F

GCSE (9–1)

Mathematics

J560/02: Paper 2 (Foundation tier)

General Certificate of Secondary Education

Mark Scheme for June 2019

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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 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

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 × (*their* '37' + 16), or FT 300 – $\sqrt{}$(*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.

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.
   - **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)	(i)	9.43	1		
		(ii)	3	1		
		(iii)	54	1		
	(b)	(i)	>	1		
		(ii)	<	1		
		(iii)	=	1		
2			[£]3.6[0]	2	**B1** for 4 or 90 or 0.9 or **M1** for 4 lots of 87 or 4 lots of their attempt to round 87	Condone 3.6[0] rounded to give an answer of 4 for 2 marks **M1** implied by answer 360 or 3.48
3	(a)	(i)	12	1		
		(ii)	9	1		
	(b)		$\frac{7}{15}$ **oe**	2	**M1** for $\frac{10k}{15k}$ or $\frac{3k}{15k}$ seen where *k* is a positive integer	May be seen as part of a single fraction eg $\frac{10-3}{15}$
4	(a)		[0].21 **oe** final answer	1		
	(b)		[0].08 **oe** final answer	1		
5	(a)	(i)	25	1		

Question			Answer	Marks	Part marks and guidance	
		(ii)	4	1		
	(b)		56	2	**M1** for [2^3 **oe** =] 8 or [$\sqrt{49}$ =] 7	Condone ±56 or -56 For M1 condone ±7 or -7
6	(a)	(i)	32	1		
		(ii)	9	2	**M1** for either step reversed **soi**	eg +3, ÷ 5, 45
	(b)		$y = 5x - 3$ final answer	2	**M1** for $5x - 3$ **seen** or y = 5x + 3 in final answer or $y = kx - 3$ ($k \neq 0$) in final answer or $y = 5x - c$ where c > 0 If 0 scored **SC1** for $x = \frac{y+3}{5}$ final answer	Accept $5x - 3 = y$ Allow $x \times 5 - 3$ for 1 or 2 marks Accept $5x + 3 = y$ or $kx - 3 = y$ or $5x - c = y$
7			alternate corresponding	1 1		Condone alternating, alternative Do not accept Alternate = 180 Condone correspondent Do not accept Corresponding = 180 Accept other fully-reasoned methods
8	(a)	(i)	C	1		Mark answer line
		(ii)	A	1		
		(iii)	E	1	If all 3 answer lines are blank **SC1** for all 3 colours correctly placed on the diagram	

Question			Answer	Marks	Part marks and guidance	
	(b)		6 nfww	**3**	**M2** for $\frac{20+16}{2} - 8$ or **M**1 for $\frac{20+16}{2}$	M2 may be implied by 10 [either 10 more blue or 10 total red] but nfww M1 may be implied by 18 [total blue]
9	**(a)**		She travels at constant speeds **oe**	**1**		Any incorrect statement invalidates the reasoning eg implying a constant speed for the entire journey SEE APPENDIX
	(b)		36	**1**		
	(c)		10:30[am] and 11:00[am] distance from home stays the same or zero gradient **oe**	**1** **1**		Accept. eg 11, 1100, 10 30, 10.30 Do not accept eg 11h, 10h30 SEE APPENDIX
	(d)	**(i)**	Horizontal line from (1140, 36) to (1300, 36) Line from (*their* 1300, 36) to reach time axis after *their* 1300 at (1340, 0) or FT (*their* 1300 + 40 mins, 0)	**1** **1** **1**	 Could be a curve provided no horizontal sections 	Condone freehand line Ignore construction lines Mark endpoint as the vertex with their second line If no/wrong horizontal section drawn assume (*their* 1300, 36) to be the start of their line with negative gradient eg 2 marks for one line such as (1140, 36) to (1220, 0)

