

8300

GCSE MATHEMATICS

Foundation tier – Questions by Topic – Mark Scheme

Number

Adding, subtracting, multiplying and dividing integers

v1.0

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 within the scheme 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. e.g. accept 0.5 as well as $\frac{1}{2}$
[a, b]	Accept values between a and b inclusive.
3.14...	Allow answers which begin 3.14 e.g. 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.

Q1.

1489

B1 for
(1152 + 476 =) 1628
or (1152 - 139 =) 1013
or (476 - 139 =) 337
or their 1628 - 139 correctly evaluated
or their 1013 + 876 correctly evaluated
or their 337 + 7152 correctly evaluated

B2

[2]

Q2.

7889

B1 for
(7152 + 876 =) 8028
or (7152 - 139 =) 7013
or (876 - 139 =) 737
or their 8028 - 139 correctly evaluated
or their 7013 + 876 correctly evaluated
or their 737 + 7152 correctly evaluated

B2

Additional Guidance

$$7152 + 876 = 8026$$

$$8026 - 139 = 7887$$

B1

[2]

Q3.

Alternative method 1

$$\begin{array}{r} 8 3 \\ \times 2 6 \\ \hline 4 9 8 \\ 1 6 6 0 \\ \hline \end{array}$$

or

$$\begin{array}{r} 2 6 \\ \times 8 3 \\ \hline 7 8 \\ 2 0 8 0 \\ \hline \end{array}$$

at least one row correct, with the 0 correct for multiplication by the multiple of 10
you may see the rows of working switched

M1

their 498 + their 1660

or

their 78 + their 2080

M1dep

2158

A1

Alternative method 2

	20	6
80	1600	480
3	60	18

*at least three of the calculated values correct
may be seen as 4 calculations, not in a grid*

M1

their 1600 + their 480 + their 60 + their 18

M1dep

2158

A1

Alternative method 3

2	6	
1 6	4 8	8
0 6	1 8	3

at least three of the calculated values correct

M1

Total calculated for each diagonal with at least one correct carrying figure
clear attempt to add each diagonal

M1dep

2158

A1

Additional Guidance

$$20 \times 80 + 6 \times 3 \quad (= 1618)$$

MOA0

Alternative method 1: if the place holder 0 is missing or misaligned, allow this to be evidenced by their 8 as the units value in the answer, or an 'x' in place of the 0

Alternative method 2: if numbers are broken down further they must have at least 8 of the calculated values correct in example below (oe)

eg 40 40 3 and 10 10 6 (ie a maximum of one error)

Alternative method 3: diagonals must slope the correct way for M1
(unless recovered)

Diagonal lines not present is M0 unless this is recovered by seeing correct totals around the grid

Example of alternate method 3 with carrying completed once

	2	6	
1	1 6	4 8	8
11	0 6	1 8	3
	5	8	

M1M1depA0

[3]

Q4.

Alternative method 1 – traditional method

304 or 1520 with the 0 correct for the multiplication by 20

values may be seen separately or in rows

or

144 or 1680 with the 0 correct for the multiplication by 70

if 1520 or 1680 incorrect, placeholder 0, or equivalent must be present

M1

their 304 + their 1520

or

their 144 + their 1680

M1dep

1824

A1

Alternative method 2 – grid method

At least three of 1400, 280, 120 and 24

may not be in a grid

M1

their 1400 + their 280 + their 120 + their 24

M1dep

1824

A1

Alternative method 3 – Napier's bones

7	6	
1 4	1 2	2
2 8	2 4	4

oe

at least three of the calculated values correct

M1

Attempt to total correctly four diagonals for their table with carrying figure seen

M1dep

1824

A1

Alternative method 4 – breaking calculation down

Calculation broken down correctly with a maximum of one calculation error

eg $76 \times 10 \times 2$ (+) 70×4 (+) 6×4 with at least two of 1520, 280 and 24 correct

M1

Addition of their parts

eg $1520 + 280 + 24$

M1dep

1824

A1

Additional Guidance

$70 \times 20 + 6 \times 4 (= 1424)$

M0M0A0

Alt 1 $304 + 152 = 456$

M0M0A0

Alt 1 If the 0 is missing, allow 0 to be replaced by x or a placeholder space (may be implied by their 4 in units column of their final answer)

Alt 3 Diagonal lines must slope consistently for M1 unless recovered

Alt 3 Diagonal lines missing is M0 unless recovered

Alt 3 For M1M1dep, a carrying figure must be seen or implied

Alt 3 Answer must be clearly stated and not left “around” the grid

[3]

Q5.

