



GCSE Mathematics

Grades 3-4 Resource Non-calc Test 2

Mark scheme

8300 Grades 3-4 Resource Non-calc Test 2

Version: 1.0

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Glossary for Mark Schemes

GCSE examinations are marked in such a way as to award positive achievement wherever possible. Thus, for GCSE Mathematics papers, marks are awarded under various categories.

If a student uses a method which is not explicitly covered by the mark scheme the same principles of marking should be applied. Credit should be given to any valid methods. Examiners should seek advice from their senior examiner if in any doubt.

M	Method marks are awarded for a correct method which could lead to a correct answer.
A	Accuracy marks are awarded when following on from a correct method. It is not necessary to always see the method. This can be implied.
B	Marks awarded independent of method.
ft	Follow through marks. Marks awarded for correct working following a mistake in an earlier step.
SC	Special case. Marks awarded for a common misinterpretation which has some mathematical worth.
M dep	A method mark dependent on a previous method mark being awarded.
B dep	A mark that can only be awarded if a previous independent mark has been awarded.
oe	Or equivalent. Accept answers that are equivalent. eg accept 0.5 as well as $\frac{1}{2}$
[a, b]	Accept values between a and b inclusive.
[a, b)	Accept values $a \leq \text{value} < b$
3.14...	Accept answers which begin 3.14 eg 3.14, 3.142, 3.1416
Use of brackets	It is not necessary to see the bracketed work to award the marks.

Examiners should consistently apply the following principles

Diagrams

Diagrams that have working on them should be treated like normal responses. If a diagram has been written on but the correct response is within the answer space, the work within the answer space should be marked. Working on diagrams that contradicts work within the answer space is not to be considered as choice but as working, and is not, therefore, penalised.

Responses which appear to come from incorrect methods

Whenever there is doubt as to whether a student has used an incorrect method to obtain an answer, as a general principle, the benefit of doubt must be given to the student. In cases where there is no doubt that the answer has come from incorrect working then the student should be penalised.

Questions which ask students to show working

Instructions on marking will be given but usually marks are not awarded to students who show no working.

Questions which do not ask students to show working

As a general principle, a correct response is awarded full marks.

Misread or miscopy

Students often copy values from a question incorrectly. If the examiner thinks that the student has made a genuine misread, then only the accuracy marks (A or B marks), up to a maximum of 2 marks are penalised. The method marks can still be awarded.

Further work

Once the correct answer has been seen, further working may be ignored unless it goes on to contradict the correct answer.

Choice

When a choice of answers and/or methods is given, mark each attempt. If both methods are valid then M marks can be awarded but any incorrect answer or method would result in marks being lost.

Work not replaced

Erased or crossed out work that is still legible should be marked.

Work replaced

Erased or crossed out work that has been replaced is not awarded marks.

Premature approximation

Rounding off too early can lead to inaccuracy in the final answer. This should be penalised by 1 mark unless instructed otherwise.

Continental notation

Accept a comma used instead of a decimal point (for example, in measurements or currency), provided that it is clear to the examiner that the student intended it to be a decimal point.

Question	Answer	Mark	Comments
1	Any correct conversion using values given $800 \div 1000$ or 0.8 or 2.1×1000 or 2100 or 1.9×1000 or 1900 or $2.7 (\times 1000)$ or 2700 or 0.2×1000 or 200	M1	oe eg 0.800 may be seen in 2nd M1 2.7 or 4.8 or 2.9 implies 0.8 4800 implies 2100 and 1900 2900 implies 2100
	$1.9 + \text{their } 0.8 - 2.1$ or $\text{their } 1900 + 800 - \text{their } 2100$ or $\text{their } 0.8 - (2.1 - 1.9)$ or $800 - (\text{their } 2100 - \text{their } 1900)$ or 600	M1	oe allow their conversions allow mixed units eg $1.9 + 800 - 2.1$
	0.6	A1	
	Additional Guidance		
	Check diagram		
	600 (implies 2100 and 1900)		M1M1
	Accept additional zeroes in the answer eg 0.600 or 00.6		M1M1A1
	No correct unit changes or no changes attempted can score M0M1A0 but calculation must be seen eg $190 + 800 - 210 = 780$		M0M1A0
	Up to M2 may be awarded for correct work, with no or incorrect answer, even if seen amongst multiple attempts		

