

GCSE

Mathematics (9-1)

Unit **J560/02**: Paper 2(Foundation Tier)

General Certificate of Secondary Education

Mark Scheme for June 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.

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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, 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, eg FT $180 \times (\text{their '37' } + 16)$, or FT $300 - \sqrt{(\text{their '5}^2 + 7^2)}$. Answers to part questions which are being followed through are indicated by eg FT $3 \times \text{their (a)}$.

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 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 and applies as a default.
 - **nfw** 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		12 or 18	1		Allow 12 and 18 but no extras
	b		Two from 2, 3, 5	2	B1 for one correct and one error	If more than 2 values listed, max B1 scored
2	a	i	[0].9	1		Condone trailing zeros
		ii	[0].75	1		
	b		0.4 or 40 cm clearly identified	2	M1 for $2.4 \div 6$ or $240 \div 6$ soi	Condone trailing zeros M1 can be implied by figs 4 as answer
3	a	i	1000	2	M1 for $10 \times 10 \times 10$	
		ii	18	2	M1 for $9(8 - 6)$ or 9×2 or SC1 for answer of 90 or -18	M1 for eg $72 - 54$
	b		$1 + 2 \times (3 + 5) = 17$	1	Or $1 + (2 \times (3 + 5)) = 17$	Condone $1 + 2 (3 + 5) = 17$ if rewritten
4	a	i	$4x - 3y$ final answer	2	B1 for $4x$ or $-3y$ in final answer	$4x + -3y$ scores B1 only
		ii	w^6 final answer	1		
		iii	$15c^3d$ final answer	1		Accept $15dc^3$ Do not accept eg $15 \times c^3 \times d$
	b	i	13	1		
		ii	3	1		

Question			Answer	Marks	Part marks and guidance	
5	a		Rhombus	1		Accept any clear indication
	b		2	1		
	c		12	2	M1 for $4 \times \frac{3 \times 2}{2}$ oe soi	Accept any full method for area eg $\frac{1}{2} \times 4 \times 6$
6	a		Entertainment	1		
	b		80	2	B1 for 480 or 560 seen or 4×20	For B1, could be seen on bar chart
	c		20	3	M2 for $\frac{240}{1200} \times 100$ oe Or M1 for $\frac{240}{1200}$ oe or 10% is 120 soi or for $\frac{\text{their } 240}{1200} \times 100$ oe	<i>Their</i> 240 a value between 200 and 280 or the value 510

Question			Answer	Marks	Part marks and guidance	
7			angle BDC = 44	2	<p>B1 for angle ABD = 44 or angle ADC = 100 or M1 <i>their</i> BDC = <i>their</i> ABD</p>	<p>Notation not required but values need to be identified eg the angle must be named or the value written in the correct place in the diagram or for BDC, on the answer line</p> <p>Ignore answer line if angle BDC is identified correctly in working If BDC is only correctly labelled on the diagram max B1 scored</p>
			correct reasons leading to angle BDC = 44	2	<p>two marks for [co-]interior angles [add up to 180] or allied angles [add up to 180] or angles between parallel lines [add up to 180] OR one mark for each relevant reason (maximum of two) from [angles in a] triangle [add up to] 180 alternate [angles are equal] corresponding [angles are equal] angles on a straight line [add up to] 180</p>	<p>Reasons must be correct for <u><i>their</i></u> <u>method</u> leading to angle BDC = 44.</p> <p>180 may be implied in these reasons by a correct calculation</p>

Question			Answer	Marks	Part marks and guidance	
8			1.07 or 107 cm clearly identified	3	M2 for $\frac{0.83 + 1.31}{2}$ or M1 for $1.31 - 0.83$ soi or 0.48 M1 for <i>their</i> $0.48 \div 2 + 0.83$ oe	M2 is spoilt by further incorrect working eg $\frac{0.83 + 1.31}{2} + 0.83$ is M0
9	a		Valid explanation	1	Such as 'It should be $\frac{2}{5}$ ',	eg $\frac{2}{3}$ is more than half See AG
	b		$6 : 11$ or $1 : \frac{11}{6}$ or $1 : 1\frac{5}{6}$ or $\frac{6}{11} : 1$	1		Condone ratio not in its simplest form, eg using $\frac{6}{17}$ and $\frac{11}{17}$
10	a	i	2	2	M1 for $29 - (13 + 5 + 9)$ oe	
		ii	18	1		
		iii	$\frac{9}{29}$	1		Do not accept a ratio Do not accept eg 9 in 29
	b		0	1		Accept none, zero, nil

