

8300

GCSE MATHEMATICS

Foundation and Higher tier – Questions by Topic – Mark Scheme

Algebra

Term-to-term rules

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.

39 – 10 or 29

oe

M1

their 29 – 10 or 19

or $19n$

oe

39 – 10 – 10 implies M1M1

(3rd term =) 48 implies M1M1

may be implied by the difference, after their 2nd term,

consistently being the correct 19

$19n$ may be seen as part of $19n + b$

M1dep

their $29 + 3 \times$ their 19

or

$10 + 4 \times$ their 19

oe

(4th term =) 67 implies M1M1M1

or substitutes $n = 5$ into expression of the form their $19n + b$

b must be an integer

M1dep

86

SC1 107 or 137 using Fibonacci

SC1 126 using difference of 29

A1

Additional Guidance

3rd mark must be a correct method for working out the 5th term

Going past the 5th term eg 10, 29, 48, 67, 86, 105, without answer 86

M1M1M1A0

$10 + 19 = 39$ 10, 39, 58, 77, 96 (not the correct 19 being added)

M0

[4]

Q2.

(a) 3 or 35 or 291 seen

or $8 \times$ their $3 + 11$

M1

35 chosen

A1

(b) Subtract 11 and divide by 8

accept – or $\div$ for words subtract and divide but not / for divide

B1

Additional Guidance

Do not accept use of algebra e.g. $(x - 11)/8$

B0

[3]

Q3.

Alternative method 1

$34 - k$ or $34 - 10$ or 24

oe implied by $34 - 2k$ or $34 - 3k$

M1

$3k = 34 - 10$ or $3k = \text{their } 24$

or

$$\frac{34 - 10}{3} \quad \text{or} \quad \frac{\text{their } 24}{3}$$

oe

M1dep

8

SC2 -8 or all terms seen 34, 26, 18, 10

SC1 6

A1

Alternative method 2

$10 + k$ or $34 - 10$ or 24

oe implied by $10 + 2k$ or $10 + 3k$

M1

$10 + 3k = 34$ or $3k = \text{their } 24$

or

$$\frac{34 - 10}{3} \quad \text{or} \quad \frac{\text{their } 24}{3}$$

oe

M1dep

8

SC2 -8 or all terms seen 34, 26, 18, 10

SC1 6

A1

Alternative method 3

One correct trial

M1

Two or more correct trials

a correct trial is either

*a subtraction of the same value, exactly three times, from 34
and evaluated correctly*

or

*addition of the same value, exactly three times, from 10 and
evaluated correctly*

M1dep

8

SC2 -8 or all terms seen 34, 26, 18, 10

SC1 6

A1

Additional Guidance

Accept any letter in place of k

[3]

Q4.

$46 \div 2$ or 23
or $4x = 46$

oe

M1

their $23 \div 2$
or
 $46 \div 2 \div 2$ or $46 \div 4$

oe

may be seen as a fraction

eg $\frac{23}{2}$ or $11\frac{1}{2}$ or $\frac{46}{4}$ or $11\frac{2}{4}$

M1dep

11.5

SC2 5.75 or 11 remainder 1

A1

Additional Guidance

$46 \div 2 = 25$, ($25 \div 2 =$) 12.5

M1M1A0

$46 \div 2 = 24$, followed by 11

M1M0A0

11.5 in working, different answer on answer line (do not ignore further work)

M1M1A0

[3]

Q5.

16

B1

Additional Guidance

Ignore further terms

[1]

Q6.

-1

B1

Additional Guidance

Ignore further terms

[1]

Q7.

$\times 2$

oe eg double, multiply by 2, add to itself

B1

Additional Guidance

Times 2

B1

$2n$

B0

Ignore any attempt to continue the sequence

[1]

Q8.

(a) 23

ignore further terms

B1

(b) add 6

accept + 6

ft their 23 or correct answer

B1ft

20 in part (a) answer + 3

B1ft

34 in part (a) answer $\times$ 2

B1ft

[2]

Q9.

