x^2$	B2	**M1** for $0.5 \times x \times x$ soi $\frac{x^2}{2}$ oe	
			[Un-shaded area =] *their* square – *their* 4 ∆s	M1	Must be areas (Expect $9x^2 - 2x^2$)	
			$\frac{2x^2}{7x^2}$ with completion to $\frac{2}{7}$	A1	If 0 scored, **SC3** for $\frac{2x^2}{7x^2}$ with completion to $\frac{2}{7}$ with no supporting working	

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