



GCSE Mathematics

Grades 3-4 Resource Calc Test 1

Mark scheme

8300 Grades 3-4 Resource Calc Test 1

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	Alternative method 1		
	90×5 or 450 or $\frac{72+83+88+97+x}{5}$ or $\frac{340+x}{5}$	M1	oe any letter or symbol
	$90 \times 5 - 72 - 83 - 88 - 97$ or $90 \times 5 - 340$ or $72 + 83 + 88 + 97 + x = 90 \times 5$ or $340 + x = 90 \times 5$	M1dep	oe any letter or symbol equations must have fraction eliminated
	110	A1	
	Alternative method 2		
	Trial of any value with mean correctly evaluated	M1	also allow if given to the next or previous integer eg1 trial of 100 $\frac{72+83+88+97+100}{5} = 88$ eg2 trial of 78 $\frac{340+78}{5} = 83$ (or 84 or 83.6) ignore trials with mean not evaluated or incorrectly evaluated
	Trial of 110 with mean evaluated to 90	M1dep	eg $\frac{72+83+88+97+110}{5} = 90$ this mark implies M1M1
	110	A1	

Question	Answer	Mark	Comments
1 cont	Alternative method 3		
	$\frac{72+83+88+97}{4}$ or $\frac{340}{4}$ or 85	M1	oe
	their 85 + 5 × (90 – their 85) or their 85 + 5 × 5 or their 85 + 25	M1dep	oe 90 + 4 × (90 – their 85)
	110	A1	
	Alternative method 4		
	$\frac{72+83+88+97}{5}$ or $\frac{340}{5}$ or 68	M1	oe
	5 × (90 – their 68) or 5 × 22	M1dep	oe
	110	A1	
	Alternative method 5		
	(90 – 72) + (90 – 83) + (90 – 88) + (90 – 97) or 18 + 7 + 2 – 7 or 20	M1	oe eg (72 – 90) + (83 – 90) + (88 – 90) + (97 – 90) or 90 × 4 – 72 – 83 – 88 – 97 or –18 – 7 – 2 + 7 or –20
	90 + their 20	M1dep	oe eg 90 – their –20
	110	A1	
	Additional Guidance		
	M1 may be awarded for correct work with no, or incorrect answer, even if this is seen amongst multiple attempts		
	Embedded 110 scores M1M1A0 using Alt 2 (even if a different answer is given)		
	Condone eg Alt 3 $72 + 83 + 88 + 97 \div 4$ No further marks unless recovered		M1
	Alt 5 1st M1 Subtractions must be consistent		
	Condone 110% for 110		

Question	Answer	Mark	Comments
2	$180 \div 3$ or 60	M1	oe eg $60 + 60 + 60 = 180$
	$(180 - 28) \div 2$ or $152 \div 2$ or 76	M1	oe eg $76 + 76 + 28 = 180$
	$180 - \text{their } 60 - \text{their } 76$	M1dep	oe eg $44 + 60 + 76 = 180$ dep on M1M1
	44	A1	
	Additional Guidance		
	60 or 76 seen in appropriate place on diagram or in working scores one mark for each		
	Answer 44 not from wrong working		M3A1
	$180 - 28 \div 2$ unless recovered		2nd M0

Question	Answer	Mark	Comments
3	Alternative method 1		
	$\frac{5}{7} \times 168$ or 120	M1	oe eg $168 \div 7 \times 5$ implied by 48 allow 0.71(4...) or 71(.4...) % for $\frac{5}{7}$
	$\frac{1}{3} \times (168 - \text{their } 120)$ or $\frac{1}{3} \times 48$ or 16 or $\left(1 - \frac{1}{3}\right) \times (168 - \text{their } 120)$ or $\left(1 - \frac{1}{3}\right) \times 48$	M1	oe must subtract their 120 from 168 with $10 < \text{their } 120 < 150$ allow 0.33(3...) or 33(.3...) % for $\frac{1}{3}$ allow 0.66(6...) or 0.67 or 66(.6...) % or 67% for $\left(1 - \frac{1}{3}\right)$ 16 is M1M1
	32(.00p)	A1	SC2 80 SC1 40
	Alternative method 2		
	$\left(1 - \frac{5}{7}\right) \times 168$ or 48	M1	oe eg $168 \div 7 \times 2$ allow 0.28(6...) or 0.29 or 28(.6...) % or 29% for $\left(1 - \frac{5}{7}\right)$
	$\frac{1}{3} \times \text{their } 48$ or 16 or $\left(1 - \frac{1}{3}\right) \times \text{their } 48$	M1	oe $18 < \text{their } 48 < 100$ allow 0.33(3...) or 33(.3...) % for $\frac{1}{3}$ allow 0.66(6...) or 0.67 or 66(.6...) % or 67% for $\left(1 - \frac{1}{3}\right)$ 16 is M1M1
	32(.00p)	A1	SC2 80 SC1 40

