GCSE MATHEMATICS 8300/3F

Foundation Tier Paper 3 Calculator

Mark scheme

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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 Examiner.

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.

No student should be disadvantaged on the basis of their gender identity and/or how they refer to the gender identity of others in their exam responses.

A consistent use of 'they/them' as a singular and pronouns beyond 'she/her' or 'he/him' will be credited in exam responses in line with existing mark scheme criteria.

Further copies of this mark scheme are available from aqa.org.uk

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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 $\leqslant$ 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.

Q	Answer	Mark	Comments
1(a)	5	B1	
	Additional Guidance		
	Condone embedded answer		B1

Q	Answer	Mark	Comments
1(b)	9	B1	
	Additional Guidance		
	Condone embedded answer		B1

Q	Answer	Mark	Comments
1(c)	1	B1	
	Additional Guidance		
	Condone embedded answer		B1
	$\frac{10}{10}$		B0

Q	Answer	Mark	Comments
1(d)	-11	B1	
	Additional Guidance		
	Condone embedded answer		B1

Q	Answer	Mark	Comments
2(a)	$\frac{1}{3}$	B1	oe fraction, decimal or percentage condone 0.33(3…) or 33(.3…)%
	Additional Guidance		
	Ignore conversion attempt after correct answer seen		
	$33\frac{1}{3}\%$		B1
	Answer as a ratio eg 1 : 3		B0
	Do not allow answers in words eg1 1 out of 3 eg2 1 in 3		 B0 B0
	Ignore words alongside a correct response eg $\frac{1}{3}$ so unlikely		B1

Q	Answer	Mark	Comments
2(b)	All 5 of GG GW WR WG WW	B2	may be in any cell B1 any 2 correct
	Additional Guidance		
	Ignore any repeated answers for B1 eg GG WW RG RW GG		B1
	Ignore any blank cells for B1		

Q	Answer	Mark	Comments
3(a)	(6 + 5) – (3 + 7) = 1 or (Lee =) 11 and (Mike =) 10 or 6 – 3 = 3 and 7 – 5 = 2 and 3 – 2 = 1	B2	oe B1 9 + 12 or 21 or 6 + 5 or 11 or 9 – 6 + 12 – 5 or 3 + 7 or 10 or 6 – 3 and 7 – 5
	Additional Guidance		
	Ignore further work after correct response seen		
	Accept use of words in a statement to indicate subtraction eg1 Difference 3 on grass and difference 2 on clay and Lee one more eg2 Lee 3 more on grass and 2 less on clay	 B2 B1	
	Mike = 11 and Lee = 10	B1	

Q	Answer	Mark	Comments
3(b)	Fully correct composite bar drawn in correct position, with height 8 and width 1 and lower section = 6 and upper section = 2 and correct shading	B2	B1 correct composite bar drawn in incorrect position or incorrect width or 6 and 2 (either order) or composite bar drawn with lower section = 6 or upper section = 2
	Additional Guidance		
	Bar drawn (in any position) with lower section = 2 and upper section = 6	B1	

Q	Answer	Mark	Comments
4	156 ÷ 3 × 12 or 52 × 12 or 156 × 4 or 1872 ÷ 3	M2	oe M1 156 ÷ 3 or 52 or 12 ÷ 3 or 4 or 12 × 156 or 1872
	624	A1	

Q	Answer	Mark	Comments
5(a)	$\frac{3}{5}$	B1	oe fraction

Q	Answer	Mark	Comments
5(b)	$18 \div 3 \times 5$ or 6×5 or $90 \div 3$ or $18 \div$ their $\frac{3}{5}$	M1	oe their $\frac{3}{5}$ from part (a)
	30	A1	

Q	Answer	Mark	Comments
5(c)	$12 \div 5$ or 2.4 or their $\frac{3}{5} \times 2$ or 1.2 or their $\frac{3}{5} \times 12$ or 7.2	M1	oe their $\frac{3}{5}$ from part (a)
	8	A1	