Question	Answer	Mark	Comments
2(a)	5	B1	
	Additional Guidance		
	Condone $10 - 5 = 5$		B1
	Condone $x = 5$		B1
	$\frac{10}{2}$		B0
2(b)	-10	B1	
3	33.3%	B1	

Question	Answer	Mark	Comments
4	$ADC = 110$ or $BAD = 180 - 110$ or $BAD = 70$ or $BCD = 180 - 110$ or $BCD = 70$ or any indication that angle $EAD =$ angle EDA or any indication that angle $BCD =$ angle ADE	M1	may be seen on diagram eg both written as x or both having the same value
	$EDA = 180 - 110$ or $EDA = 70$ or $EAD = 180 - 110$ or $EAD = 70$	M1dep	may be seen on diagram
	40	A1	
	Additional Guidance		
	Angle values must be identified with the correct angle, either by notation or use of the diagram Notation such as $D = 110$ or $C = 70$ is not acceptable (although marks may still be awarded for correct position of angles on diagram)		
	Work on the diagram can score up to M2		
	Subject to the previous comment, award the higher mark for work seen on diagram and work seen in working space		
	Ignore incorrect angles when awarding up to M2, but any incorrect work cannot score M2A1		
	40 marked as angle AED on diagram but :- 180 on answer line or no sign of 40 as final answer in working		M2A0

5	0.75	B1	
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Question	Answer	Mark	Comments
6	$405 \div (4 + 11)$ or $405 \div 15$ or 27 or build up in 15s to 405	M1	Clear intention to divide Do not accept $15 \div 405$ unless clearly recovered
	their 27×4 or 108 or their 27×11 or 297	M1dep	
	108 and 297	A1	
	Additional Guidance		
	297 and 108		M1M1A0
	Answer 108 : 297		M1M1A1
	Partial build up using ratios from 4 : 11 (eg 104 : 286) is 0 marks unless correct answer achieved		M0M0A0
	If 405 is divided by 10 and then divided by 5 this is M0 unless $405 \div 15$ was clearly seen first, then it is M1M0A0		

Question	Answer	Mark	Comments
7	$2x = 14 \times 5$ or $2x = 70$ or $\frac{x}{5} = 14 \div 2$ or $\frac{x}{5} = 7$ or $14 \times 5 \div 2$ or $70 \div 2$	M1	oe eg $14 \div 0.4$
	35	A1	
	Additional Guidance		
	Trial and improvement scores 2 or 0		
	Embedded answer eg $\frac{2 \times 35}{5}$		M1A0
	$\frac{2x}{5} = \frac{14 \times 5}{5}$		M1

Question	Answer	Mark	Comments
8	4×10^5	B2	B1 400 000 or correct answer not in standard form eg 40×10^4 or 8×10^7 or 2×10^2 or $8 \times 10^5 \div 2$ or $4 \times 10^7 \div 100$ or any value seen and then correctly converted to standard form eg 4 000 000 and 4×10^6 40 000 and 4×10^4
	Additional Guidance		
	Ignore incorrect position of commas or spacing in long numbers		
	Condone 400 000 and 4×10^5 on the answer line, in either order		B2
	Condone 40 000 and 4×10^4 on the answer line, in either order		B1
	400 000 only on the answer line		B1
	Do not award both marks for the correct answer from incorrect working but B1 can be awarded for one or both numbers incorrectly converted to standard form and the result of their division given correctly in standard form eg $(8 \times 10^8) \div (2 \times 10^3) = 4 \times 10^5$ eg $(0.8 \times 10^7) \div (2 \times 10^3) = 4 \times 10^5$		B1 B0
	Condone a decimal point and any number of zeros after 4 eg 4.00000×10^5		B2
	8×10^7 is implied by $(8 \div 2) \times (10^7 \div 10^a)$ or condone $(8 \div 2) \times (10^7 \times 10^a)$		B1
	2×10^2 is implied by $(8 \div 2) \times (10^b \div 10^2)$ or condone $(8 \div 2) \times (10^b \times 10^2)$		B1