Additional Guidance is on the next page

Question	Answer	Mark	Comments
3 cont	Additional Guidance		
	Up to M2 may be awarded for correct work with no, or incorrect answer, even if this is seen amongst multiple attempts		
	$\frac{5}{7} \times 168 = 120$, $120 \div 3 = 40$, Answer 40		M1M0A0 (or SC1)
	$\frac{5}{7} \times 168 = 120$, $120 \div 3 = 40$, Answer 80		SC2
	Alt 1 Allow $0.71(4\dots)$ or $71(.4\dots)\%$ for $\frac{5}{7}$ and $0.33(3\dots)$ or $33(.3\dots)\%$ for $\frac{1}{3}$ eg $0.71 \times 168 = 119.28$ $0.33 \times (168 - 119.28) = 16.08$, Answer 32.64		M1 M1A0
	Do not allow $\frac{5}{7} = 0.7$ or $\frac{2}{7} = 0.3$ or $\frac{1}{3} = 0.3$ or $\frac{2}{3} = 0.7$ eg $0.7 \times 168 = 117.6$ $0.3 \times (168 - 117.6) = 15.12$, Answer 35.28		M0 M0A0
	Second mark of Alt 1 is independent eg $0.7 \times 168 = 117.6$ (unacceptable to use 0.7 for $\frac{5}{7}$) $(168 - 117.6) \div 3 = 16.8$		M0 M1A0
	Second mark of Alt 2 is independent eg $0.3 \times 168 = 50.4$ (unacceptable to use 0.3 for $\frac{2}{7}$) $0.33 \times 50.4 = 16.63$		M0 M1A0
	Calculation shown as eg $71\% \times 168$		M1

Question	Answer	Mark	Comments
4	$7(\text{kg}) 200(\text{g}) + 650$ or $7200 + 650$ or $7.2(00) + 0.65(0)$ or 7850 seen or 7.85(0) seen or 850 seen or 0.85(0) seen	M1	
	7 kilograms 850 grams	A1	SC2 7.85(0) kilograms 7850 grams
	Additional Guidance		
	850 may be seen embedded eg Answer 29.75 kilograms 850 grams		M1A0
	7 kg 850 g seen in working but different answer		M1A0
	7.2 + 650 with no other creditworthy work		M0A0
5	$0.5 \times 10 \times 12$ or 60	M1	oe
	$180 \div \text{their } 60$	M1dep	
	3	A1	SC1 1.5 oe
6a	$\frac{3}{4} \times \frac{3}{4} \times 15$ or $\frac{3}{4} \times 15$ or 11.25 and $\frac{3}{4} \times \text{their } 11.25$	M1	oe
	$8.4(375)$ or 8.44 or 8.438 or $\frac{135}{16}$ or $8\frac{7}{16}$	A1	
	Additional Guidance		
	8.43 or 8.437		M1A1
	8.4 seen, answer 8		M1A1
	$\frac{3}{4}$ of 11.25 (unless correctly evaluated)		M0
	$\frac{3}{4} \times 8.4375$, answer 6.328 (further work) $11.25 + 8.4375$, answer 19.6875 (further work)		M1A0 M1A0

