

8300

GCSE MATHEMATICS

Foundation and Higher tier – Questions by Topic – Mark Scheme

Algebra

Simplifying expressions using the four operations

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.

$14a + 3b$ or $3b + 14a$

B1 for $14a$ or $(+)3b$

B2

Additional Guidance

$14a + 3b$ followed by further work eg $17ab$

B1

B1 response followed by further work

eg $2a + 3b = 5ab$

B1

[2]

Q2.

$6m + 11$ or $11 + 6m$

B1 $6m$ or $(+)11$

B2

Additional Guidance

Do not ignore further work for B2

eg $6m + 11 = 17m$

B1

eg $6m + 3 = 9m$

B1

[2]

Q3.

$3cd$ or $3dc$

B1 3 or cd or dc

B2

Additional Guidance

cd^3

B1

Use of multiplication signs is max B1

eg $3 \times cd$

B1

eg $c \times d$

B0

$6\frac{1}{2}cd$

B1

$\frac{1}{2}c6d$

B0

$\frac{1}{2}c3d$

B0

[2]

Q4.

Valid explanation referencing the multiplication by 2 twice
eg she has multiplied by 2 twice

B1

Additional Guidance

She multiplied 2 by 2 but there was only one 2 to start with

B1

2×2 should not be calculated

B1

She doubled everything

B1

There should only be one 2

B1

There should be a 2

B0

She's adding up the 2s, whereas it should be $cd \times 2 = 2cd$

B0

She multiplied by 4 (instead of 2)

B1

She has 4 instead of 2

B0

The 4 is wrong

B0

She should not have both $2c$ and $2d$

B1

She has multiplied (each of) c and d by 2 separately

B1

She has multiplied (each of) c and d separately

B0

She did $2c \times 2d$

B0

Answer is $2c + 2d$

B0

She shouldn't separate the c and d , it's just $2c$

B0

You don't times each letter by 2

B1

She has multiplied each letter by 2

B1

She has multiplied each letter by 2, it should be $2cd^2$

B0

It is $c \times d \times 2$ not $2c \times 2d$

B1

She shouldn't do all that it is just $cd \times 2 = 2cd$

B0

Answer is $2cd$

B0

Her answer is wrong

B0

[1]

Q5.

$$a + 3 \text{ or } 3 + a$$

B1

[1]

Q6.

$$5a - 4a^2$$

B1

[1]

Q7.

$$22a$$

B1

[1]

Q8.

$$5x$$

B1

Additional Guidance

$$5 \times x \text{ or } x \times 5 \text{ or } x5$$

B0

[1]

Q9.

$$4x$$

oe

B1

$$y$$

oe

B1

$$3t$$

oe

B1

[3]

Q10.

$$5$$

B1 correct partial simplification

$$\text{eg } \frac{20}{4} \text{ or } \frac{5}{1} \text{ or } \frac{10w}{2w} \text{ or } \frac{5w}{w}$$

SC1 5w

B2

Additional Guidance

Correct partial simplification followed by incorrect further work

$$\text{eg } \frac{10w}{2w}, \text{ Answer } 8w$$

B1

Correct answer followed by further work

B1

[2]

Q11.

$$y^3$$

B1

Additional Guidance

$$y^2 \times y \text{ or } y \times y^2$$

B0

[1]

Q12.

$$10w$$

B1

Additional Guidance

$$10 \times w \quad \text{or} \quad w \times 10 \quad \text{or} \quad w10$$

B0

[1]

Q13.

$$p^3$$

B1

Additional Guidance

$$\text{Accept } 1p^3$$

[1]

Q14.

$$2$$

B1

Additional Guidance

$$\frac{2}{1} \quad \text{or} \quad 2 \div 1$$

B0

[1]

Q15.

$$10x + 4y - 6$$

or

$$2(5x + 2y - 3)$$

any order

B2 two terms correct

B1 one term correct

B3

Additional Guidance

B1 may be awarded for correct work, with no answer or incorrect answer, even if this is seen amongst multiple attempts

Further incorrect work after a B3 response is B2

$$\text{eg1 } 10x + 4y - 6 = 8xy$$

$$\text{eg2 } 10x + 4y - 6 \text{ and } 10x = -10$$

$$\text{eg3 } 10x + 4y - 6 \text{ and } 2(5x + 2y - 6)$$

B2

Further incorrect work after a B2 or B1 response is B1

$$\text{eg1 } 10x + 4y + 6 = 20xy$$

$$\text{eg2 } 10x - 4y + 6 \text{ and } 10x = -2$$

$$\text{eg3 } 10x + 4y + 6 \text{ and } 2(5x + 2y + 6)$$

B1

$$10x + 4y + 6 \text{ and } 2(5x + 2y + 3)$$

B2

$$10x \text{ and } 4y \text{ and } -6$$

B2

[3]