Q	Answer	Mark	Comments
6(a)	Cake shop	B1	

Q	Answer	Mark	Comments
6(b)	1200	B2	B1 4 or 4 × 300 oe

Q	Answer	Mark	Comments
6(c)	180	B1	

Q	Answer	Mark	Comments
7	number of £2 coins 3 number of £1 coins 2 number of 50p coins 3	B3	B2 number of £2 coins 2 number of £1 coins 5 number of 50p coins 1 B1 total £9.50 or exactly 8 coins
	Additional Guidance		
	Mark the answer lines – if blank mark unambiguous working Two exceptions: answer 6, 2, 3 or answer 4, 5, 1 check working for possible transcription error		
	number of £2 coins 3 number of £1 coins 1 number of 50p coins 5 (total £9.50)		B1
	number of £2 coins 3 number of £1 coins 3 number of 50p coins 2 (exactly 8 coins)		B1
	number of £2 coins 3 number of £1 coins 0 (may be blank) number of 50p coins 5 (exactly 8 coins)		B1

Q	Answer	Mark	Comments
8(a)	4	B1	
	Additional Guidance		
	If answer line blank check the output oval		

Q	Answer	Mark	Comments
8(b)	11	B2	B1 $25 - 3$ or 22 or $11 \times 2 + 3$ or 11 adjacent to or in the input oval or 14 or 44 or 23.5 oe
	Additional Guidance		
	14 or 44 or 23.5 are for using at least one inverse operation		

Q	Answer	Mark	Comments
8(c)	$2x + 3$	B1	

Q	Answer	Mark	Comments
9	**Three** of the following four mistakes • key is missing • wrong number of apples • bananas are different (sizes) • each fruit has a different symbol	B3	oe B2 two of the mistakes B1 one of the mistakes
	Additional Guidance		
	Ignore non-contradictory statements alongside a correct statement		
	For the second possible mistake accept eg Wrong number of apples There are only 8 apples There's half an apple (symbol) missing There should be $2\frac{1}{2}$ symbols for apple There are 2 apples missing (but do **not** accept 2 apple symbols missing) The total is 30 but it adds up to 28		
	For the third possible mistake accept eg Bananas are different sizes Bananas should all be the same size The fruit should all be the same size The fruits are different sizes The symbols / pictures are different sizes He should make the symbols / pictures the same size		
	For the fourth possible mistake accept eg Each fruit has a different symbol / picture The symbols / pictures are different She should use the same symbol / picture for all the fruit		
	For either the third or fourth (but **not** both) accept The symbols / pictures are different The symbols / pictures should be the same They should use the same symbol / picture		

Q	Answer	Mark	Comments
10	925 ÷ 45 or [20.5, 20.6] or 20 remainder 25	M1	oe
	21	A1	implied by 10 500
	their 21 × 500	M1	oe their 21 cannot be 45 or 925
	10 500	A1ft	ft M1A0M1 with an integer number of coaches SC3 10 000 (using 20 coaches)

Q	Answer	Mark	Comments
11(a)	$3^2 + 2 \times -7$ or 9 or -14	M1	oe
	-5	A1	
	Additional Guidance		
	Values are not implied by expressions eg $-14c$ with no valid working		M0

Q	Answer	Mark	Comments
11(b)	$b = a + c$	B1	oe formula with $b =$ or $= b$

Q	Answer	Mark	Comments
12	0.01 × 80 ÷ 5 × 200 or 32 or 0.32	M3	oe M2 0.01 × 80 ÷ 5 or 0.16 or 0.01 × 80 × 200 or 160 or 0.01 ÷ 5 × 200 or 0.4 or 80 ÷ 5 × 200 or 3200 (all oe) M1 0.01 × 80 or 0.8 or 0.01 ÷ 5 or 0.002 or 0.01 × 200 or 2 or 80 ÷ 5 or 16 or 80 × 200 or 16 000 or 200 ÷ 5 or 40 (all oe)
	32p or £0.32	A1	must have correct units SC2 answer with digits 32
	Additional Guidance		
	Condone £0.32p		M3A1
	Allow working in pounds or pence throughout		
	An M2 or M1 calculation may be seen within a string of calculations which may contain errors eg 80 × 5 = 400 and 400 × 200 = 80 000		M1