30

B1

[1]

Q6.

344

B1

39

B1

305

ft their 344 – their 39 if either B1B0 or B0B1 awarded

B1ft

Additional Guidance

If their division results in a decimal answer, allow correct rounding to 0dp or better for the B1ft

eg $234 \div 6 = 38.333$, $344 - 38.3 = 305.7$ (may have answer 306)

B1B0B1ft

eg 344, $234 \div 6 = 20.3$, answer 324

B1B0B1ft

Negative, fractional and decimal answers are acceptable on ft

[3]

Q7.

- (a) Division set up, with 8 and a remainder 3 seen in correct position
or
 $830 \leq \text{answer} < 840$ but not 834

$$\begin{array}{r} 8 \\ 8 \overline{) 91374} \end{array} \quad \text{or} \quad \begin{array}{r} 8 \\ 9 \ 1 \ 7 \ 4 \\ \underline{8 \ 8} \\ 3 \end{array}$$

834

M1

A1

Additional Guidance

Build up method or chunking method must lead to $830 \leq \text{answer} < 840$ to score M1 or better

(b) $\frac{35}{42} (+) \frac{18}{42}$

oe

fractions with a correct common denominator and at least one correct numerator

M1

$$\frac{53}{42}$$

oe improper fraction

A1

$$1 \frac{11}{42}$$

oe mixed number

ft for correct conversion of an improper fraction to a mixed number

B1ft

Additional Guidance

For B1ft the mixed number must not be an integer

Beware $5 + 3 = 53$

M0

When attempts are made to cancel the fraction, full marks cannot be scored

$$\frac{53}{42} = \frac{9}{4} = 2 \frac{1}{4} \quad (\text{attempt to cancel occurs before conversion to mixed number})$$

M1A1B0

$$\frac{53}{42} = 1 \frac{11}{42} = 1 \frac{1}{3} \quad (\text{attempt to cancel occurs after completely correct answer seen})$$

M1A1B0

[5]

Q8.

(a) 1236

B1

(b) 67

B1

(c) 13

B1

(d) Attempt to multiply 93 by 60 and 7
or
attempt to multiply 67 by 90 and 3

For example:

$$\begin{array}{r} 93 \\ 67 \times \\ \hline xxx \\ \hline xxx0 \end{array}$$

	90	3
60	xx00	xx0
7	xx0	xx

where x represents a digit, so that:
 xx represents a two digit number,
 $xx0$ represents a three digit number ending in zero, etc

9	3	
5	4	1
6	3	2

54, 63, 18 and 21 correctly entered into the grid. Allow 1 error in the values

M1

Adds all the required components

$$\begin{array}{r} 93 \\ 67 \times \\ \hline 651 \\ 5580 + \end{array} \quad \begin{array}{r} 67 \\ 93 \times \\ \hline 201 \\ 6030 + \end{array}$$

At least 1 of the 2 parts correct and added

	90	3
60	5400	180
7	630	21

At least 3 of the values correct and all 4 added

Napier's Bones method:

At least three of 54, 63, 18 and 21 correct and all four numbers added in the correct manner

M1

6231

A1

[6]

Q9.

- (a) 17
- (b) 55
- (c) 9
- (d) 180

B1

B1

B1

B1

[4]

Q10.

40

condone 040

B1

[1]

Q11.

6

B1

[1]

Q12.

624

B1 answer ending with units digit 4

or

addition method from 438 with no more than one error

or

shows correct “borrowing” with no more than one error

B2

[2]

Q13.

Fully correct:

- 4 correct sums
- only uses integers 1-12
- no repeated numbers

$$1 + 2 + 4 = 7$$

$$9 + 11 + 12 = 32$$

$$3 + 5 + 7 = 15$$

$$6 + 8 + 10 = 24$$

B3

each set of 3 in any order

B2

4 mathematically correct sums with one of:

- *only uses integers 1-12*
- *no repeated numbers*

or

2 or 3 mathematically correct sums and both of:

- *only uses integers 1-12*
- *no repeated numbers*

B1

2 or 3 mathematically correct sums with one of:

- *only uses integers 1-12*
- *no repeated numbers*

or

only 4 mathematically correct sums

Additional Guidance

Allow negative or decimal numbers for up to B2

For a row to be mathematically correct, there must be three numbers

Blank boxes should not be treated as zeros

Any box that is not crossed out must be considered when checking the conditions regarding integers 1-12 and repeated numbers

If a number is crossed out, but still legible, judge in favour of the student to give the best mark