Q16.

$$\frac{a^2}{2}$$

accept any indication

B1

[1]

Q17.

$$2a + 11c$$

either order

B1 2a or 11c

B2

Additional Guidance

Further incorrect work after a B2 response is B1

$$\text{eg } 2a + 11c = 13ac$$

B1

Further incorrect work after a B1 response is B1

$$\text{eg } 3a + 11c = 14ac$$

B1

$$a^2 + 11c \text{ or } 2a + c^{11}$$

B1

$$a^2 \text{ or } c^{11}$$

B1

[2]

Q18.

$$1 \text{ or } n^0$$

B1

Additional Guidance

$$\frac{n}{n} = 1 \text{ or } \frac{n}{n} = n^0$$

B1

$$\frac{n}{n}$$

B0

$$\frac{1}{1} \text{ or } 1 \div 1$$

B0

[1]

Q19.

$$2t$$

B1

Additional Guidance

Allow 2T

B1

$$2 \times t = 2t$$

B1

$$2 \times t$$

B0

$$2^t$$

B0

$$\frac{2t}{1} \text{ or } \frac{2}{1}t$$

B0

[1]

Q20.

All 3 correct matches

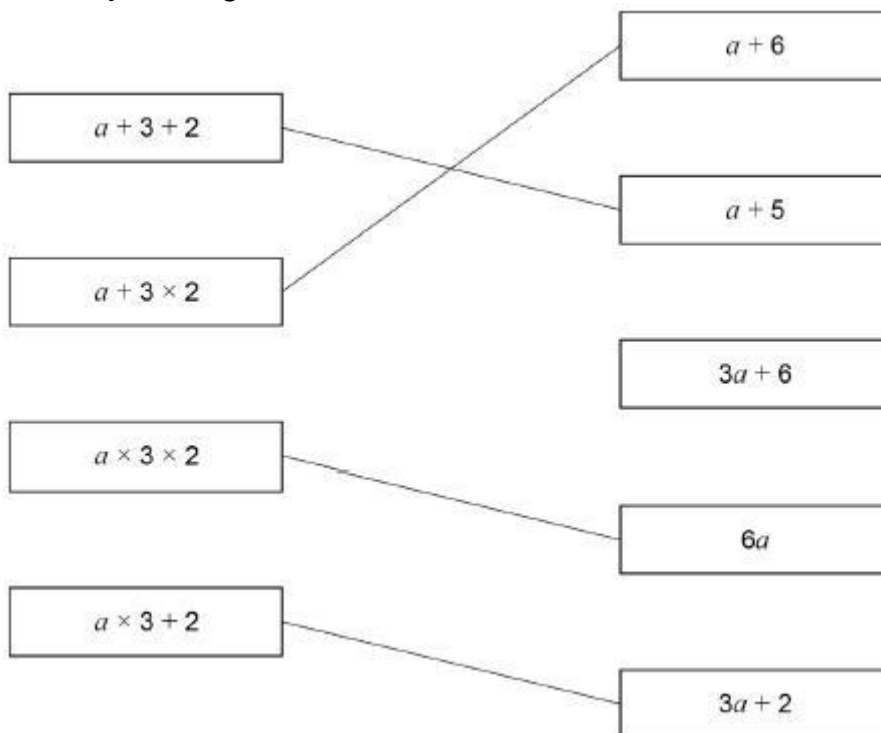
B1 each correct match

B3

Additional Guidance

Two different matches from left hand column is choice for that box

Allow any unambiguous indication



B3

[3]

Q21.

8c

B1

[1]

Q22.

$3x + 2y$

either order

B1 3x or 2y

B2

Additional Guidance

Further incorrect work after a B2 response is B1

eg $3x + 2y$ followed by $5xy$

B1

Further incorrect work after a B1 response is B1

eg $15x + 2y$ followed by $30xy$

B1

[2]