Question			Answer	Marks	Part marks and guidance	
		(ii)	54	3	**M2** for $\frac{36 \text{ or their } (b)}{40} \times 60$ **oe** or **M1** for $\frac{36 \text{ or their } (b)}{40}$ **soi** by 0.9 or for an equivalent distance to time ratio	Condone 36000 used for M2 and M1 eg 18 associated with 20 but not 36 to 40
10	(a)	(i)	$t + 8u$ final answer	2	**M1** for [+1]t or [+]8u in final answer If 0 scored **SC1** for correct answer seen then spoilt	Accept $1t + 8u$, $8u + 1t$ Condone capitals for 2 or 1 marks eg t + 8u = 9tu
		(ii)	$12a^3$ final answer	2	**B1** for $12a^k$ or ka^3 ($k \neq 0$)	
	(b)		$x = \sqrt{y+1}$ final answer	2	**M1** $\sqrt{y+1}$ final answer or for $x^2 = y + 1$ or for correct FT step to answer after incorrect first step	Ignore ± or – for 2 marks or M1 Condone $\sqrt{y+1} = x$ For M1 condone $y + 1 = x^2$ eg x = $\sqrt{y-1}$, after $x^2 = y - 1$ seen.
11	(a)		Four points correctly plotted	2	**B1** for 2 or 3 correct plots	Overlay gives guidance, tolerance ± ½ small square
	(b)		Positive	1		Ignore embellishments

Question			Answer	Marks	Part marks and guidance	
	(c)		Ruled line of best fit No - it is too low **oe**	**1** **1**		Use overlay for LOBF – ruled line should touch blue lines and should not go outside the yellow lines Eg No, at 95cm you're only about age 3 SEE APPENDIX
	(d)		Only have data on heights up to age 9 **oe**	**1**		e.g. the trend may not continue SEE APPENDIX
12			5 × 12 + 2 *their* 62 × 2.5 **oe** Stating 2 correct comparable figures Alice is correct	**M1** **M1** **M1** **A1**	Implied by 62 Alt method **M1** 157 ÷ 2.5 **M1** *their* (157 ÷ 2.5) ÷ 12 or 5 × 12 + 2 or 62 **M1** Stating 2 comparable figures **A1** Alice is correct	 Condone 60 x 2.5 eg Alice is taller See table in APPENDIX for allowable figures
13	**(a)**		12 [eggs]	**1**		
	(b)		35	**2**	**M1** for 140 ÷ (20/5) **oe**	

Question			Answer	Marks	Part marks and guidance	
	(c)		210 ÷ 60 x 20 **soi** No he can only make 70	**M2** **A1**	or **M1** 210 ÷ 60 **soi** Alt method **M2** 60 ÷ 20 × 75 **soi** **A1** No he will need 225g of cocoa powder OR **M1** 60 ÷ 20 or 75 ÷ 20	eg 60 + 60 + 60 + 30 [g] is 20 + 20 + 20 + 10 [cupcakes] implies M2 eg 60 x 3 + 45 If nothing on the answer line mark to candidates advantage but do not mix methods
14	**(a)**		Image at (2, −1), (5, −1) and (5, 5)	**3**	**B2** for two vertices correct or **M1** for enlargement SF3 with wrong centre or correct centre with wrong SF≠ 1	Use overlay, mark intention, condone freehand Must be completely on the grid
	(b)		Enlargement [sf] $\frac{1}{3}$ (-4, -4)	**3**	**B1** for each	Extra transformations spoils all marks Extra properties, treat as choice Condone P Accept -4, -4 Accept centre as a vector
15	**(a)**		40	**3**	**M2** for $\frac{1.68-1.20}{1.20}$ [× 100] **oe** or **M1** for $\frac{1.68}{1.20}$ **oe** or for 1.68 – 1.20 **oe**	eg $\frac{48}{1.20}$ or $\frac{48}{120}$ or 0.4 For M1 accept 168 – 120 **oe** eg 48 M1 implied by 1.4 or 140

Question			Answer	Marks	Part marks and guidance	
	(b)		450	**3**	**M2** for 360 ÷ 0.8 **oe** or **B1** for 0.8[0] **oe** seen or for 360 associated with 80% **isw**	For B1 0.8 oe seen allow fraction but not just for 80%
16	**(a)**		7	**3**	**B2** for 6.5 or 6 $\frac{1}{2}$ **oe** Or **M1** for $\frac{\textit{their}\ (106-80)}{4}$ **oe**	For M1 accept attempted repeated subtraction from 106 to 80 or from 26 to 0 or repeated addition of 4 from 80 to 106 or from 0 to 26 condone 1 error At least 4 correct additions or subtractions needed soi FT one error
	(b)		Fewer days **oe**	**1**		e.g. smaller, less, days would be shorter, would decrease, ignore reference to numbers of days if lower
17	**(a)**		$\frac{3}{7}$, $\frac{3}{7}$, $\frac{4}{7}$, $\frac{3}{7}$ correctly placed	**2**	**M1** for 2 or 3 probabilities correctly placed	Accept equivalent fractions, decimals or %'s (3 figures for dec or %)
	(b)		$\frac{16}{49}$ **oe**	**2**	**M1** for $\frac{4}{7}\times\frac{4}{7}$ **oe**	

