

8300

GCSE MATHEMATICS

Foundation and Higher tier – Questions by Topic – Mark Scheme

Number

Rounding using significant figures

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.

1950 or 2049 or 1500 or 2499

M1

1500 and 2049

or

1950 and 2499

Must be seen as a linked pair

M1

549

SC2 550

A1

[3]

Q2.

Sight of 20, 0.5, 10 or 2

M1

$$\frac{20 \times 0.5}{2}$$

oe $\frac{10}{2}$ or 10×0.5 or 20×0.25

M1

5

A1

[3]

Q3.

32

B1 4 or 16 or 0.5

B2

[2]

Q4.

80 or 10 or 400

M1

80 and 10 and 400 seen

$$\frac{80 \times 10}{400}$$

or with two correct

M1

2 from correct approximations

A1

Additional Guidance

2 without any correct approximations

MOM0A0

[3]

Q5.

Any two of 0.5, 40 and 100

1600 implies 40

10 implies 100

M1

$(40^2 =) 1600$

or $(0.5 \times 40^2 =) 800$

or $(\sqrt{100} =) 10$

M1

80 with correct working

A1

Additional Guidance

$$\frac{0.5 \times 1600}{\sqrt{100}} \text{ or } \frac{0.5 \times 40^2}{10} \text{ or } \frac{1 \times 1600}{10} \text{ or } \frac{800}{\sqrt{100}} \text{ or } \frac{800}{10}$$

M1M1

80 with no or incorrect working, e.g. attempt at actual calculation and then rounding to 80

M0M0A0

Condone 0.50(0) for 0.5, 40.0(0) for 40 and 100.0(0) for 100 etc

Rounding 0.526 to 1, but otherwise correct, with answer 160

M1M1A0

[3]

Q6.

(a) 752951 or 752951 or 752,951

Allow commas even if positioning incorrect

eg 75,2951 or 752'951 B1

B1

Additional Guidance

752.951

B0

(b) 20 000 and 400 and 10
and

800 000 and Yes

ft correct decision for their answer to (a)

oe decision e.g. it is sensible

B2 20 000 and 400 and 10

B1 20 000 or 400 or 10

B3ft

Additional Guidance

800 000 (and Yes) with no other values

B0

If answer to (a) is 800 000 to 1sf then the correct ft decision in (b) is Yes

eg1 (a) 770 000 (b) decision should be Yes

eg2 (a) 1762 (b) decision should be No

eg3 (a) 752.951 (b) allow decision to be Yes or No

[4]

Q7.

(a) 8 or 10

8 may be implied by 2^2 or 4

M1

8 and 10

and

$\frac{1}{40}$

or 0.025

8 may be implied by 2^2 or 4

accept 0.03 with $\frac{1}{40}$ or 0.025 seen

A1

Additional Guidance

Do not allow exact calculations for M1A1

eg $4.113 = 4$ and $10.21 = 10$ and $\frac{1}{40}$

M1A0

$\frac{1}{40}$

or 0.025 with 8 or 10 seen (8 may be implied by 2^2 or 4)

M1A0

$\frac{1}{40}$

or 0.025 without 8 or 10 seen (8 may be implied by 2^2 or 4)

M0A0

(b) Valid explanation

eg both numbers have been rounded down

B1

Additional Guidance

Ignore irrelevant reasons alongside a correct reason, unless contradictory

Ignore a calculation using exact values alongside a correct reason

eg 0.025 is greater than 0.0238... and both numbers rounded down

B1

0.025 is greater than 0.0238...

B0

The denominator is smaller

B1

The denominator using the exact values is bigger

B1

(Decimals) rounded down

B1

Because 8.34 is more than 8 and 10.21 is more than 10

B1

One is divided by less (with answer more)

B1

Estimating rounds the numbers down which makes the denominator less

B1

Estimating rounds the numbers down which makes it less

B0

Because it rounds up

B0

Because she rounded each number to one significant figure

B0

The numbers get rounded up so more than the exact value

B0

Rounded up when estimating

B0

Removing the decimals makes the number bigger

B0

[3]

Q8.

225

B1

224.5 or 224.49^r

B1 for the minimum value of their 225

Eg 229 giving 228.5, 226 giving 225.5

Must be a sensible lower bound for 230

B1ft

[2]

Q9.

