

H

GCSE (9–1)

Mathematics

J560/05: Paper 5 (Higher tier)

General Certificate of Secondary Education

Mark Scheme for November 2020

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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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1. Annotations available in RM Assessor. These **must** be used whenever appropriate during your marking.

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
BP	Blank page
SEEN	Seen

For a response awarded zero (or full) marks a single appropriate annotation (cross, tick, M0 or ^) is sufficient, but not required.
For responses that are not awarded either 0 or full marks, you must make it clear how you have arrived at the mark you have awarded and all responses must have enough annotation for a reviewer to decide if the mark awarded is correct without having to mark it independently.

It is vital that you annotate standardisation scripts fully to show how the marks have been awarded.

Subject-Specific Marking Instructions

2. **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.
3. 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.
 - **nfw** means **not from wrong working**.
 - **oe** means **or equivalent**.
 - **rot** means **rounded or truncated**.
 - **soi** means **seen or implied**.
 - **dep** means that the marks are **dependent** on the marks indicated. You must check that the candidate has met all the criteria specified for the mark to be awarded.
 - **with correct working** means that full marks **must not** be awarded without some working. The required minimum amount of working will be defined in the guidance column and **SC** marks given for unsupported answers.
4. 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.
5. Unless the command word requires that working is shown and the working required is stated in the mark scheme, 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.

6. 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. 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.

Figures or expressions that are being followed through are sometimes encompassed by single quotation marks after the word *their* for clarity, e.g. FT $180 \times (\textit{their} '37' + 16)$, or FT $300 - \sqrt{(\textit{their} '52 + 72')}$. Answers to part questions which are being followed through are indicated by e.g. FT $3 \times \textit{their} (a)$.

7. 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'.
8. In questions **with a final answer line and incorrect answer given**:
- (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 if there is no other method leading to the incorrect answer. Use the **M0**, **M1**, **M2** annotations as appropriate and place the annotation ✗ next to the wrong answer.
9. 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. A correct step, value or statement that is not part of the method that leads to the given answer should be awarded **M0** and/or **B0**.
 - (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 marks for the poorer response unless the candidate has clearly indicated which method is to be marked.
10. 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 marks for the poorer response unless the candidate has clearly indicated which response is to be marked.
11. 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. If a candidate corrects the misread in a later part, do not continue to follow through, but award **A** and **B** marks for the correct answer only.
 12. 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.
 13. Ranges of answers given in the mark scheme are always inclusive.
 14. 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.
 15. If in any case the mark scheme operates with considerable unfairness consult your Team Leader.

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Question		Answer	Marks	Part marks and guidance	
1		3×5^2 oe	2	B1 for only 3 and 5 or M1 for any correct factor pair of 75	Condone inclusion of 1 for B1 Not 1 and 75
2	(a)	2.5 oe	2	M1 for $4x = 13 - 3$ or for $x + \frac{3}{4} = \frac{13}{4}$	Accept $\frac{10}{4}$ or $\frac{5}{2}$ isw Embedded answer scores M1 max
2	(b)	$12x + 7$ final answer	3	M1 for $10x + 15$ M1 for $2x - 8$	
3	(a)	5	2	B1 for 225 [min] or for 0.75 and 3.75 oe seen	
3	(b)	$\frac{9}{9+16} [x k]$ or $\frac{16}{9+16} [x k]$ oe or better Correct method to convert <i>their</i> fraction to a percentage or a fraction with 100 as denominator or a decimal or correct method for 60% of 25 $64[\%]$ or 15 or a pair of other correctly calculated comparative values with a correct conclusion and no error seen	M1 M1 A1	or $[60\% =] 0.6$ oe or $0.6 \times k$ oe eg $64 > 60$ 64% , so Reece is correct	Where k is a chosen value implied by 64, 0.64, $\frac{64}{100}$, 15 and all imply previous M1 k is same value as used previously. Same k must be used in both parts to get this second mark accept 0.64 and 0.6[0], $\frac{64}{100}$ and $\frac{60}{100}$ or equivalent fractions with same denominator or with correctly evaluated values from using k