Question	Answer	Mark	Comments
9(a)	$\frac{1}{3}$	B2	B1 (may be seen in diagram) 120 or 100 or 0.4(0) may be seen in a fraction eg $\frac{120}{40}$ or $\frac{0.4}{1.2}$ or correct, but unsimplified fraction eg $\frac{20}{60}$ or their fraction written in simplest form SC1 1 : 3
	Additional Guidance		
	Ignore units on answer line		
	Do not ignore further work after $\frac{1}{3}$ seen		
	If converting to mm both values must be correct		
	$\frac{1}{3}$ given as a decimal or percentage must be correct to 2sf or better		B1
	B1 for simplifying their fraction can only be awarded from the use of digits 1, 12 and 4, eg $\frac{40}{1200}$, answer $\frac{1}{30}$ $\frac{1200}{40}$, answer 30 $\frac{40}{1200}$, answer $\frac{1}{3}$ $\frac{2}{4}$, answer $\frac{1}{2}$		B1 B1 B0 B0
	$\frac{0.04}{1.2}$, answer $\frac{1}{30}$		B1
	$\frac{1}{40}$ or $\frac{40}{1} = 40$		B0

Question	Answer	Mark	Comments
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9(b)	180 – 112 or 68 or $3y + y + 112 = 180$	M1	oe
	their $68 \div (3 + 1)$ or their $68 \div 4$ or $y = \frac{\text{their } 68}{4}$ or 51 or $x = 17$	M1	oe their 68 must be < 180 but not 112 51 or $x = 17$ imply M1M1
	17	A1	
	Additional Guidance		
	Check diagram for workings and answer		
	17 seen in diagram or working and 51 on answer line		M1M1A0
	$180 \div 4$		M0M0
	$68 \div 3$		M1M0
	$180 - 112 = 78$ and $78 \div 4$ $78 \div 4$		M1M1 M0M1
	Embedded answer eg $4 \times 17 + 112 = 180$		M1M1A0

10	7	B1	
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11	$1\frac{1}{7}$	B1	
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Question	Answer	Mark	Comments
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12	Alternative method 1		
	Angle $DAB = 70$	B1	may be on diagram
	Angle $ABC = 360 - \text{their } 70 - 90 - 120$ or Angle $ABC = 80$	M1	may be on diagram
	Valid reason	A1	eg $180 - 80 = 100$ $80 + 100 = 180$ angles on a straight line add to 180 $(360 - 80 - 80)/2 = 100$
	Alternative method 2 working backwards from $x = 100$		
	Angle $ABC = 180 - 100$ or Angle $ABC = 80$	M1	may be on diagram
	Angle $DAB = 360 - \text{their } 80 - 90 - 120$ or Angle $DAB = 70$	M1dep	may be on diagram
	Valid reason	A1	eg opposite angles are equal vertically opposite angles (are equal) $180 - 70 = 110$ and $180 - 110 = 70$
	Additional Guidance		
	Incorrect angles seen anywhere around A or B cannot score the A1		

Question	Answer	Mark	Comments
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13	$(\sqrt{121}) = 11$ or -11 or $121 = 11^2$ or $121 = 11 \times 11$ seen	B1	oe
	$13 - 10$ or 3 or $(13 - 10)^2$ or 3^2 or 3×3 or 9	M1	
	2 or -20	A1ft	ft their 11
	Additional Guidance		
	Accept 2 and -20	B1M1A1ft	
	$11 - 16^2$ or $11 - 256$ or -245	B1M0A0	
	$11 \times 9 = 99$	B1M1A0	
	$\sqrt{121} = 60.5$, $60.5 - 3^2 = 51.5$	B0M1A1ft	
	$60.5 - 3^2 = 51.5$	B0M1A0ft	