(a) $8^2 + 5^2 + 3^2$

or $64 + 25 + 9$ or 98

M1

9.899(49...) or 9.9

accept 10 with working

A1

(b) 9.9

*ft their (**a**) 3 sf rounded to 2 sf*

B1ft

(c) $(4a)^2$ or $(8a)^2$ or $16a^2$ or $64a^2$ seen

M1

$81a^2$ or $\sqrt{81a^2}$

M1dep

$9a$

A1

[5]

Q10.

41 + 22 + 28 + 17
or 108

M1

(0 +) 14 + 30 + 53 + 37 + 41 + 22 + 28 + 17
or their 108 + 14 + 30 + 53 + 37
or their 108 + 134
or 242

oe

M1

their 108
their 242 × 100

M1dep

44.62(...) or 44.63

A1

44.6

ft their 44.62

SC3 for 27.7 (percentage higher than grade C)

SC2 for 27.6(8...)

B1ft

Alternative Method

14 + 30 + 53 + 37
or 134

M1

(0 +) 14 + 30 + 53 + 37 + 41 + 22 + 28 + 17
or their 134 + 41 + 22 + 28 + 17
or their 134 + 108
or 242

oe

M1

their 134
their 242 × 100 or 55.37(...)

M1dep

44.62(...) or 44.63

A1

44.6

ft their 44.62 or 55.37

SC3 for 27.7 (percentage higher than grade C)

SC2 for 27.6(8...)

Note: 55.4 scores M1M1M1A0B1ft

B1ft

[5]

Q11.

$$\tan 50 = \frac{h}{24}$$

$$\tan 40 = \frac{24}{h}$$

M1

$$24 \times \tan 50 \text{ or } [28.5, 29]$$

$$24 \div \tan 40 \text{ or } [28.5, 29]$$

M1dep

$$\frac{1}{2} \times 24 \times 24 \tan 50$$

$$\frac{1}{2} \times 24 \times (24 \div \tan 40)$$

M1dep

$$[342, 348]$$

A1

$$340 \text{ or } 350$$

Must ft from their 3sf answer if seen

B1ft

Alternative Method 1

$$\cos 50 = \frac{24}{x}$$

$$\sin 40 = \frac{24}{x}$$

M1

$$24 \div \cos 50 \text{ or } [37.3, 37.5]$$

$$24 \div \sin 40 \text{ or } [37.3, 37.5]$$

M1dep

$$\frac{1}{2} \times 24 \times \text{their } 37.3 \times \sin 50$$

M1dep

$$[342, 348]$$

A1

$$340 \text{ or } 350$$

Must ft from their 3sf answer if seen

B1ft

Alternative Method 2

$$\frac{x}{\sin 50} = \frac{24}{\sin 40}$$

$$\frac{x}{\sin 90} = \frac{24}{\sin 40}$$

M1

$$\frac{24 \sin 50}{\sin 40} \text{ or } [28.5, 29]$$

$$\frac{24}{\sin 40} \text{ or } [37.3, 37.5]$$

M1dep

$$\frac{1}{2} \times 24 \times 24 \tan 50$$

$$\frac{1}{2} \times 24 \times \text{their } 37.3 \times \sin 50$$

M1dep

$$[342, 348]$$

A1

$$340 \text{ or } 350$$

Must ft from their 3sf answer if seen

B1ft

[5]

Q12.

445 and 544

*B2 445 or 544
or 450 and 540
or 450 and 549
B1 450 or 540 or 545 or 549*

B3

[3]

Q13.

342.5 or 347.5

Allow 347.49 for 347.5

B1

6.35 or 6.45 or 2.55 or 2.65

Allow 6.449 for 6.45

Allow 2.649 for 2.65

B1

their $6.35 \times$ their 2.55 or 16.1925

*Must use their lower bounds for lengths
their 6.35 must be [6.3, 6.4]
their 2.55 must be [2.5, 2.6]*

M1

their $347.5 \div$ their 16.1925

*Must use their upper bound for force
their 347.5 bound must be (345, 350]*

M1dep

21.46

*Must come from $347.5 \div (6.35 \times 2.55)$
or $347.49 \div (6.35 \times 2.55)$*

A1

Additional Guidance

$347.49 \div (6.35 \times 2.55) = 21.46$

B0B1M1M1A0

21.4... or 21.5 does not score any marks if no working is seen

[5]