Question	Answer	Mark	Comments
6b	Alternative method 1		
	Ticks second box and [7.425, 7.5375] or Ticks second box and correctly evaluates $\frac{2}{3} \times \text{their } 11.25$	B2ft	ft correct box ticked for comparing with their answer to (a) B1ft [7.425, 7.5375] with no or incorrect decision or Correctly evaluates $\frac{2}{3} \times \text{their } 11.25$ with no or incorrect decision
	Alternative method 2		
	Ticks second box and valid comparison	B2	eg $\frac{8}{12}$ and $\frac{9}{12}$ 0.66... or 0.67 and 0.75 66.(...)% or 67% and 75% $\frac{9}{16}$ and $\frac{8}{16}$ clear diagrams showing $\frac{2}{3}$ and $\frac{3}{4}$ B1 Ticks second box and incomplete comparison eg $\frac{8}{12}$ and $\frac{3}{4}$ two thirds is less than three quarters $\frac{3}{4} \times \frac{3}{4} = \frac{9}{16}$ and $\frac{3}{4} \times \frac{2}{3} = \frac{6}{12}$ or Valid comparison (that would score B2) with no or incorrect decision
	Additional Guidance		
	In Alt 1 only follow through their answer to (a) for the comparison, the working for $\frac{2}{3}$ of their 11.25 must be correct		
	(a) answer 6.5 (b) Ticks first box and 7.5 seen		B2ft
	Accept 0.66... or 0.67 for $\frac{2}{3}$		
	Using 0.6 for $\frac{2}{3}$		B0

Question	Answer	Mark	Comments
7a	Alternative method 1		
	$1.8 \times -40 + 32$ or -72	M1	oe eg $1.8(-40) + 32$
	$1.8 \times -40 + 32 = -40$ or $1.8 \times -40 = -72$ and $-72 + 32 = -40$	A1	oe eg $1.8(-40) + 32 = -40$ Full working must be seen oe eg $1.8 \times -40 = -72$ and $-40 - 32 = -72$
	Alternative method 2		
	$\frac{-40 - 32}{1.8}$ or -72	M1	
	$\frac{-40 - 32}{1.8} = -40$ or $-40 - 32 = -72$ and $-72 \div 1.8 = -40$	A1	Full working must be seen oe eg $-40 - 32 = -72$ and $-40 \times 1.8 = -72$
	Alternative method 3		
	$F = 1.8F + 32$ and $F - 1.8F = 32$ or $0.8F = -32$	M1	Forms equation in one variable and collects terms correctly using any letter oe eg $1.8F - F = -32$ or $-0.8F = 32$
	$(F =) -32 \div 0.8$ and $F = -40$	A1	Full working must be seen oe eg $(F =) 32 \div -0.8$ and $F = -40$
	Additional Guidance		
	Ignore units		
	72 does not imply M1		
	Only $-72 + 32 = -40$		M1A0

Question	Answer	Mark	Comments
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7b	No and 5 or No and correctly evaluated counter example	B1	
	Additional Guidance		
	No, anything between -17°C and 0°C is positive in Fahrenheit	B1	
	No, anything between 0°F and 32°F is negative in Celsius	B1	
	Unless the range from -17°C to 0°C is given, then the counter example must be evaluated correctly		
	No because 1.8×-15 is -27 , and $32 - 27 = 4$	B0	
	Any temperature in Celsius between $-17\frac{7}{9}^{\circ}\text{C}$ and 0°C can be used as a counter-example eg1 $1.8 \times -10 + 32 = 14$ so No eg2 $1.8 \times -1 + 32 = 30.2$ so No	B1 B1	
	No because 14°F is -10°C	B1	
	Accept No because $-10 = 14$	B1	
	No because -15 is positive in Fahrenheit	B0	

8	$210 \div 2 \times 5$ or 105×5 or $1050 \div 2$ or $210 : 525$	M1	oe eg 210×2.5 or $420 + 105$
	525	A1	
	Additional Guidance		
	Further work after reaching 525		M0A0

