F

GCSE (9–1)

Mathematics

J560/03: Paper 3 (Foundation tier)

General Certificate of Secondary Education

Mark Scheme for November 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 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 × (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.

- **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 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).
- **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.

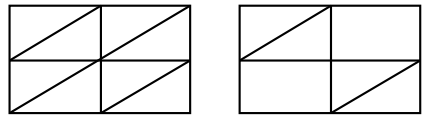
13. Anything in the mark scheme which is in square brackets […] is not required for the mark to be earned, but if present it must be correct.

Throughout mark scheme, accept missing non-critical zeroes such as .28 for 0.28 or £1.3 for £1.30 unless otherwise stated.

Question			Answer	Marks	Part marks and guidance	
1	(a)	(i)	[an] odd [number]	1		
		(ii)	[a] prime [number]	1		
	(b)	(i)	24 and 28 only	1		
		(ii)	12n	1		Where n is integer. 12, 24, 36, 48, ...
	(c)		$(4 - 1) \times 2$	1		
	(d)		$\frac{7}{100}$	1		Accept equivalent proper fractions
2			1.6	2	**B1** for 1520 or 0.08[0]	Accept 1.60 and 1.600
3	(a)		33 000	1		
	(b)		30 000	1		
4	(a)		31.4 to 31.42	2	**B1** for $2\pi r$ or πd only seen or used	**0 marks** if $2\pi r$ or πd and πr^2 seen and wrong one used
	(b)		78.5 to 78.55	2	**B1** for πr^2 only seen or used	**0 marks** if $2\pi r$ or πd and πr^2 seen and wrong one used
5			29	2	**M1** for 16×2 soi 32	May be $16 \times 2 - 3$
6	(a)		Cat	1		

Question			Answer	Marks	Part marks and guidance	
	(b)		Correct graph	**3**	**B2** for two correct bars or three correct height bars but not all correct width or **B1** for one correct height bar of any width or one of [mouse] 2 or [dog] 7 or [horse] 6 seen If **0** scored, allow **B1** for [dog] 84.	Three correct heights and correct widths with no daylight Condone freehand with lines on gridlines (no daylight). Use overlay Number associated with correct animal
7	**(a)**		$\frac{28}{100}$ oe or 0.28 or 28%	**1**		Do not accept ratio or in words Ignore attempts to change to decimals or cancel once correct answer seen
	(b)	**(i)**	Blue	**1**		
		(ii)	Yellow is [a sector] on the spinner oe or Yellow is a possible outcome oe	**1**		Anything saying the spinner can land on yellow or yellow is on the spinner. Contradictory statements score 0.
8	**(a)**		Correct ruled rotation	**2**	**B1** for correct rotation but lines unruled or Ruled but one vertex just outside tolerance or rotation of 180° about another point and ruled and with vertices in tolerance	Use overlay as a guide. Set screen to zoom 57%. Vertices to be within overlay circles
	(b)		Correct ruled enlargement	**2**	**B1** for correct unruled enlargement or ruled enlargement with one vertex just outside tolerance enlargement sf 2 but from different point	Use overlay as a guide. Set screen to zoom 57%. Vertices to be within overlay circles for all marks For **B1**, enlargement must fit on grid

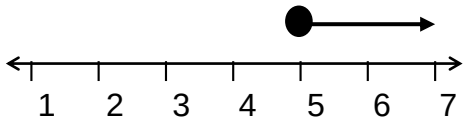
Question			Answer	Marks	Part marks and guidance	
9			40 : 48 linked to 5 : 6 or 100 : 120 linked to 5 : 6 or 1 : 1.2 linked to 5 : 6	3	**B2** for 48 or 120 or **B1** for 8	40 : 48 = 5 : 6 is enough. Allow $\frac{40}{48} = \frac{5}{6}$ for 3 marks
10	(a)		[BY] GY RY BW GW RW BP GP RP	2	**B1** for 6 or more correct with repeats and/or errors or **B1** for 4 to 7 correct with no repeats and/or errors	Number does not include BY Mark only the contents of the table unless clearly a restart or table continued
	(b)		Not a random choice oe	1	Accept explanations suggesting unequal / not random EG Grey and pink do not match and so less likely to be used; she may not like the colours and so won't choose them, it's a decision…	Anything suggesting she may have a preference or that colours would not "go together"
11	(a)		$3x - 6$ final answer	1		
	(b)		$2a^2 + 2ab$ final answer	2	**B1** for $2a^2$ or $2ab$ in final answer	Do not accept 2aa for 2 marks but condone for 1 mark
12	(a)	(i)	6	1		
		(ii)	256	1		
	(b)		$3^3 + \sqrt{7}$ final answer	1		Accept clear indication