Q	Answer	Mark	Comments
13	May be true Always true Not true	B3	B1 for each
	Additional Guidance		
	Accept any indication, but if a tick and a cross are used in the same row, mark the tick		
	A row with more than one tick is incorrect for that row		

Q	Answer	Mark	Comments
14	729	B3	B2 at least 3 square numbers greater than 64 **and** at least 3 cube numbers greater than 64 eg 81, 100, 121 **and** 125, 216, 343 or the cube root of a square number greater than 64 eg $\sqrt[3]{81}$ or the square root of a cube number greater than 64 eg $\sqrt{125}$ or 27^2 selected or 9^3 selected B1 at least 3 square numbers greater than 64 or at least 3 cube numbers greater than 64 SC2 4096
	Additional Guidance		
	SC2 is for working out the next number that is both a square number and a cube number after 729		
	Allow values of square and cube numbers from crossed out working		

Q	Answer	Mark	Comments
15	72 ÷ 4 or 18 or 72 × 5 or 360	M1	oe
	90	A1	

Q	Answer	Mark	Comments
16	810 ÷ 3 or 270	M1	oe implied by 1350
	810 ÷ 3 × (5 – 3) or 810 ÷ 3 × 5 × $\left(1-\frac{3}{5}\right)$ or 810 ÷ 3 × 5 – 810 or 540	M1dep	oe eg 1350 ÷ 5 × 2 810 ÷ 3 × 2 is M2
	0.45 × their 540 or 243	M1dep	oe 0.45 × $\frac{2}{5}$ × 1350 is M3
	623(.00)	A1	SC2 525.8(0)
	Additional Guidance		
	SC2 is for initially calculating $\frac{3}{5}$ of 810		

Q	Answer	Mark	Comments
17	$13x + 14$ or $14 + 13x$	B2	B1 $10x + 20$ or $13x$ or (+)14
	Additional Guidance		
	B1 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts		

Q	Answer	Mark	Comments
18	$2(3b-5)+7$	M1	oe
	$6b-3$ or $-3+6b$	A1	implied by $12b+1$ or $24b+9$
	$12b+1$ or $1+12b$	B1ft	ft 2 × (their $6b-3$) + 7
	Additional Guidance		
	Do not ignore further work for A1 or B1(ft) eg $6b-3=3b$ eg $12b+1=13b$ eg $6b-3=3b$ followed by $2(3b)+7=6b+7$ eg $6b-3=3b$ followed by $2(3b)+7=6b+7$ followed by $6b+7=13b$		M1A0 M1A1B0 M1A0B1ft M1A0B0
	Ignore additional terms, even if incorrect, unless given as the answer eg $6b-3$, $12b+1$, $24b+9$ Answer $12b+1$ eg $6b-3$, $12b+1$, $24b+9$ Answer $24b+9$		M1A1B1 M1A1B0

Q	Answer	Mark	Comments
19	$2+3+3+4$ or 12	M1	
	360 ÷ their 12 or 30	M1dep	$360 \times \frac{4}{12}$ oe scores M2
	120	A1	

Q	Answer	Mark	Comments	
20	14^2 and 6^2 **or** 160	M1	oe eg 196 and 36 implied by 232 or $\sqrt{232}$ or 15.2(…)	
	$\sqrt{14^2-6^2}$ or $\sqrt{196-36}$ or $\sqrt{160}$	M1dep	oe	
	12.6(…) with M1 seen	A1	accept 13 with M1 seen	
	Additional Guidance			
	12.6(…) with no working			M0M0A0
	12.6(…) using trigonometry or accurate/scale drawing only			M0M0A0

