

8300

GCSE MATHEMATICS

Foundation and Higher tier – Questions by Topic – Mark Scheme

Number

Four operations with mixed numbers

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.

Correct conversion of or correct method to convert $1\frac{1}{5}$ to $\frac{12}{10}$ or $1\frac{2}{10}$

with no incorrect conversion of $\frac{3}{10}$

or

correct method for or correct result of conversion of both fractions to a common denominator $\neq 10$

or

$$1 - \frac{1}{10}$$

or

$$1.2 - 0.3 \quad \text{or} \quad 0.9$$

M1

$$\frac{9}{10}$$

oe fraction eg $\frac{45}{50}$

A1

Additional Guidance

Ignore attempt to simplify if correct fraction seen

$$\frac{12}{10} - \frac{3}{10}$$

M1

$$\frac{12}{10} - \frac{6}{10}$$

M0

[2]

Q2.

$$\left(\frac{5}{8} = \right) \frac{10}{16}$$

or

Converts both fractions to a common denominator with at least one numerator correct

M1

$$\frac{23}{16}$$

oe improper fraction

A1

$$1\frac{7}{16}$$

oe mixed number

ft correct conversion of their improper fraction to a mixed number

B1ft

Additional Guidance

Ignore incorrect simplification after B1 or B1ft awarded

[3]

Q3.

$$\frac{7}{3}$$

oe improper fraction

M1

$$\frac{5}{4} \text{ or } \times 1.25$$

or

$$7 \times 5 \text{ and } 3 \times 4$$

or

$$\frac{7 \times 5}{3 \times 5} \div \frac{4 \times 3}{3 \times 5} \text{ or } \frac{35}{15} \div \frac{12}{15}$$

oe
if seen in a grid, must be selected

M1

$$\frac{35}{12}$$

oe improper fraction

A1

$$2\frac{11}{12}$$

oe mixed number
ft their improper fraction correctly converted to a mixed number if at least M1 awarded

A1ft

Additional Guidance

Ignore attempts to simplify after mixed number seen

$$\frac{8}{3} \times \frac{5}{4} = \frac{40}{12}, \text{ answer } 3\frac{4}{12}$$

M0M1A0A1ft

[4]

Q4.

Alternative method 1

$$\frac{17}{2} \text{ or } \frac{8}{3}$$

oe fractions

M1

their $\frac{17}{2} \times$ their $\frac{3}{8}$

conversion of both mixed numbers to improper fractions and
multiplication of the conversion of $8\frac{1}{2}$ by the reciprocal of the
conversion of $2\frac{2}{3}$

M1

$$\frac{51}{16}$$

oe fraction or decimal

A1

$$3\frac{3}{16}$$

oe mixed number
ft correct conversion of their improper fraction to a mixed number

B1ft

Alternative method 2

$$\frac{17}{2} \text{ or } \frac{8}{3}$$

oe fractions

M1

$$\frac{51}{6} \div \frac{16}{6}$$

conversion of both mixed numbers to improper fractions,
correct conversion to improper fractions with a common
denominator and division of the conversion of $8\frac{1}{2}$ by the
conversion of $2\frac{2}{3}$

M1

$$\frac{51}{16}$$

oe fraction or decimal

A1

$$3\frac{3}{16}$$

oe mixed number
ft correct conversion of their improper fraction to a mixed
number

B1ft

Additional Guidance

Working with decimals

0, 3 or 4

Ignore incorrect attempt to simplify a mixed number

eg $3\frac{3}{16} = 3\frac{1}{8}$

M1M1A1B1

$3\frac{3}{16}$ seen, then $\frac{51}{16}$ on answer line

M1M1A1B0

$\frac{9}{2}$ and $\frac{8}{3}$, $\frac{27}{6} \div \frac{16}{6}$, $\frac{27}{16}$, $1\frac{11}{16}$

M1M1A0B1ft

$\frac{9}{2}$ and $\frac{8}{3}$, $\frac{27}{6} \div \frac{16}{6}$, $1\frac{11}{16}$

M1M1A0B1ft

$\frac{9}{2}$ and $\frac{4}{3}$, $\frac{27}{6} \div \frac{8}{6}$, $\frac{27}{8}$, $3\frac{3}{8}$

M0M1A0B1ft

[4]

Q5.

$$3\frac{1}{2}$$

$$B1 \frac{7}{2}$$

B2

[2]

Q6.

$$\frac{7}{12}$$

B1 for $\frac{67}{12}$ or 5.58...

or $\frac{1}{3}$ or $\frac{21}{4}$

B2 oe mixed fraction eg $5\frac{14}{24}$

B2

[2]

Q7.

$$2\frac{4}{7} \times 5\frac{3}{5} \text{ oe}$$

$$\text{or } \frac{18}{7} \times \frac{28}{5}$$

$$14.4 \text{ or } \frac{72}{5} \text{ or } \frac{504}{35}$$

$$14\frac{2}{5}$$

oe mixed fraction

M1

A1

[2]

Q8.