Question	Answer	Mark	Comments
9	$\frac{100-68}{2}$ or $\frac{32}{2}$ or 16(%) or $\frac{1-0.68}{2}$ or $\frac{0.32}{2}$ or 0.16	M1	oe
	68 : 16 or $\frac{68}{16}$ or $68 \div 16$ or 4.25	A1	oe ratio not in form $n : 1$ eg 68% : 16% or 17 : 4 or 0.68 : 0.16 oe fraction or division or decimal implied by 4.25 : 1 oe
	4.25 : 1 or $4\frac{1}{4} : 1$	B1ft	oe ratio in form $n : 1$ eg $\frac{68}{16} : 1$ ft any ratio not in form $n : 1$ ft values must give n to 2 dp or better
	Additional Guidance		
	$\frac{100-68}{2} = 66$ 68 : 66 = 1.03 : 1	M1 A0B1ft	
	68 : 32 = 2.125 : 1 or 68 : 32 = 2.13 : 1	M0A0B1ft	
	68 ÷ 32, Answer 2.125 : 1 (no ratio seen to ft)	M0A0B0ft	
	Correct ratio with subsequent truncation or rounding to < 2 dp eg1 4.25 : 1, Answer 4 : 1 eg2 68 : 32 = 2.125 : 1, Answer 2.1 : 1	M1A1B0 M0A0B0	
	4.25 n : 1	M1A1B0	
	16 : 1 with no other creditworthy work	M1A0B0	

Question	Answer	Mark	Comments
10	$2 \times 4.2 \times \pi$ or 8.4π	M1	oe allow [3.14, 3.142] for π
	[26.376, 26.393]	A1	may be implied by 26.4 as answer
	26.4	B1ft	ft their value to at least 2 dp rounded correctly to 1 dp
	Additional Guidance		
	26.4	M1A1B1ft	
	26.3 only	M0A0B0ft	
	55.4 only	M0A0B0ft	
11	Any two of $(-2, -9)$, $(-1, -7)$, $(0, -5)$, $(1, -3)$, $(2, -1)$, $(3, 1)$, $(4, 3)$, $(5, 5)$	M1	gives at least two correct pairs of coordinates, may be in a table implied by points plotted $\pm \frac{1}{2}$ small square
	At least two correct points plotted or at least two of their points plotted correctly	M1dep	implied by correct line which does not have to extend from $x = -2$ to $x = 5$ $\pm \frac{1}{2}$ small square
	Correct line from $(-2, -9)$ to $(5, 5)$	A1	$\pm \frac{1}{2}$ small square ignore ends of line outside $[-2, 5]$
	Additional Guidance		
	Ignore extra points that are incorrect		

Question	Answer	Mark	Comments
12	$\frac{45+12}{380}$ or $\frac{57}{380}$ or $\frac{3}{20}$ or 0.15 or $100 \div \frac{380}{57}$ or $57 \div 3.8$	M1	oe proportion or calculation must use 380
	15	A1	
	Additional Guidance		
	$1 - \frac{59+158+106}{380}$ or $1 - \frac{323}{380}$ or $1 - \frac{17}{20}$ or $1 - 0.85$	M1	
	Correct proportion seen even if not subsequently used	M1A0	
	Do not allow misreads of 380		
	Build-up eg $10\% = 380 \div 10$ or 38 $5\% = 38 \div 2$ or 19 $38 + 19 = 57$ is M0A0 unless answer 15		

Question	Answer	Mark	Comments
13	$\frac{6}{120} \times 500$ or $[4.16, 4.17] \times 6$ or $[24.96, 25.02]$ or 4.2×6 or 25.2 or $25 : 500$ or $\frac{25}{500}$	M1	oe eg 0.05×500 or $500 \div 20$
	25	A1	
	Additional Guidance		
	Working and value may be seen by table		
	24 + 1, Answer 25		M1A1
	480 = 24, Answer 25		M1A1
	Embedded but not selected as answer eg $137.5 + 337.5 + 25 = 500$		M1A0
	Working for Not answered or Answered but sale not made is not choice eg ignore 137.5 and 337.5 seen		
	25 followed by answer 19		M1A0
	If rounded or truncated values are used, the final answer must be exactly 25 eg1 $500 \div 120 = 4.16, 4.16 \times 6$ Answer 25 (may have kept full value on calculator) eg2 $500 \div 120 = 4.16, 4.16 \times 6 = 24.96$ Answer 25 (comes from further rounding)		M1 A1 M1 A0