Question			Answer	Marks	Part marks and guidance	
18			173.4[0]	6	**M1** for evidence at some stage of intention to find the total ticket cost of 2 adults + 1 child (eg **soi** by 200 or 170) AND **M2** for complete method to reduce any valid ticket price or combination by 15% (eg full attempt at 85% or 100% – 15%) **isw** or **M1** for complete method to find 15% of a valid ticket price or combination **isw** AND **M2** for complete method to increase *their* valid ticket price or combination by 2% or **M1** for complete method to find 2% of *their* valid ticket price or combination	This may be at the start or later if calculating individual ticket prices and payments even if errors in the prices Working with just an individual ticket price will be M2M2max) Valid ticket price combinations are eg 40, 80, 120, 160, 200 "Complete method" means it would lead to a correct answer if not for arithmetic slips M2 may be implied by eg 170, 34, 68, 102, 136 M1 may be implied by 30, 6, 12, 18, 24 May be from an original "valid ticket price or combination" or from a calculated sale price. The 2% increase and the 15% decrease can be done in either order but if the 15% decrease is done first with the original price then the 2% increase must be done with *their* sale price and vice versa

Question			Answer	Marks	Part marks and guidance	
19			36	5	**M4** for 40 × $\frac{3}{5}\times\frac{3}{2}$ **oe** OR **M3** for "*women*" × $\frac{2}{3}$ = 40 × $\frac{3}{5}$ OR **M2** $\frac{their\,24}{"women"}$ = $\frac{2}{3}$ OR **M1** for 40 × $\frac{3}{5}$ **oe** **A1** for 24	eg 0.6 x 40 ="*men passed"* ="*women*" and "*women*" + $\frac{"women"}{2}$ eg accept any symbol for "*women"* or condone omission of "*women*" if further working does not imply finding $\frac{2}{3}$ of 24 24 implies M1A1

Question			Answer	Marks	Part marks and guidance	
20			125 nfww	**6**	**B3** for $x = 35$ or **B1** for $x + 20 = 3x - 50$ **M1** for $\pm 2x = k$ or $kx = \pm 70$ $(k \neq 0)$ AND **M1** for *their x* + 20 or 3 × *their x* – 50 **M1dep** for y = 180 – (*their x* + 20) **oe** If 0 scored **SC**1 for x + 20 + 3x – 50 + y + y = 360 or better or 3x – 50 + y = 180 or x + 20 + y = 180	eg $y = \frac{360 - 2 \times their\ 55}{2}$ Dependent on the previous M1

APPENDIX

Exemplar responses for Q9a

Response	**Mark**
Her speed was the same (this does not imply the whole journey)	**1**
She stayed at a constant speed (BOD as doesn't refer to whole journey)	**1 BOD**
Sarah drove at the same speed 2km from home all the way to the shopping centre.	**1**
The straight lines on the graph show steady speed.	**1**
She walked at the same pace (BOD, question doesn't state form of transport)	**1**
She stayed at the same speed on the way to the shopping centre (implies whole journey)	**0**
That she was constantly moving and through no traffic. Therefore going at a constant speed. (The first sentence invalidates the reason)	**0**
She was going the same speed throughout. (implies whole journey so 0)	**0**
That she rest for 30 minutes after doing 30 minutes of her journey	**0**
She walked slowly at the beginning and fast at the end (doesn't imply **constant** speed)	**0**
Her journey to the shopping centre would take less than 4 hours (reference to the size of the graph not relevant)	**0**
Her route did not alter. She went straight to the shopping centre (Incorrect)	**0**
When she left home she started off and then she goes into constant speed and then she accelerated. Or Sarah was at a constant acceleration. (reference to acceleration is wrong)	**0**
There was no traffic. (no indication of speed)	**0**
There are no major issues which cause delay. (Reference to conditions on the journey are irrelevant we need a comment about why we are drawing a straight line)	**0**
That Sarah did not stop off	**0**
Her journey is faster from 11:00 (true but nothing about constant speed)	**0**
She will leave exactly on time (answer MUST refer to constant speed)	**0**