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4	(a)		Correctly completes table $\begin{array}{ccc} & & 7 \\ & 6 & \\ 7 & & \end{array}$	1		
4	(b)	(i)	$\frac{13}{25}$ oe	2	B1FT for <i>their</i> correct numerator B1 for fraction with denominator 25	In (b)(i) and (ii), not ratio or words, eg $\frac{13}{25}$, likely but not $\frac{13}{25}$, unlikely isw cancelling/conversion to other forms FT numerator 12 + any evens in <i>their</i> (a)
4	(b)	(ii)	$\frac{14}{25}$ oe	2	FT <i>their</i> correct numerator / 25 B1FT for <i>their</i> correct numerator but denominator incorrect	FT numerator 13 + any multiples of 3 or 4 in <i>their</i> (a)

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Question		Answer	Marks	Part marks and guidance	
5		5.6[0] with correct working	6	<p>M2 for $\left(\frac{1}{3} + \frac{2}{5}\right) \times 10$ oe</p> <p>or M1 for $\frac{1}{3} \times 10$ or $\frac{2}{5} \times 10$</p> <p>A1 for $\frac{110}{15}$ oe</p> <p>or</p> <p>M1 for $\frac{1}{3} + \frac{2}{5}$ oe</p> <p>A1 for $\frac{11}{15}$ oe</p> <p>AND</p> <p>M1dep for <i>their</i> improper fraction/decimal/mixed number rounded up to next integer</p> <p>M1 for <i>their</i> integer multiplied by 70 or 0.7</p> <p>If 0 scored, SC1 for answer 5.6[0] or 5.6</p>	<p>“Correct working” requires full evidence of M1A1 AND M1 or convincing pictorial/alternate convincing approach For method accept equivalent decimals or percentages (to 2 sf)</p> <p>M2 could be split into $\frac{1}{3} \times 10 + \frac{2}{5} \times 10$</p> <p>The method may be shown pictorially</p> <p>For A1 eg $7\frac{1}{3}$, accept $4 + 3\frac{1}{3}$ oe, 733[.]% A1 implies M2</p> <p>The method may be shown pictorially</p> <p>Implies M1</p> <p>Dep on their improper fraction \neq integer Must show a more accurate value first, could be in two parts eg $4 + 3\frac{1}{3}$ then 8</p> <p>This may be earned by those with wrong working then doing eg 8×0.7. Must see a calculation implying an integer $\times 70$ or 0.7, could be in several parts</p>

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Question		Answer	Marks	Part marks and guidance	
6		6 with correct working	5	<p>B2 for 40 [LCM] identified or M1 for multiples of 8 and 20 up to at least 40</p> <p>AND</p> <p>B2 for indicates 40, 80, 120, 160, 200, 240</p> <p>or B1 for [time =] 269 oe or 270 oe M1 for <i>their</i> time \div 40 oe</p> <p>If 0 scored, SC1 for answer 6</p>	<p>“Correct working” requires evidence of at least B2 AND B1 or alternate convincing approach</p> <p>eg attempts to count in 40</p> <p>May be seen as clock times eg 0808, 0816, 0824,...</p> <p>8.20, 8.40, 9.00,... condone 1 error in either list FT other values</p> <p>Accept also if starting from 0801</p> <p>Implies previous B2</p> <p>Accept as times [0800], 8.40, 9.20, 10.00, 10.40, 11.20, 12.00</p> <p>Condone [0801], 8.41, 9.21, 10.01, 10.41, 11.21, 12.01</p> <p>eg Accept 4 hours 30 mins</p> <p>For M1 accept 4 correct multiples of 40 listed condone 1 error FT other values</p> <p>Accept as times as above</p>