Question			Answer	Marks	Part marks and guidance	
13			75 cao nfww	**4**	**M1** for inventing a length and width and correct answer to their length × their width **M1** for correct area of one triangle **M1** for their rectangle area – 2 × their triangle area oe OR **M1** for subdividing shape into right triangles and/or rectangles **B2** for shaded area = $\frac{6}{8}$ oe of rectangle or **B1** for one triangle = $\frac{1}{8}$ oe or 12.5% of rectangle oe OR **M1** for recognising two triangles = rectangle **B2** for shaded area = $\frac{3}{4}$ or oe $\frac{6}{8}$ of rectangle or **M1** for two triangles = $\frac{1}{4}$ or $\frac{2}{8}$ oe or 25% of rectangle	May be algebraic "x by y" rectangle (Diagram is 11 cm by 5 cm) Accept equal length and width Or a trapezium = half shaded area May be 6 × one triangle or 2 × one trapezium e.g.  May be as 8 triangles make the rectangle May be as 8 triangles or 4 rectangles make the rectangle Example for 11 by 5 **M1** for 11 × 5 = 55 **M1** for 5.5 × 2.5 ÷ 2 = 6.875 **M1** for 55 – 13.75 = 41.25
14	**(a)**		157	**2**	**M1** for 103 + 100 soi 203	

Question			Answer	Marks	Part marks and guidance	
	(b)	**(i)**	Angles [on a straight] line add to 180˚ or 180 – 130 [= 50] oe	**1**		Key words "Angle[s]", "line" and "180" must be seen If reason and calculation seen, mark the best
		(ii)	80 final answer ACB = 50 isosceles [triangle] One from ABC = 80 angles in a triangle = 180 CBY = 100 angles on a straight line = 180 or exterior angle ACW = 130 alternate angles [are equal]	**2** **1** **1**		80 may be seen on diagram Allow one letter for angle when usage makes clear e.g. B = 80 isosceles Reasons must be geometric e.g. angles on a straight line add to (allow =) 180 or Isosceles triangle Do not accept AB = BC for isosceles Do not accept e.g. Z angles for alternate Do not accept drawings as a reason
15	**(a)**		Correct tree diagram	**2**	**B1** for $\frac{1}{3}$ correctly placed on first branch **B1** for $\frac{3}{5}$ and $\frac{2}{5}$ correctly placed on both sets of second branches	Accept equivalent fractions and decimals with $\frac{1}{3}$ at least 0.33
	(b)	**(i)**	$\frac{2}{15}$ oe nfww	**2**	**FT** their (a) **M1** for their $\frac{1}{3} \times$ their $\frac{2}{5}$	FT their fractions < 1 Ignore attempts to cancel or change to decimal or percentage once correct answer seen Do not accept words or ratios Accept 0.13[3...] or 13[.3...]% If no working seen answer must be correct