Alternative method 1

$72 \div 6 \times 5$ or 60 oe
 $72 \div 6 \times 11$ or 132 implies M1

M1

72×1.5 or 108 oe eg $72 \times 3 \div 2$
 14×12 implies M2

M1

60 and 108 and 240
or $250 - 60 - 108 = 82$
oe eg1 168 and 240
eg2 60 and 108 and 10
eg3 168 and $(250 - 72 =) 178$

A1

Alternative method 2

6×1.5 or 9 oe eg1 $6 \times 3 \div 2$
eg2 $6 : 5 : 9$

M1

$72 \div 6 \times (6 + 5 + \text{their } 9)$
or $72 \div 6 \times 5$ and $72 \div 6 \times \text{their } 9$
oe eg 12×20
 14×12 implies M2

M1dep

9 and 240
or 60 and 108 and 240
or $250 - 60 - 108 = 82$
oe eg1 168 and 240
eg2 60 and 108 and 10
eg3 168 and $(250 - 72 =) 178$

A1

Additional Guidance

Up to M2 may be awarded for correct work, with no or incorrect answer, even if this is seen amongst multiple attempts
In Alt 1 the 2nd mark is not dependent
In Alt 2 the 2nd mark is dependent
240 alone or 240 with no correct method

M0

$72 \div 6 \times 11 = 132$ and $132 + 108 = 240$

M1M1A1

$1\frac{1}{2} \times 72 = 36$ and $72 + 36 = 108$ and $72 + 60 + 108 = 240$

M1M1A1

$1\frac{1}{2} \times 72 = 36$

M1

$1\frac{1}{2}$ of 72 = 36

M0

$72 \div 11$

M0

[3]

Q9.

$$2\frac{7}{9}$$

B1

[1]

Q10.

$$\frac{17}{8}(-\frac{2}{3}) \text{ Or } 1\frac{9}{8}(-\frac{2}{3})$$

M1

Common denominator with at least one numerator correct *ft their fractions*

$$\frac{51}{24}(-)\frac{16}{24} \text{ if correct}$$

Or grid method with correct bottom right cell and at least one other cell correct

M1

$$\frac{35}{24} \text{ or } 1\frac{11}{24} \text{ oe}$$

A1

Alternative method 1

Common denominator with at least one numerator correct

$$\text{eg } 2\frac{3}{24} - \frac{16}{24} \text{ if fully correct}$$

Or grid method with correct bottom right cell and at least one other cell correct

M1

$$1\frac{27}{24} - \frac{16}{24} \text{ ft their } 2\frac{3}{24}$$

M1

$$\frac{35}{24} \text{ or } 1\frac{11}{24}$$

A1

Alternative method 2

Common denominator with at least one numerator correct

$$\text{eg } 2\frac{3}{24} - \frac{16}{24} \text{ if fully correct } \text{Or grid method with correct bottom right cell and at least one other cell correct}$$

M1

$$2\frac{13}{24}$$

Award for subtraction of numerators (one may be wrong)

M1

$$\frac{35}{24} \text{ or } 1\frac{11}{24}$$

A1

Alternative method 3

$$1\frac{1}{3} + \frac{1}{8}$$

M1

Common denominator with at least one numerator correct

$$\text{eg } \frac{32}{24} + \frac{3}{24} \text{ if fully correct}$$

M1

$$\frac{35}{24} \text{ or } 1\frac{11}{24}$$

A1

[3]

Q11.

$$4\frac{1}{2} \times 3\frac{3}{4} \text{ or } \frac{9}{2} \text{ or } \frac{15}{4}$$

M1

$$\frac{9}{2} \times \frac{15}{4} \text{ or } \frac{135}{8}$$

M1dep

$$16\frac{7}{8}$$

oe mixed number

A1

Alternative method

$$4.5 \times 3.75 \text{ or } 15 \text{ or } 1.875$$

M1

Full method to evaluate 4.5×3.75

allow one error

M1dep

$$16.875$$

condone rounding or truncation after correct answer seen

A1

[3]

Q12.

$$1\frac{3}{4} \div 5\frac{5}{6}$$

or $\frac{7}{4}$ and $\frac{35}{6}$

oe

$$\text{eg } \frac{42}{24} \text{ and } \frac{140}{24}$$

M1

$$\text{or } \frac{7}{4} \div \frac{35}{6}$$
$$\text{or } \frac{7}{4} \times \frac{6}{35} \text{ or } \frac{6}{20}$$

oe unsimplified correct fraction

M1

$$\frac{3}{10}$$

A1

[3]

Q13.

$$\frac{11}{4} \text{ or } \frac{16}{9}$$

oe fraction

M1

$$\frac{\text{their } 11 \times \text{their } 16}{4 \times 9} \text{ or } \frac{176}{36}$$

oe fraction

$$\frac{11 \times 8}{2 \times 9} \text{ or } \frac{88}{18} \text{ or } \frac{11 \times 4}{9} \text{ or } \frac{44}{9}$$

M1dep

$$4\frac{8}{9}$$

oe mixed number

$$\text{SC2 } 4.\dot{8}$$

A1

Additional Guidance

$$4\frac{16}{18} \text{ or } 4\frac{32}{36}$$

M1M1A1

Working in decimals is SC2 or 0

[3]

Q14.

$$1\frac{5}{6} \div 4\frac{1}{8}$$

$$\text{or } \frac{11}{6} \text{ and } \frac{33}{8}$$

oe

$$\text{eg } \frac{44}{24} \text{ and } \frac{99}{24}$$

M1

$$\frac{11}{6} \div \frac{33}{8}$$

$$\text{or } \frac{11}{6} \times \frac{8}{33} \text{ or } \frac{8}{18}$$

oe unsimplified correct fraction

M1

$$\frac{4}{9}$$

A1

[3]