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Question		Answer	Marks	Part marks and guidance	
7		C (24, 9) D (10, 2)	5	<p>B4 for three correct ordinates or B3 for two correct ordinates or B2 for one correct ordinate from 24, 10, 2 or for longer length of triangle = 7 soi or B1 for 9 as <i>y</i>-coordinate for C or for shorter length of triangle = 3 soi</p> <p>OR</p> <p>M1 for long = $17 - 4 - 2 \times \textit{their short}$ oe A1FT for C $((4 + 2 \times \textit{their short} + 2 \times \textit{their long}), 9)$ A1FT for D $(4 + 2 \times \textit{their short}, 9 - \textit{their long})$</p>	<p>For part marks, check ordinates first (may be on diagram if answer line blank). If B2 or fewer check alt method and mark to candidates' advantage</p> <p>B4, B3, B2, B1 May be on diagram</p> <p>For M1 and A1FT, <i>their short</i> and <i>their long</i> needs to be clear in working or on diagram</p>
8		<p>For Monday, does not rain should be $1 - 0.55$ oe</p> <p>For Tuesday, 0.25 is incorrectly placed on the does not rain branch oe</p> <p>A pair of branches is missing for Tuesday after does not rain on Monday oe</p>	3	B1 for each	<p>After each correct statement isw eg $0.55 + 0.35$ does not equal 1 Monday not rain should be 0.45</p> <p>eg For Tuesday the probabilities are placed the wrong way around 0.25 should be on the rain branch</p> <p>eg There should be two more branches for Tuesday</p> <p>See AG</p>

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Question		Answer	Marks	Part marks and guidance	
9		Angle ABD = Angle CDB (alternate) BD is common oe AB = CD given oe SAS so triangles are congruent and Angle DAB = angle BCD	M3 A1	M2 for 2 correct statements with reason[s] or 3 correct but no/incorrect reason[s] M1 for 1 correct statement with reason or 2 correct but no/incorrect reasons If 0 scored, SC1 for any attempt to prove congruency	Not alternative angles Accept BD = BD, BD is shared Accept same length oe for 'given' eg attempt to list pairs of equal sides or equal angles (2 or more even if incorrect)
10		90 with correct working	5	M4 for $36 \div (0.8 \times 0.5)$ oe or M3 for $0.4[t] [= 36]$ oe or M2 for $0.8 \times 0.5 [t] [= 36]$ oe OR M1 for $36 \div 0.8$ oe or $36 \div 0.5$ oe A1 for 45 or 72 M1 for <i>their</i> $45 \div 0.5$ oe or <i>their</i> $72 \div 0.8$ oe If 0 scored, SC1 for answer 90 with no working	"Correct working" requires evidence of at least M3 or M1A1M1 or alternate convincing method where [Thurs =] t A1 implies previous M1
11	(a)	$\frac{1}{4}$ or 0.25	2	B1 for 4 in answer or answer $\frac{1}{n}$ (n is an integer > 1) or answer -4	For B1 accept decimal equiv provided $\frac{1}{n}$ seen first

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Question		Answer	Marks	Part marks and guidance	
11	(b)	$3\sqrt{2}$ final answer	2	B1 for $\sqrt{18}$ or $[\sqrt{6} =]\sqrt{3} \times \sqrt{2}$	Accept eg $3 \times \sqrt{2}$ as final answer for 2 marks
12	(a)	She has reduced the price by 10% oe 18050	B1 B3	M2 for $20\,000 \times 0.95^2$ oe or B1 for 1000 or 19000 seen	e.g. She has decreased by 1000 each year She took 10%/ found 90% [of 20000] See AG
12	(b)	(i)	$20\,000 \times 0.95^n$ oe	2	M1 for 0.95 oe or for $20\,000 \times k^n$ ($k \neq 0$)
12	(b)	(ii)	Second graph indicated	1	
13	(a)	Correct sketch with max at (90, 1) and min at (270, -1) and crossing x-axis at 0, 180 and 360	2	M1 for correct shape starting at (0, 0) but inaccurate at roots and max/min. Needs at least one cycle, but may have more than one.	Mark intention
13	(b)	120 300	1 1	FT <i>their</i> 120 + 180	For FT both must be in range 0 to 360
14	(a)	$12a^{\frac{5}{2}}$ oe final answer	2	B1 for $ka^{\frac{5}{2}}$ oe or $12a^k$ ($k \neq 0$)	For B1 accept 12a
14	(b)	$8a^{15}$ final answer	3	B2 for $8a^5$ or $\frac{8a^6}{a^{-9}}$ or ka^{15} ($k \neq 0$) or B1 for ka^5 or $\frac{ka^6}{a^{-9}}$ or 8 seen ($k \neq 0$)	