Q	Answer	Mark	Comments
21	**Alternative method 1: uses or states sin or cos 65**		
	sin or cos 65 stated or used	M1	oe implied by [0.42, 0.423] do not allow cos 25 or sin 65
	$\sin 25 = \frac{x}{5}$ or 5 × sin 25 or $\cos 65 = \frac{x}{5}$ or 5 × cos 65	M1dep	oe eg 5 × 0.423 accept [0.42, 0.423] for sin 25 or cos 65
	[2.1, 2.12] with M2 awarded	A1	
	Alternative method 2: works out vertical side first		
	5 × cos 25 or 5 × sin 65 or [4.5, 4.55]	M1	oe eg 5 × 0.906 accept [0.9, 0.91] for cos 25 or sin 65
	$\sqrt{5^2 - (\text{their } [4.5, 4.55])^2}$ or $\sqrt{[4.29, 4.75]}$ or their [4.5, 4.55] × tan 25 or their [4.5, 4.55] ÷ tan 65	M1dep	oe accept [0.46, 0.47] for tan 25 accept [2.14, 2.15] for tan 65
	[2.1, 2.12] with M2 awarded	A1	
	Additional Guidance		
	Alt 1 SOHCAHTOA with SOH selected (eg circled)		M1
	[2.1, 2.12] with no working		M0M0A0
	[2.1, 2.12] from accurate/scale drawing only		M0M0A0

Q	Answer	Mark	Comments
22(a)	$\pi \times (7.6 \div 2)^2 \times 2.5$ or 36.1π or [113.3, 113.43]	M1	oe
	170 ÷ their [113.3, 113.43]	M1	oe $\frac{170}{36.1\pi}$ their [113.3, 113.43] must not be 7.6 or 2.5
	[1.49, 1.5]	A1	
	g/cm^3	B1ft	ft change of unit
	Additional Guidance		
	Allow change of units, but stated units must be consistent with units used eg 1 changes units to mm vol = 36100π density = 0.0015 g/mm^3 eg 2 changes units to m and kg vol = 0.0001134 density = 1498.97 kg/m^3		M1M1A1B1 M1M1A1B1
	$\pi \times 3.8^2 \times 2.5 = 356.3$ and $170 \div 356.3$		M1M1
	$(\pi \times 3.8)^2 \times 2.5 = 356.3$ and $170 \div 356.3$		M0M1
	$\pi \times 7.6^2 \times 2.5 = 453.6$ and $170 \div 453.6$		M0M1

Q	Answer	Mark	Comments
22(b)	The density is less than the answer to part (a)	B1	

Q	Answer	Mark	Comments
23	**Alternative method 1: comparing actual number of 6s to expected number**		
	1038 ÷ 6 or 173	M1	
	1038 + their 173 or 1211	M1dep	1038 × $\frac{7}{6}$ oe scores M2
	Yes and 1211	A1	
	Alternative method 2: comparing actual extra number of 6s to expected number		
	1038 ÷ 6 or 173	M1	
	1092 – 1038 or 54	M1	
	Yes and 173 and 54	A1	
	Alternative method 3: comparing relative frequency to theoretical probability		
	1092 – 1038 or 54 or 1092 ÷ 1038 or 1.05(2…) or $\frac{1}{6}$	M1	oe fraction, decimal or percentage
	their 54 ÷ 1038 or their 1.05(2…) – 1 or 0.05(2…)	M1dep	oe fraction, decimal or percentage eg $\frac{9}{173}$
	Yes and 0.05(2…) and 0.16(6…) or 0.167 or 0.17	A1	oe using fractions with common denominators relative frequencies must be in a comparable form
	Additional Guidance		
	Up to M2 may be awarded for correct work with no answer or incorrect answer, even if this is seen amongst multiple attempts		

Q	Answer	Mark	Comments
24	$3x + 2$	B2	oe equation B1 $3x + c$ where c is a constant with $c \neq 2$ or $kx + 2$ where k is a non-zero constant with $k \neq 3$
	Additional Guidance		
	$3x$		B1
	$2 + 2x$		B1