Exemplar responses for Q9c

Response	Mark
It goes horizontally	**1**
Because it's a straight line not moving up or down which means no distance is being made	**1**
A horizontal line with no gradient (BOD 'no' rather than 'zero')	**1BOD**
It has a flat part	**1**
The line which goes straight across which means she stopped (word 'across' is needed)	**1**
The **distance** stayed the same	**1**
The line during this time does not move in distance but the line still moves on the time showing she was stationary	**1**
The graph stays on the same level	**1BOD**
The line doesn't carry on increasing it stays constant for half an hour. (BOD time referred to therefore 'it' must imply distance)	**1**
The line has no incline	**1**
Straight line which indicates when Sarah stopped	**0**
A straight line that does not increase (just 'straight line' is not enough – needs to imply distance hasn't changed with time)	**0**
The straight parallel line (parallel to 'time axis' would be fine to score)	**0**
The consistent line between the two times meaning that she stopped for 30 minutes ('consistent' is not correct)	**0**
The slope on the graph shows that Sarah stopped (reference to, 'no slope' would score)	**0**
Not going up in a diagonal line and staying straight ('straight across' in this statement would be enough to score)	**0**
A steady line that does not go up (so could go down, horizontal not implied)	**0**

Exemplar responses for the second mark of Q11c

Response	Mark
No, the LOF shows that the girl is 105cm (LOBF passing through (6, 105) but allow accuracy within 1 square vertically of line)	**1**
No because the LBF is further away	**1**
The scatter diagram doesn't support the doctors statement, the diagram said that is around 117 cm the height	**1**
No, because the six year old on this **diagram** is 117 in height (this is ok without referring to LOBF as they are referring to the diagram)	**1**
No, the height would be around 114 (114 read from their LOBF or in range 110-120)	**1**
No, because the plotting is mostly at the top of the line, **only (age) 3 at 95** (this last part is the alternative correct reason)	**1**
Because 6 is 117 on the diagram (No decision is stated)	**0**
Yes because in the SD there is a 6 yr old girl that has a height of 117 (Statement acceptable but wrong decision of yes)	**0**
No the height of a 9 year old is 110 (LOBF passes through (6, 115)	**0**
6 year olds are about 100 – 110 (giving a range 110 – 120 in the statement would earn the mark)	**0 (1)**

Exemplar responses for Q11d

Response	Mark
Because the graph has only been plotted from 2 – 9 years old so you would not get an accurate estimation.	**1**
Because the correlation of height with the age is not always the same	**1**
Because there has been no 12 year olds that were in the group of girls which means it may be an unfair assumption	**1**
Because the graph doesn't cover that age group and the growth process can change then	**1**
There is no data beyond a 9 year old so it would be unreliable	**1**
Because there are no points plotted for a 12 year old	**1**
You are missing 2 age groups not including 12 anyway so it wouldn't be accurate	**1**
Because there is no original data on the diagram for anyone over 10	**1**
After 9 years points may not be near the line of best fit (Reference to trend in the given data changing is ok)	**1**
A 12 year old girl would be too tall for this diagram (reference to scale/size of axes rather than available data)	**0**
Because the line of best fit won't go that far because the graph only goes up to 135cm	**0**
Because it will go out of the graph	**0**
Because the line of best fit would say the 12 year old girl would be about 160cm	**0**
Because there is no height recorded (not enough)	**0**
Growth slows down as they get taller (Referring to trend in growth scores 0)	**0**
This is because at this age girls will be different heights because of puberty	**0**

Allowable comparable figures for Q12

5ft 2 and 1.57 are values given in the question therefore do not need to be stated.

	Kate	Alice
M / cm	1.55 or 155	1.57 or 157
Inches	62	62.8
Inches	62	62**.** …… (as a result of 157 ÷ 2.5)
Inches	62	63
Feet & Inches	5ft 2	5ft 2.8
Feet & Inches	5ft 2	5ft 2**.** …… (as a result of 157 ÷ 2.5 – 60)
Feet & Inches	5ft 2	5ft 3
Feet	$5\frac{1}{6}$ or 5.16 or 5.17	5.23….. (as a result of 157 ÷ 2.5 ÷ 12)
Inches & cms	60in 5cm	60in 7cm
Metres & inches	1m 22	1m 22.8
Metres & inches	1m 22	1m 22**.** …… (as a result of 57 ÷ 2.5)
Metres & inches	1m 22	1m 23in

OCR (Oxford Cambridge and RSA Examinations)
The Triangle Building
Shaftesbury Road
Cambridge
CB2 8EA

OCR Customer Contact Centre

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Facsimile: 01223 552627
Email: general.qualifications@ocr.org.uk

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Facsimile: 01223 552553