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Question			Answer	Marks	Part marks and guidance	
15			-7.5 or $-7\frac{1}{2}$ or $-\frac{15}{2}$	3		<p>Condone $-\frac{30}{4}$ as final answer</p> <p>Embedded answer scores M2 maximum</p> <p>M1 for $x = 5(x + 6)$</p> <p>M1 for $x - 5x = 30$ oe FT <i>their</i> first step</p>
16	(a)		Refers to overlapping intervals	1		<p>eg</p> <p>10 could go into 2 intervals</p> <p>The same number can go in 2 places</p> <p>Upper value in interval should be <</p> <p>Both inequalities are \leq when only one should be</p>
16	(b)	(i)	5×6 and 2×20	2	M1 for 5×6 or 2×20	<p>Could be written on graph</p> <p>Allow eg $2 \times 10 + 2 \times 10$ for 2×20</p> <p>Not just $30 + 40$, must show products</p>
16	(b)	(ii)	50.25 with correct working	5	<p>B1 for frequencies 10, 20, 30, 40</p> <p>M1 for mid-interval values 35, 42.5, 47.5, 60 soi</p> <p>M1 for $\sum ft$ where t is in the interval including boundaries FT <i>their</i> frequencies</p> <p>M1 for $\sum ft \div \sum f$ dep on previous M1 FT <i>their</i> frequencies</p> <p>If 0 scored, SC2 for answer 50.25 or</p> <p>SC1 for 5025 with no working</p>	<p>“Correct working” requires evidence of at least B1M1M1</p> <p>Condone 1 error, could be on graph,</p> <p>Condone 1 error</p> <p>$10 \times 35 + 20 \times 42.5 + 30 \times 47.5 + 40 \times 60$</p> <p>$350 + 850 + 1425 + 2400$ [= 5025]</p>

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Question		Answer	Marks	Part marks and guidance	
17			5	B2 for $y = 4 - 2x$ broken line or B1 $y = 4 - 2x$ solid line AND B1FT for R correct side of $y = 4 - 2x$ B1 for R correct side of $y = -2$ B1 for R correct side of $y = x$	See marks on diagram for next 3 marks Grid assumes $y = 4 - 2x$ is correct FT dep on sloping line drawn
18	(a)	5000	4	M2 for $2.5 \times \frac{1}{2} \times 80 \times 100 \times \sin 30$ oe or M1 for $\frac{1}{2} \times 80 \times 100 \times \sin 30$ oe B1 for $\sin 30 = \frac{1}{2}$ oe soi	Area of triangle = 2000 implies M1B1
18	(b)	Conditions for growing may have been different in 2019 oe	1		e.g. extremes in weather oe disease in the carrots oe 2019 may not have been an “average” year oe 2019 may not have harvested the same number as other years Assumes the same amount will grow [in 2019]
19	(a)	$(x - 5)^2 - 3$ final answer	3	B1 for $(x - 5)^2$ B2 FT for -3 or M1 for $22 - (-5)^2$ oe	M1 FT $22 - (their -5)^2$ oe