A completed row takes precedence over working space

If a row is blank, check working space for that calculation and award a mark based on the work that benefits the student most

Working outside of boxes must be evaluated

[3]**Q14.**

344

B1

39

B1

305 ft their 344 – their 39 if either B1B0 or B0B1 awarded

B1ft**Additional Guidance**

If their division results in a decimal answer, allow correct rounding to 0dp or better for the B1ft

eg $234 \div 6 = 38.333$, $344 - 38.3 = 305.7$ (may have answer 306)

B1B0B1ft

eg 344, $234 \div 6 = 20.3$, answer 324

B1B0B1ft

Negative, fractional and decimal answers are acceptable on ft

[3]

Q15.

$$16 \times 3$$

oe

M1

$$48$$

accept 3:48 or 48:3

A1

[2]

Q16.

Alternative method 1

$$68 \div 10$$

M1

6.8 or 6 remainder (8)

or 6

May be implied

A1

$$7$$

ft their 6.8 rounded up

A1ft

Alternative method 2

Lists multiples of 10 up to at least 60 or counts down in 10s to at least 8

Allow one error

M1

$$6 \times 10 = 60$$

$$\text{or } 7 \times 10 = 70$$

May be implied

A1

$$7$$

A1ft

[3]

Q17.

$$21 \times 9$$

oe

M1

$$189$$

A1

their 189 – 90 or 99

M1

their 99×8 or 90×5

ft their 189

M1dep

their $99 \times 8 + 90 \times 5$

or $792 + 450$ or 1242

ft their 189

M1dep

1242 and Close

ft their 189

A1ft

[6]

Q18.

$63 \div 12$ or $5.2\ldots 5 \text{ r } 3$ or 5
or 12, 24, 36, 48, 60 and 72 seen

oe

M1

$27 \div 8$ or $3.3\ldots 3 \text{ r } 3$ or 3
or 8, 16, 24 and 32 seen

oe

M1

6 or 4 *From either M1*

A1

10 *Condone 6 (for squash) and 4 (for coffee)*

A1

[4]

Q19.

Alternative method 1

53×3 or 159

M1

their $159 \div 12$

oe eg $53 \div 4$

*for build up method allow one error, must get as far as 1
minibus below their total number of passengers*

M1dep

13. or 13.2 or 13.25

or 13 r (3) or $13\frac{3}{12}$

or build up method reaches 156 (for 13 minibuses) with no errors

may be implied by correct answer

oe fraction

A1

14

*ft their decimal or remainder value rounded up to the nearest
whole number with M2 scored*

A1ft

Alternative method 2

$53 \div 12$ or $4.4\ldots$ or $4 \text{ r } 5$

or $4\frac{5}{12}$

M1

their $4.4\ldots \times 3$

or $4\frac{5}{12} \times 3$ or $12\frac{15}{12}$ oe fraction

M1dep

13.(2...) or 13 r (3) or $13\frac{3}{12}$

may be implied by correct answer oe fraction

A1

14

*ft their decimal or remainder value rounded up to the nearest
whole number with M2 scored*

A1ft

Additional Guidance

For answers of 14, please check for incorrect working
eg $159 \div 12 = 14.1$ and answer 14

M2A0A0ft

$159 \div 12$ with result 13.8 and answer 14

M2A0A1ft

$159 \div 12$ with result 13 r 2 and answer 14

M2A0A1ft

159 with build up to 13 minibuses is 158 and answer 14

M2A0A1ft

$159 \div 12$ with no decimal or remainder value and answer 14

M2A2

$159 \div 12 = 13$. Answer 13

M2A1A0

$159 \div 12 = 13$ Answer 13

M2A0

14 with no working

M2A2

$159 \div 12$ with result 13.3 (bod from 13.25) and answer 14

M2A2

$159 \div 12$ with result 13.3 (bod from 13.25) with no final answer

M2A1A0

$53 \div 12 = 4(.) = 5$, $5 \times 3 = 15$, so 15 minibuses (conceptually incorrect)

M1M0A0A0ft

$53 \div 12 = 4.7$, $4.7 \times 3 = 14.1$, so 15 minibuses

M2A0A1ft

For build up method

$53 \times 3 = 159$, $12 \times 13 = 156$

M2A1A0

$53 \times 3 = 159$, $12 \times 13 = 156$, 15 minibuses

M2A1A0

$12 \times 13 = 156$, without their 159 (don't know what they are building up to)

M0A0

Build up method reaches 156 (for 13 minibuses) with no errors and no answer, but says "3 more seats needed"

M2A1A0

[4]