

8300

GCSE MATHEMATICS

Foundation and Higher tier – Questions by Topic – Mark Scheme

Number

Calculating with roots and powers (calculator)

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.

Alternative method 1 of 4

Identifies any 3-digit cube number

125 or 216 or 343 or 512 or 729

M1

125 and 216 and 343 and 512 and 729

M1dep

125 and 216 and 343 and 512 and 729
and 64 and 1000

A1

Alternative method 2 of 4

Identifies any 3-digit cube number

125 or 216 or 343 or 512 or 729

M1

$5^3 = 125$ and $9^3 = 729$ and 5, 6, 7, 8, 9 or $9 - 4 = 5$

M1dep

$5^3 = 125$ and $9^3 = 729$ and 5, 6, 7, 8, 9 or $9 - 4 = 5$ and ($4^3 =$) 64 and ($10^3 =$) 1000

A1

Alternative method 3 of 4

$\sqrt[3]{100} = 4.6\dots$

M1

$\sqrt[3]{999} = 9.9\dots$ or $\sqrt[3]{1000} = 10$

M1

$\sqrt[3]{100} = 4.6\dots$

and $\sqrt[3]{999} = 9.9\dots$ or $\sqrt[3]{1000} = 10$

and 5, 6, 7, 8, 9 or $9 - 4 = 5$

A1

Alternative method 4 of 4

$5^3 = 125$

M1

$10^3 = 1000$ or $\sqrt[3]{1000} = 10$

M1

$4^3 = 64$ and $5^3 = 125$

and $10^3 = 1000$ or $\sqrt[3]{1000} = 10$

and 5, 6, 7, 8, 9 or $9 - 4 = 5$

A1

[3]

Q2.

$$\boxed{36} \div \boxed{2}$$

*B1 any square number > 1
or
any prime number*

B2

Additional Guidance

Allow squares to be written in index form for B2 or B1 eg

$$\boxed{6^2} \div \boxed{2}$$

B2

$$\boxed{2} \div \boxed{36}$$

B1

$$\boxed{} \div \boxed{9}$$

B1

$$\boxed{72} \div \boxed{4}$$

B1

Mark the boxes

[2]

Q3.

$$5^4$$

B1

[1]

Q4.

$$8$$

B1

[1]

Q5.

(a) 24

B1

(b) 7.5(26...)

B1

(c) 6.25 or $6\frac{1}{4}$ or $\frac{25}{4}$

B1

[3]

Q6.

$$7488$$

B1

[1]

Q7.

(a) 1.4

oe

B1

(b) 1.26

B1

[2]

Q8.

(a) 343

B1

(b) Any two cube numbers from 8 or 27 or 64 or 125 or 216

M1

125 and 216

Any order

Accept 5^3 and 6^3

Accept 5 and 6

A1

[3]

Q9.

729

B1

[1]

Q10.

3^4

Any unambiguous indication

B1

[1]

Q11.

Any even square whole number

eg 4 or 16 or 36 or 64

B1

Additional Guidance

0

B1

$2^2 = 4$

B1

Answer only of 2^2

B0

Answer only of $\frac{16}{4}$

B0

[1]

Q12.

10 000

B1

[1]

Q13.

27

B1

[1]

Q14.

($x =$) 14 and -14 *B1*
($x =$) 14
or ($x =$) -14

B2

[2]

Q15.

(a) 16

B1

(b) 2187

B1

[2]

Q16.

26

B1

[1]

Q17.

27 in the box on the left side of calculation *accept 3^3 for 27 throughout*

B1

Three different prime numbers in the boxes on the right side of calculation

M1

$27 = 3 + 5 + 19$

or $27 = 3 + 7 + 17$

or $27 = 3 + 11 + 13$

numbers in the boxes on the right side of calculation can be in any order

SC2

$27 = 2 + 2 + 23$

or $27 = 5 + 5 + 17$

or $27 = 7 + 7 + 13$

or $27 = 5 + 11 + 11$

A1

Additional Guidance

SC2 is for using a repeated prime number

$27 = 3 + 5 + 17$

B1M1A0

$27 = 7 + 11 + 9$

B1M0A0

$27 = 1 + 3 + 23$

B1M0A0

List of prime numbers with right side boxes empty or incorrect

M0

[3]

Q18.

32

B1

[1]

Q19.

125 216 343 with no extras

B1 125 216 343 seen with extras

or

two of 125 216 343 seen alone or with extras

or

5^3 6^3 7^3

B2

Additional Guidance

125 216 343 seen with answer 5^3 6^3 7^3

B2

5^3 6^3 7^3 only

B1

125 216 343 seen with answer 5 6 7

B1

5 6 7 only

B0

Extras may be incorrect for B1

[2]

Q20.

22

B1

[1]

Q21.

9 and 18

B1

[1]

Q22.

(a) $\frac{6}{7}$

B1

(b) 23

B1

(c) 81

B1

[3]

Q23.

256

B1

[1]

Q24.

125 or 216

only one value needed

B1

Additional Guidance

Ignore any values out of range

125 and 216 given

B1

Condone 5 and 125 on answer line

B1

Condone 6^3 and 216 on answer line

B1

Condone 5 or 5^3 on answer line with 125 seen in working

B1

6 or 6^3 on answer line with no correct evaluation seen

B0

More than one answer including an incorrect answer in range

B0

[1]

Q25.

361

B1

[1]

Q26.

9

B1

[1]

Q27.

13 or 31 or 79 or 97 or 103 or any other prime whose digits add up to a square number

B1 any prime of 2 or more digits

B1 any number of 2 or more digits whose digits add up to a square number

B2

[2]

Q28.

At least four square numbers seen or at least four cube numbers seen or 64 identified

M1

67 and prime

A1

[2]

Q29.

1

B1

[1]

Q30.

$$a = 11, b = 23, c = 29$$

B2 three trials using correct prime numbers

B1 all 4 prime numbers between 15 and 30 seen and at least one trial.

B3

[3]

Q31.

5

B1

[1]

Q32.

3.5 and -3.5

oe

B1 for each

B2

Additional Guidance

± 3.5

B2

[2]