Question			Answer	Marks	Part marks and guidance	
		(ii)	$\frac{13}{15}$ oe nfww	2	**FT** their (i) **M1** for 1 – their $\frac{2}{15}$ ALTERNATIVE with each of their fractions < 1 **M1** for $\frac{2}{3}\times\frac{3}{5}+\frac{2}{3}\times\frac{2}{5}+\frac{1}{3}\times\frac{3}{5}$ or $\frac{2}{3}+\frac{1}{3}\times\frac{3}{5}$	FT their fractions < 1 Do not accept words or ratios Accept 0.86 to 0.87 or 86% to 87% If no working seen answer must be correct Ignore attempts to cancel or change to decimal or percentage once correct answer seen May be implied by $\frac{6}{15}+\frac{4}{15}+\frac{3}{15}$ or $\frac{2}{3}+\frac{3}{15}$
16			[x =] 3 [y =] –1	**3**	**M1** for correct method to eliminate one variable **B1** for x = 3 **B1** for y = –1 If 0 scored **SC1** for correct substitution in a given equation and correct evaluation to find other variable	Allow one error in addition or subtraction of terms or in rearrangement If previously rearranged must be correct rearrangement
17			25, 50, 75, 150	**5**	**B4** for 25, 50, 75 seen or **B3** for two from 25, 50, 75 seen or **B2** for one from 25, 50, 75 seen or **M1** for car A associated with 5	Mark answer line first and accept numbers on the line as answers Only look back into working if answer line blank
18	**(a)**		2.4	**1**		

Question			Answer	Marks	Part marks and guidance	
	(b)	**(i)**	Percentages are not of the same amount oe	**1**	If calculation used 10% of 1500 = 150 80% of 1650 = 1320 1500 – 150 = 1350 It has lost more [than 10%]	If calculation, must contain all four steps Accept anything that suggests 20% is of a different amount [than 1500]
		(ii)	12 nfww	**5**	**M3** for $1500\times\left(1-\left(1+\frac{10}{100}\right)\left(1-\frac{20}{100}\right)\right)$ oe possibly implied by 180 or **M2** for $1500\times\left(1+\frac{10}{100}\right)\times\left(1-\frac{20}{100}\right)$ oe possibly implied by 1320 or **M1** for $\times\left(1+\frac{10}{100}\right)$ oe possibly implied by 1650 AND **M1** for $\frac{\text{their } 180}{1500}$ [$\times 100$] oe	If non calculator methods, must show operations to score method marks **M3** for $1500\times(1-1.1\times0.8)$ May be in stages e.g $1500\div10=150$ **M1** $1500+150=1650$ $1650\div10\times2=330$ **M2** $1650-330=1320$ **M3** $1500-1320=180$ **M1** $180\div1500\times100=12$ ALTERNATIVE **not using 1500** **B1** for 1.1 or 110% **B1** for 0.8 or 80% **M1** for 1.1×0.8 soi 0.88 **M1** for (1 – their 0.88) $\times$ 100

Question			Answer	Marks	Part marks and guidance	
19			$x \geq 5$ AND  	4	**B2** for $x \geq 5$ as final answer or **M1** for $3x \geq 10 + 5$ or better AND **B2FT** for $x \geq 5$, or their inequality, correctly shown or **B1FT** for $x \geq 5$, or their inequality, shown with a correct circle and wrong arrow or wrong circle and correct arrow	Solution to inequality Allow **M1** for this expression with other inequality symbols or equals sign or [x =] 5 as solution (can be implied by mark/circle on the diagram) or trials leading to selection of 5 or final correct trial using 5 Displaying the solution Diagram must show an inequality that fits on the number line for FT Mark to candidate's advantage either $x \geq 5$ or their inequality Accept a line or arrow **If no solution to inequality seen:** Filled circle at 5 arrow to right **M1 B2** Empty circle at 5 arrow to right **M1 B1** Filled circle at 5 arrow to left **M1 B1** Empty circle at 5 arrow to left **M1 B0** Mark at 5 no line or arrow **M1B0** Circle and/or arrow at other than 5 **M0B0**