14	$\begin{pmatrix} 7 \\ -2 \end{pmatrix}$	B2	B1 $\begin{pmatrix} 7 \\ a \end{pmatrix}$ or $\begin{pmatrix} b \\ -2 \end{pmatrix}$ or $\begin{pmatrix} -2 \\ 7 \end{pmatrix}$ or $\begin{pmatrix} 7x \\ -2y \end{pmatrix}$ or $\begin{pmatrix} -7 \\ 2 \end{pmatrix}$ SC1 7 right 2 down or 2 down 7 right or $(7, -2)$
	Additional Guidance		
	B1 responses must be in vector form		
	Condone $\begin{pmatrix} 7 \\ -2 \end{pmatrix}$	B2	
	$7 \rightarrow$ $2 \downarrow$ 7 across, 2 down	SC1 B0	
	$\begin{pmatrix} 2 \\ 7 \end{pmatrix}$	B0	
	$7 \leftarrow$ $2 \uparrow$	B0	

Question	Answer	Mark	Comments
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15	$8 + 10 + 14 + 7$ or $50 - 4 - 7$ or $50 - 11$ or 39	M1	allow one error (but not omission) in the 4 frequencies being added frequencies may be seen as numerators of fractions (as probabilities) – ignore denominators as long as they are all the same and all probabilities are < 1 in subtraction method, both frequencies must be correct Condone 51 for 50 for M1
	$\frac{39}{50}$	A1	oe fraction, decimal or percentage eg 0.78 78%
	Additional Guidance		
	Ignore attempts to simplify or convert a correct fraction		M1A1
	$\frac{8}{100} + \frac{10}{100} + \frac{14}{100} + \frac{6.5}{100}$ (frequencies have one error and no omissions, seen as probabilities, with same denominator)		M1A0
	$1 - \frac{11}{50}$ or $1 - \frac{7}{50} - \frac{4}{50}$ is correct for M1 (allow $\frac{50}{50}$ in place of 1) also accept the above with any consistent denominator eg $\frac{52}{52} - \frac{11}{52}$		at least M1 M1A0
	$\frac{39}{50}$ then 39 as final answer		M1A0
	39 out of 50 or 39 in 50 or 39 : 50 is M1A0 however, condone 39 out of 50 or 39 in 50 with a correct fraction, decimal or percentage (together on answer line) but do not accept 39 : 50 with a correct fraction, decimal or percentage (together on answer line)		M1A1 M1A0
	Ignore probability words unless contradictory, eg $\frac{39}{50}$ unlikely		M1A0
	Numbers may be shown on the diagram but must then be added (or subtracted from 50 as appropriate) to score M1		
	$\frac{39}{51}$ (or denominator other than 50)		M1A0
Question	Answer	Mark	Comments

16	$x^2 + 5x - x - 5$	M1	three or four terms with three correct $x^2 + 4x + k$ implies M1
	$x^2 + 4x - 5$	A1	
	Additional Guidance		
	Further work, eg $x^2 + 4x - 5 = 5x - 5$		M1A0
	$y = x^2 + 4x - 5$ or $x^2 + 4x - 5 = 0$		M1A0
	$x^2 + 4x - 4$		M1A0
	$x^2 + 4x$		M1A0
	Condone $1x$ for x eg $x^2 + 5x - 1x - 5$		at least M1
	Terms may be seen in the grid method or in a list where a plus sign can be implied		