Question			Answer	Marks	Part marks and guidance	
11	a		10	3	<p>M2 for $\frac{10}{18}$ [green] or 8 : 10 soi or $8 \div 4 \times 5$ oe</p> <p>Or</p> <p>M1 for $\frac{8}{18}$ [red] or 4 : 5 soi or $8 \div 4$ oe</p> <p>Or</p> <p>B1 for $\frac{5}{9}$ seen</p>	<p>Eg $\frac{5}{9} = 2 \times 5$ [green grapes]</p> <p>Eg $\frac{1}{9} = 2$ [green grapes]</p>
	b		red 15 green 20	2	<p>M1 for fraction equivalent to $\frac{4}{9}$ or $\frac{3}{7}$ seen or</p> <p>B1 3<i>k</i> red grapes and 4<i>k</i> green grapes, <i>k</i> a positive integer > 1 seen in working or as final answer</p> <p>If 0 scored, SC1 for red 16 green 20 or red 20 green 15</p>	
12	a		$4cd - 20c$ final answer	2	M1 for $4cd$ or $-20c$ in final answer	<p>Condone $4dc$ $4cd + -20c$ scores M1 only Do not accept eg $4 \times c \times d$</p>
	b		$3x^2 - 10x - 8$ final answer	2	<p>M1 for at least three of the following terms correct $3x^2 - 12x + 2x - 8$</p>	<p>May be seen in a table</p> <p>-10<i>x</i> implies both -12<i>x</i> and 2<i>x</i></p>

Question			Answer	Marks	Part marks and guidance	
	c		$x \leq 8$	2	Mark final answer M1 for $3x \leq 22 + 2$ or $3x < 22 + 2$ or $3x = 22 + 2$ or $x > 8$ or $x = 8$ If 0 scored, SC1 for answer $x \leq \frac{20}{3}$ or $x \leq 6\frac{2}{3}$	Condone $x < 8$ for 2 marks Condone 8 on answer line for M1
13	a		$1\frac{9}{40}$	3	Mark final answer M2 for $\frac{24[k] + 25[k]}{40[k]}$ or better (k is positive integer) or M1 for two equivalent fractions with common denominator of $40[k]$ attempted with one numerator correct If 0 scored, SC1 for answer 1.225	Could be separate fractions M2 soi by $\frac{49[k]}{40[k]}$ oe Could be seen in 2 different fractions without addition
	b		4.84×10^4	3	M2 for figs 484 in final answer or B1 for 50 000 or 50×10^3 seen or for 1600 or 0.16×10^4 seen	Allow M2 if correct answer oe seen in working

Question			Answer	Marks	Part marks and guidance	
14			Correct attempt to find 90% or 10% of 110	M1	or $\frac{99.4}{110}[\times 100]$ oe or $\frac{9.5+1.1}{110}[\times 100]$ oe	
			99 or 11 and 10.6	A1	or 90.36 to 90.4 or 9.6[4] and 10	M1 implied by 99 seen or 11 and 10.6 seen or 90.36 or 9.6[4] and 10 seen Be aware of 90.36 or 9.6[4] appearing without written evidence as possible calculator use
			[She is] correct oe	A1	Dep on M1A1 earned	Other methods are possible
15			[£]225[.00] nfww	6	B3 for 54 [tiles] OR M1 3×4.5 oe or 300×450 oe or $4.5 \div 0.5$ or $450 \div 50$ oe soi and M1 0.5×0.5 oe or 50×50 oe or $3 \div 0.5$ or $300 \div 50$ oe soi AND M1 for <i>their</i> 6×20 M1 for <i>their</i> 14×7.5	Could be on diagram Could be in diagram <i>their</i> 6 is correct number of packs for <i>their</i> number of tiles – must be positive integer, implied by 120 <i>their</i> 14 is <i>their</i> answer to (3×4.5) rounded up to next integer, implied by 105

Question			Answer	Marks	Part marks and guidance	
16	a		$(a, a - b)$	2	B1 for one correct coordinate	Condone eg 1 a
	b		$a = 8$ $b = 3$	2 2	M1 for $2a = 16$ soi M1 for $2a - b = 13$ soi If 0 scored SC1 for $a = (8,0)$ or $b = (0,3)$	Eg their values of a and b correct for $2a - b = 13$
17	a		Valid assumption	1	Such as 'he travelled at a constant speed'	See AG
	b		12	1		
	c		350	3	B1 7 km = 7000 m and M1 for <i>their</i> 7000/20 If 0 scored SC1 for 12000/58	B1 implied by 7000 seen Accept 7 as <i>their</i> 7000
	d		Valid explanation	1	Such as 'graph is steeper on the first part of the journey'	eg 'last part of graph is not as steep' see AG
18	a		[0].35 oe	2	M1 for $1 - (0.2 + 0.45)$ oe	isw conversion to other forms M1 implied by answer 0.53
	b		40	3	M2 for $10 \div (0.45 - 0.2)$ oe or M1 for $0.45 - 0.2$ soi	e.g. 0.25 oe associated with 10 [games] then 4×10 soi Allow with algebra, eg for M1 $0.45x - 0.2x = 10$