Question			Answer	Marks	Part marks and guidance	
20			31 218	**5**	**M4** for $54868 - \frac{54868}{2.32}$ oe or **M3** for $\frac{54868}{2.32}$ soi by 23650 or 236.5 or **M2** for 2.32 or 232[%] soi or **M1** for 1.32 or 132[%] soi If **M1** only scored then also allow an **SC1** for $\frac{54868}{1.32}$ soi by 41566 to 41567	May be seen as $54868 \times \frac{132}{232}$ or 236.5×132 Examples of implied: 2.32 implied by [A =] 0.32B + 2B oe but not by 32[%] × B + 2B oe 1.32 implied by 0.32 + 1 but not by 32[%] + 1 nor 0.32 + 100[%]
21			$\frac{1}{27}$	**3**	**M2** for $\frac{2}{6} \times \frac{2}{6} \times \frac{2}{6}$ soi by $\frac{8}{216}$ oe or 0.037[…] or 3.7[…]% or **B1** for $\frac{2}{6}$ oe If **0** scored then **SC1** for (their $\left(\frac{2}{6}\right)$)^3 oe	 0 < their $\left(\frac{2}{6}\right)$ < 1

Question			Answer	Marks	Part marks and guidance	
22			80 nfww	**5**	**B3** for height [of B =] 10 OR **M2** for $3x^2$ = their (12 × 25) or better or **M1** for 3x × x oe or 300 seen **A1** for x = 10 AND **M1** for (2 × their 10) + (2 × 3 × their 10) oe or for 2a + 2b where ab = 300 but not with 25 and 12	May be seen on diagram May be implied by arithmetic processing e.g. $\sqrt{\frac{their\ (12 \times 25)}{3}}$ or at least two trials of 3 × number × number intending 300 Allow their 10 if clearly intended as height e.g. "h =" or marked on diagram e.g. **M1M1** for 2 × 36 + 2 × 8.3[3…]

Question			Answer	Marks	Part marks and guidance	
23			3.2 nfww	**6**	**M3** for 1500×1.03^5 or **M2** for 1500×1.03^k where k is 2, 3 or 4 or **M1** for 1.03 soi perhaps by 1545 AND **M2** for $\frac{their\ 1738.91-1500}{5 \times 1500}$ [× 100] oe or **M1** for (their 1738.91 – 1500) ÷ 5 or for (their 1738.91 – 1500) ÷ 1500 <u>Alternative (not using a base amount)</u> **M5** for [r =] $(1.03^5 - 1) \div 5$ or **M4** for $1.03^5 - 1$ or **M3** for 1.03^5 or **M2** for 1.03^k (where k is 2, 3 or 4) or **M1** for 1.03	Condone 3.2% as final answer soi by 1738 to 1739 soi by [2 yr =] 1591[.35], [3 yr =] 1639[.09..] or [4 yr =] 1688.[26…] their 1738.91 must come from a valid attempt to find compound interest for at least 2 years **M2** soi by 0.0317 to 0.032 or soi by 3.17 to 3.19 **M1** soi by 47.6[0] to 47.8[0] or soi by [0].1586 to 0.1594

Question			Answer	Marks	Part marks and guidance	
24			18 nfww	**6**	**B4** for 2a = 5 OR **M3** for 6a – 4a = 8 – 4 + 1 or better or **M2** for 6a + 4 – 1 = 4a + 2 × 4 or better or 6a – 4a = 2b – b + 1 or better or **M1** for 6a + b – 1 = 4a + 2b AND **M1dep** for correct substitution of 4 and their 2.5 in 4a + 2b or 6a + b – 1	Isolating a Expect 6a + 3 = 4a + 8 Expect 2a = b + 1 Dependent on at least M1 or B4 May be implied by 10 + 8 or 15 + 3
			Total	**100**		

Question	Example	Mark	Reason
7bii	It can't be the actual probability because **there is a yellow** ball in the bag	**1**	BOD the reference to balls, reward recognition yellow exists
	If you did it again **you (could) land on yellow**	**1**	Recognises yellow is an outcome
	She could get **yellow as it in the spinner**	**1**	Recognises yellow is on the spinner
	Her spinner is biased so **would land on yellow if** it was spun over 100 times	**1**	Recognises yellow is on spinner
	The spinner is biased. The probability of yellow is not the actual one.	**0**	Does not say yellow is on the spinner
	The total would not add up to 100. Yellow would have to be 12	**0**	Does not say yellow is on the spinner
	Because she has no yellows	**0**	Does not say yellow is on the spinner
	Because she has a biased 5 sided spinner	**0**	Does not say yellow is on the spinner

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