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Question		Answer	Marks	Part marks and guidance	
19	(b)	Correct sketch with TP at (5, -3) in 4 th quadrant and y – intercept at (0, 22)	4	<p>FT <i>their</i> (a) for TP M1 for U shaped curve B2FTdep <i>their</i> (a) for TP at (5, -3) in correct quadrant or B1FTdep for turning point at (k, -3) or (5, k) soi FT for B2 or B1 dep on answer of form $(x - a)^2 - b$ in part (a), $a, b \neq 0$</p> <p>B1 for y – intercept at 22 indicated</p>	<p>Be generous for the U shape condone broken line Values for y - intercept and TP must be shown but could be marked on axes. Mark intention Accept turning point = (5, -3) FT written in working provided no contradiction on sketch If point (5, -3) FT only plotted on graph in 4th quadrant and no sketch then B2 only</p>
20		144 with correct working	7	<p>B2 for [AD =] 10, [AB =] 24, [DC =] 12 and [BC =] 10 or M1 for $56 \div (5 + 12 + 6 + 5)$ oe</p> <p>AND</p> <p>M2 for $h^2 + 6^2 = 10^2$ or ref to 3, 4, 5 or 6, 8, 10 triangle or B1FT for deducing perpendicular from D to AB is 6 cm from A (or B)</p> <p>A1 for height = 8</p> <p>AND</p> <p>M1 for $\frac{8}{2}(12 + 24)$ or better If 0 scored SC2 for answer 144 with no working or SC1 for height = 8 with no working</p>	<p>“Correct working” requires evidence of at least B2 AND M2 AND M1 Could be written on diagram</p> <p>For M2 FT <i>their</i> BC and $\frac{1}{2}(AB - DC)$ used condone $h^2 + 3^2 = 5^2$ (using ratio values) FT $\frac{1}{2}$ (<i>their</i> AB – <i>their</i> DC)</p> <p>FT <i>their</i> AB, CD and h provided h is not <i>their</i> AD or 5</p>

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APPENDIX

Exemplar responses Q8

Mark clear intention and condone slips in language provided intention is clear. e.g. accept tree for branches

Response	Mark
0.35 needs to be 0.45	1
She didn't subtract the 0.55 probability that it rains from 1 to get the probability that it doesn't rain (0.45 seen on the diagram and 0.35 crossed out)	1
The (0.35) they did not show it, how did they get that number, because it's wrong (error identified)	1
Don't add to 100 on Monday (Condone lack of % sign)	1 BOD
They do not add up to 1 (but if 0.55 and 0.35 shown then this would score)	0
A probability tree always adds up to 1 (but if ref to 0.55 and 0.35 then this would score)	0
$0.55 + 0.35 = 90$, meaning she's not taking it from 1 (statement incorrect)	0
For Tuesday it should be 0.25 for rain and 0.75 for not rain (if stated as separate reasons this is just 1 mark)	1
She says probability that it rains on Tuesday is 0.75 but it is 0.25	1
She has said that the probability it doesn't rain on Tuesday is 0.25. (points out the error)	1
On Tuesday the chance of rain is 0.25 (just restating the stem needs further explanation)	0
For Tuesday the probability it will rain is plotted wrong (not specific enough)	0
In the second tree diagram, she has the wrong number for rain (not specific enough)	0
She wrote the probability "0.25" that it rains on Tuesday in the wrong section on the diagram (not specific enough)	0
There would be another tree diagram (with two more branches correctly drawn on the diagram)	1
She only drew 2 trees, she should have shown the probability of it raining and not raining on each end of the tree	1
She has put Tuesday branch following on from Monday it rains and has not done the Monday it does not rain tree	1
There is no tree for Tuesday it does not rain (BOD with position indicated)	1
She needs a second tree diagram for it does not rain (or for Tuesday)	1
There is no second branch for Tuesday, (or there is not a Tuesday for it does not rain)	1
She's not continued the does not rain section (BOD gives some indication of position)	1
There should be another branch (Needs to indicate where)	0
She doesn't have all the branches that are needed	0
She hasn't completed the whole tree diagram with all the outcomes	0

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Exemplar responses Q12(a)

Response	Mark
She kept decreasing by 5% of 20000	1
She took off the same amount of interest as the first year	1
She should not decrease by the same amount each year [it should be different]	1
She did simple interest rather than compound interest	1
She is decreasing by the same amount each year	1
She did not do 5% of the second year, just 5% of the first year	1
She took £1000 off each year	1
She should have done 5% for each year	1
She did not decrease the result of the first price (she did by 1000)	0
She has just decreased it by 5% each year	0

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