Question			Answer	Marks	Part marks and guidance	
19	a		440	3	M2 for $165 \div 3 \times 8$ or M1 for 165 is $1 - \frac{5}{8}$ soi or for $165 \div 3$ soi If 0 scored, SC1 for answer 264	M1 implied by 55 or 275 seen (from $165 \div 5 \times 8$)
	b		Correct comment	1	Any statement that implies the assumption is that the rate of petrol consumption remains constant	e.g. Speed stays the same Same type of roads The car uses fuel at the same rate Does not get stuck in traffic Weather stays the same See AG
20	a		3.5 oe	3	M1 for $21 \div (15 \div 5)$ soi and M1 for <i>their</i> $7 \div (8 \div 4)$ oe Or M1 for $8 \times (15 \div 5)$ soi and M1 for $21 \div (\textit{their '24'} \div 4)$ oe Or M1 $4 \times (5 \div 8)$ soi and M1 for $2.5 \times (21 \div 15)$ Or B1 scale factor from small triangle to the large triangle is 6 soi	Accept 7 correctly placed on the diagram Accept 24 correctly placed on the diagram Accept 2.5 correctly placed on the diagram Eg may be x2 then x3 correctly shown on diagram

Question			Answer	Marks	Part marks and guidance	
	b		10.5 or $10\frac{1}{2}$ or $\frac{21}{2}$	3	M1 for $\frac{OD}{14} = \frac{7}{4}$ oe or $7 : 4 = OD : 14$ A1 for $OD = \frac{49}{2}$ oe	Eg 14×1.75
21			Radius C is $2x$ Or radius A or B is x	B1		A and B are the small semicircles C is the large semicircle May be indicated on the diagram
			Area C = $\frac{\pi \times (2x)^2}{2}$ oe	M1		
			$= 2\pi x^2$	A1		
			Area A or B = $\frac{\pi \times x^2}{2}$ oe	M1	or Area A + B = πx^2 oe	πx^2 must result from combining area A and area B
			Area = $2\pi x^2 + \frac{\pi x^2}{2} + \frac{\pi x^2}{2} = 3\pi x^2$	A1	or Area = $2\pi x^2 + \pi x^2 = 3\pi x^2$	Addition must be seen with no errors or omissions but condone equivalent expressions for $2\pi x^2$, $\frac{\pi x^2}{2}$, πx^2

APPENDIX

Exemplar responses for Q9a

Response	Mark
Because you have to add ratios – 5 and put 2/5 (2/5 is seen and the statement is not contradictory)	1
Hannah will get 2/5 because there are 5 numbers not 3	1
Because the ratio 2:3 is not the same as 2/3	1
Adil's ratio is 3 meaning he will get a larger amount of money than Hannah	1
There is not 3 parts altogether there is 5 parts (explains the error in the denominator of the fraction)	1
Because Hannah would get less than Adil	1BOD
She has to add the numbers together and divide by the parts she wants (too vague)	0
$2:3 = 2 + 3 = 5$ (this statement needs some reference to 5 being in the denominator implied)	0
There is 5 parts altogether (not enough as there is not a link between the 3 and the 5)	0
because for every 2 Hannah gets Adil gets 3 (not enough to explain the difference between 2:3 and 2/3)	0
Hannah will only get 2 parts of the money	0

Exemplar responses for Q17a

Response	Mark
assume he measured distance correctly	1
That it was exactly 12km from his home	1
assume timings were accurate	1
His speed remained the same	1
Kept a steady pace	1
He was travelling at the same rate (whole journey not clearly implied so not clearly incorrect)	1BOD
That he was going at the same speed the whole time (whole time implies from home to aunts)	0
The speed he was doing	0
That he had stopped half way for a break (he did stop)	0
How long he stopped for (he timed his journey)	0
He travelled at a faster speed between 7km and 12km (not assumed, already measured)	0
The road was flat (don't accept comments that just describe the road)	0
He doesn't break down (Viraj has already done the journey and used his measurements)	0
Assumed how long he was in the shop	0

Exemplar responses for Q17d

Response	Mark
The line has a steeper gradient (assume statement refers to 1 st line unless otherwise stated)	1
The slope is steeper (ignore any mention of acceleration)	1
2 nd line is not as steep	1
The gradient is higher and therefore he was quicker	1
The line is more diagonal showing he was going faster	0
Because the line is not as steep	0
the first line is shorter	0
The strong incline or gradient on the graph (stronger would be ok BOD)	0
Because the timing from home to the shop	0
It took him less time	0
His distance is longer from his house to the shop than the shop to his aunt (adding 'but he took less time' would score 1)	0

Exemplar responses for Q19b

Response	Mark
Travelled at same speed	1
Car burns fuel same as for first 165 miles	1
Same amount of fuel is used for each bar	1
She travels constantly and does not stop BOD (speed is constant)	BOD 1
The roads are similar without having to stop and start in traffic	1
When the arrow reaches each point, she has travelled the same distance	1
The roads were similar for the rest of the journey	1
The tank empties at a consistent rate	1
Fuel gauge reading is accurate/correct	1
She did not have a fuel leak	1
She did not stop (not enough)	0
How efficiently she drove the car	0
The speed of the car	0
Car uses same amount of fuel each time	0
Every 4 bars would travel 165 miles (4 is incorrect – OK if 3 bars mentioned)	0
There are no diversions to her route	0
The fuel is used solely on covering distance (vague)	0
There are no hills (not enough as there may have been on the first part of the journey)	0

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