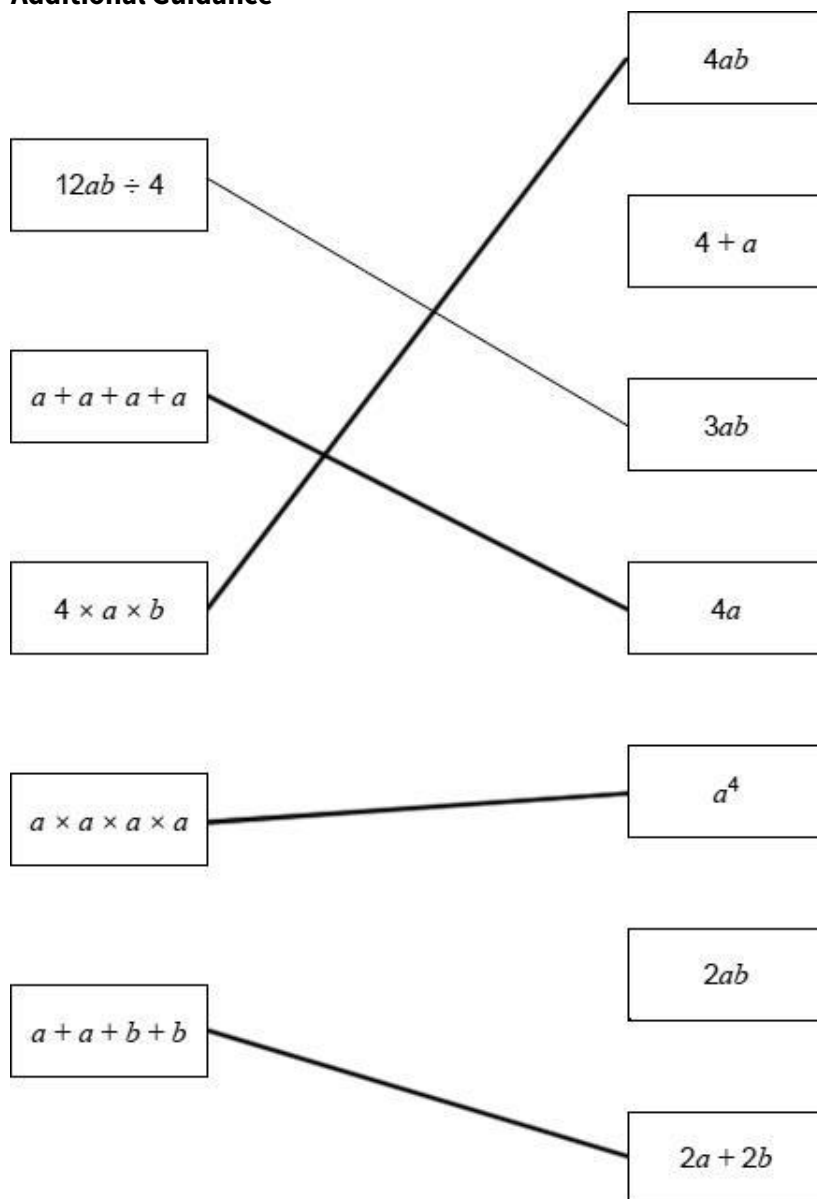
Q23.

All 4 correct matches

B1 for each correct match

B4

Additional Guidance



Two different matches from left hand column is choice for that box
Accept any unambiguous indication

B4

[4]

Q24.

$6a$

B1

[1]

Q25.

$4x^2$

B1

[1]

Q26.

$$14x - 3$$

B1

[1]

Q27.

$$2a^2 + 15a - 1$$

B2

2a² + 15a or 2a² - 1 or 15a - 1

B1

2a² or 15a or - 1

B3

Additional Guidance

$$2a + 15a - 1 = 17a - 1$$

B2

$$2a^2 + 15a + - 1$$

B2

Do not ignore further incorrect algebraic simplification for B3

$$2a^2 + 15a - 1 = 17a - 1$$

B2

Do not ignore further incorrect algebraic simplification for B2

$$2a + 15a - 1 = 17a - 1 = 16a$$

$$2a^2 + 15a - 1 = 17a - 1 = 16a$$

B1

[3]

Q28.

(a) y^2

B1

(b) $4a + 11$

B1 for each term

B2

Additional Guidance

$4a$ or 11 or $4a + 11$ seen and answer e.g. $15a$

B1

$4a + 11$ seen and then 'solves'

B1

11 and -11 seen (without $4a$ seen)

B0

[3]

Q29.

$$2\sqrt{5}a$$

B1

[1]

Q30.

$$8a + 29$$

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

eg $\frac{15a+4}{3} = 5a + 16$

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

$$8a + 29$$

B1

$$a + 2a + 4a + 8a = 15a \quad 1 + 5 + 13 + 29 = 48 \text{ but } 15a + 48 \text{ not seen}$$

B0

$$15 = 5 \times 3 \text{ and } 48 = 16 \times 3$$

B1

[3]