$8a + 29$

oe eg $2(4a + 13) + 3$

B1

$15a + 48$

correct or ft B0 only

their $8a + 29$ must be in the form $na + c$

where $n \neq 0$ and $c \neq 0$

implied by $3(5a + 16)$

B1ft

$3(5a + 16)$

or $15 = 5 \times 3$ and $48 = 16 \times 3$

oe eg $5a + 16$ so it divides by 3

B1

Additional Guidance

Ignore use of substitution as an attempt to show divisibility

Ignore further non-contradictory statements

Further simplification eg $15a + 48 = 63$ which is 21×3

B1B1B0

For the 1st B1 accept $8a + 29$ embedded in a calculation for the sum of the first four terms

eg $a + 1 + 2a + 5 + 4a + 13 + 8a + 29$

For the 2nd B1 accept $15a + 48$ embedded in a calculation to show divisibility

$15a + 48$

eg $\frac{15a + 48}{3} = 5a + 16$

For the 3rd B1 accept 15 is a multiple of 3 and 48 is a multiple of 3

$8a + 29$

B1

$a + 2a + 4a + 8a = 15a$ $1 + 5 + 13 + 29 = 48$ but $15a + 48$ not seen

B0

$15 = 5 \times 3$ and $48 = 16 \times 3$

B1

[3]

Q10.

15

implied by 70 or 345

B1

(3rd term =) 70

ft (their $15 - 1$) $\times 5$

B1ft

Additional Guidance

15 70 on answer line

B1B1

15 and/or 70 seen but not final term eg Answer 345

B1B0

Answer only 345

B1B0

[2]

Q11.

50×2 or 100

M1

80

SC1 120 or 5 or 60

A1

Additional Guidance

80, 50, ... on answer line

M1A1

80, 50, ... in working with answer line blank

M1A1

80, 50, ... in working with 35 on answer line

M1A0

$80 + 20 \div 2 = 50$ without answer 80 (embedded answer)

M1A0

[2]

Q12.

14

B1

[1]

Q13.

- (a) (2nd term =) 20
may be implied by 12

B1

(3rd term =) 12

$$\frac{\text{their } 20 + 4}{2}$$
ft

B1ft

Additional Guidance

12 with no incorrect working

B1B1

20 12 on answer line or in working with answer line blank

B1B1

(20) 12 8 on answer line or in working with answer line blank

B1B0

(20) 12 8 with 8 on answer line

B1B0

Answer 8 without 20 or 12 seen

B0B0

- (b) 60 – 10 or 50

M1

150

SC1 170 or 210 or 16.6 oe

A1

Additional Guidance

60 – 10 or 50 scores M1 even if subsequent working is incorrect

Accept 16.66(...) or 16.67 for 16.6

Embedded answer without 150 on answer line $\frac{150}{3} + 10 (= 60)$

M1A0

[4]

Q14.

(a) -8

B1

0 *ft their* -8

B1ft

Additional Guidance

Mark answer line first

If either part of answer line is blank look for terms in working
 -20 and -6

B0B1ft

-20 and -16

B0B0ft

(b) $\div 5$ then $+ 1$

*implied by 2nd term 25
 or correct first term for their 25*

M1

6

A1

Additional Guidance

6, 25 with no working seen or on dotted lines

M1A1

2nd term 23 and 1st term 5.6 is the correct first term for their 25

M1A0

25 with no incorrect working

M1

[4]

Q15.

(a) $(x=) 10$ and $(y=) 15$

B2

B1 $(x=) 10$ or $(y=) 15$

Additional Guidance

x	0	2	4	6	8	10
y	3	7	11	15	19	23

B2

(b) Straight line from $(0, 3)$ to $(4, 11)$

B2

*B1 at least two of $(0, 3)$, $(2, 7)$ and $(4, 11)$ plotted
 or straight line from $(0, 3)$ to $(2, 7)$
 or straight line from $(2, 7)$ to $(4, 11)$*

$\pm \frac{1}{2}$ square

Additional Guidance

B2 or B1 may be awarded for a straight line without points plotted

Mark intention

Ignore line drawn after $(4, 11)$

Two points plotted with the same x -coordinate is choice unless the line is drawn through one of the points

(c) 9 *correct or ft their line in (b)*

$\pm \frac{1}{2}$ square

B1ft

[5]