Question	Answer	Mark	Comments
14	Alternative method 1		
	$(65\% =) \frac{13}{20}$ or 7 : 13	M1	
	13	A1	must be selected as the answer
	Alternative method 2		
	$(100 - 35) \div 35 \times 7$ or $7 \div 35 \times 100 - 7$ or $20 - 7$	M1	oe eg $35 \div 7 = 5$ and $65 \div 5$
	13	A1	must be selected as the answer
	Alternative method 3		
	$\frac{35}{7} \times n = 100 - 35$ or $5n = 65$	M1	oe equation eg $\frac{7}{n} = \frac{35}{100 - 35}$ or $35n = 455$
	13	A1	must be selected as the answer
	Additional Guidance		
	35 : 65 with no other valid working	M0	
	Condone answer £13	M1A1	
	Answer 13% or $13n$	M1A0	
	$65\% = 0.65$	M0	
	Alt 2 $65 \div 35 = 1.9$ $1.9 \times 7 = 13.3$ (evidence of premature approximation) Answer 13	M1 A0	
	Alt 2 $65 \div 35 = 1.9$ $1.9 \times 7 = 13$ (assume full calculator value used)	M1 A1	

Question	Answer	Mark	Comments
15	Alternative method 1		
	16^2 or 256 and 30^2 or 900	M1	oe implied by 1156
	$\sqrt{16^2 + 30^2}$ or $\sqrt{256 + 900}$ or $\sqrt{1156}$ or 34	M1dep	oe eg $\sqrt{16^2 + 30^2 - 2 \times 16 \times 30 \times \cos 90}$
	52 × their 34 or 1768	M1dep	oe if M1M0 their 34 can be any value other than 16, 30 or 52 dep on 1st M
	$0.5 \times 30 \times 16$ or 240	M1	oe eg $0.5 \times 30 \times 16 \times \sin 90$
	2008	A1	SC3 2248
	Alternative method 2		
	$\tan^{-1} \frac{16}{30}$ or [28, 28.1] or $\tan^{-1} \frac{30}{16}$ or [61.9, 62]	M1	oe may be on diagram
	$\frac{30}{\cos(\text{their } [28, 28.1])}$ or $\frac{16}{\cos(\text{their } [61.9, 62])}$ or 34	M1dep	oe eg $\frac{16}{\sin(\text{their } [28, 28.1])}$ or $30 \cos(\text{their } [28, 28.1]) + 16 \cos(\text{their } [61.9, 62])$
	52 × their 34 or 1768	M1dep	oe if M1M0 their 34 can be any value other than 16, 30 or 52 dep on 1st M
	$0.5 \times 30 \times 16$ or 240	M1	oe eg $0.5 \times 30 \times 16 \times \sin 90$
	2008	A1	SC3 2248

Question	Answer	Mark	Comments
16	$\sin 72 = \frac{x}{8}$ or $8 \times \sin 72$ or $\cos (90 - 72) = \frac{x}{8}$ or $8 \times \cos (90 - 72)$ or $\frac{x}{\sin 72} = \frac{8}{\sin 90}$ or $\frac{\sin 72}{x} = \frac{\sin 90}{8}$	M1	oe eg $8 \cos 72$ or 2.47... or 2.5 and $\sqrt{8^2 - (8 \cos 72)^2}$
	[7.6, 7.61]	A1	
	Additional Guidance		
	If trigonometry and Pythagoras are used it must be a fully correct method that would lead to the correct value of x		
	Accept $\sin 72 \times 8$		M1
	Accept opp or o for x eg $\sin 72 = \frac{\text{opp}}{8}$		M1
	$\sin = \frac{x}{8}$ or $\sin \theta = \frac{x}{8}$ (unless recovered)		M0
	Answer coming from scale drawing		M0A0
	Answer in range seen followed by 7 or 8		M1A1