Question	Answer	Mark	Comments
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17	Alternative method 1 – width of small rectangle is x (any letter)		
	x and $2x$ or $x + 2x + x + 2x$ or $6x$	M1	oe
	$x + 2x + x + 2x = 15$ or $6x = 15$	M1dep	oe
	$(x =) 2.5$	A1	from correct working or with 5 as the other dimension or with 7.5 as the length of the large rectangle
	25	A1ft	ft $10 \times$ their 2.5 with M1M1 awarded
	Alternative method 2 – length of small rectangle is x (any letter)		
	x and $\frac{x}{2}$ or $x + \frac{x}{2} + x + \frac{x}{2}$ or $3x$	M1	oe
	$x + \frac{x}{2} + x + \frac{x}{2} = 15$ or $3x = 15$	M1dep	oe
	$(x =) 5$	A1	from correct working or with 2.5 as the other dimension or with 7.5 as the length of the large rectangle
	25	A1ft	ft $5 \times$ their 5 with M1M1 awarded
	Alternative method 3 – a = width of small rectangle and b = length of small rectangle (any letters)		
	$b = 2a$ or $10a$ or $5b$	M1	correct expression for perimeter of the large rectangle in one variable
	$6a = 15$ or $3b = 15$	M1dep	correct equation in one variable
	$(a =) 2.5$ or $(b =) 5$	A1	from correct working or with both values correct or with one value correct and 7.5 as the length of the large rectangle
	25	A1ft	ft $10 \times$ their a or $5 \times$ their b with M1M1 awarded

Alternative methods and additional guidance for Question 17 continue on the next page

Question	Answer	Mark	Comments
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	Alternative method 4 – trial and improvement using ratio of sides		
	length = $2 \times$ width seen or implied	M1	
	Two correctly evaluated trials for perimeter of small rectangle with length = $2 \times$ width	M1dep	eg $8 + 4 + 8 + 4 = 24$ and $10 + 5 + 10 + 5 = 30$
	2.5 and 5	A1	implied by $2.5 + 5 + 2.5 + 5 = 15$
	25	A1	
	Additional Guidance		
	Note that there is no ft in method 4		
	In all methods, marks can be awarded for annotation of the diagram, with lengths clearly identified, or working inside or alongside the diagram eg 2.5 and 5 marked correctly as the dimensions of the small rectangle 2.5 marked as the width of the small rectangle and 7.5 marked as the length of the large rectangle	M1M1A1 M1M1A1	
	If full marks not awarded, mark both the diagram and working then award the better mark		
	In alt 4, one or more trials may be crossed out to indicate that they do not give the correct perimeter. Do not treat this as the usual crossed out work not to be marked if replaced.		

Question	Answer	Mark	Comments
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18	One correct conversion to a comparable form 0.08×10^{-2} or 0.0008 400×10^{-4} or 0.04 0.06×10^{-2} or 0.0006 7×10^{-2} or 700×10^{-4}	M1	
	6×10^{-4} 8×10^{-4} 4×10^{-2} 0.07 with no clearly incorrect working	A1	oe accept in converted form
	Additional Guidance		
	Correct answer from clearly incorrect working		A0
	Accept numbers with two decimal points if it is clear that the point has been moved to the correct place eg 0.0008.0 with curved lines between each place value between the decimal points		
	If the numbers are converted into fractions, at least two must be given correctly with common denominators to score the first mark eg $\frac{4}{100}$ and $\frac{7}{100}$ eg $\frac{6}{1000}$ and $\frac{8}{1000}$ only eg $\frac{6}{10\,000}$ and $\frac{7}{100}$ only		M1 M0 M0

Question	Answer	Mark	Comments
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19	$\sqrt{64}$ or 8 or $64 = 8 \times 8$	M1	Implied by a diameter or side length of 8 stated or shown on the diagram, or radius of 4 stated or used or shown on the diagram
	$\pi \times (\text{their } 8 \div 2)^2$ or $\pi \times 4^2$ or $\pi 4^2$ or [50.24, 50.272]	M1dep	oe Allow [3.14, 3.142] for π
	16π	A1	Condone $16 \times \pi$ or $\pi \times 16$ or $\pi 16$
	Additional Guidance		
	$64 - 16\pi$	M1M1A0	
	Beware of incorrect methods which lead to the correct answer eg $r = 8, 2 \times \pi \times 8 = 16\pi$ $\sqrt{64} = 8, 8^2 = 16, 16\pi$	M0M0A0 M1M0A0	