

8300

GCSE MATHEMATICS

Foundation and Higher tier – Questions by Topic – Mark Scheme

Geometry

Understanding column vectors

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.

$$\begin{pmatrix} 3 \\ -7 \end{pmatrix}$$

B1

Additional Guidance

Condone + sign and/or fraction line eg $\begin{pmatrix} +3 \\ -7 \end{pmatrix}$

B1

(3, -7)

B0

[1]

Q2.

$$\begin{pmatrix} 2 \\ -3 \end{pmatrix}$$

B1

[1]

Q3.

$$\begin{pmatrix} 5 \\ -8 \end{pmatrix}$$

B1

[1]

Q4.

$$\begin{pmatrix} 7 \\ -2 \end{pmatrix}$$

$$\text{B1 } \begin{pmatrix} 7 \\ a \end{pmatrix} \text{ or } \begin{pmatrix} b \\ -2 \end{pmatrix}$$

$$\text{or } \begin{pmatrix} -2 \\ 7 \end{pmatrix} \text{ or } \begin{pmatrix} 7x \\ -2y \end{pmatrix} \text{ or } \begin{pmatrix} -7 \\ 2 \end{pmatrix}$$

SC1 7 right 2 down or 2 down 7 right or (7, -2)

B2

Additional Guidance

B1 responses must be in vector form

Condone $\begin{pmatrix} 7 \\ -2 \end{pmatrix}$

B2

7 → 2 ↓

7 across, 2 down

SC1

B0

$$\begin{pmatrix} 2 \\ 7 \end{pmatrix}$$

B0

7 ← 2 ↑

B0

[2]

Q5.

(a) $B(4, 2)$ and $D(-2, 5)$

or

$B(0, 4)$ and $D(6, 1)$

B1 for one correct

or for one correct and one incorrect

or B and D reversed

or correct diagonal drawn of any length

B2

Additional Guidance

eg $B(4, 2)$ and $D(6, 1)$

B1

(b) $\begin{pmatrix} 3 \\ -1 \end{pmatrix}$ or $\begin{pmatrix} -3 \\ 1 \end{pmatrix}$

B1 for vector of same size

or for any perpendicular vector

B2

[4]

Q6.

$\begin{pmatrix} 3 \\ -2 \end{pmatrix}$

B1

[1]

Q7.

(a) $\begin{pmatrix} 4 \\ -1 \end{pmatrix}$

B1 $\begin{pmatrix} 4 \\ \dots \end{pmatrix}$ or $\begin{pmatrix} \dots \\ -1 \end{pmatrix}$

or (4, -1)

SCI $\begin{pmatrix} -4 \\ 1 \end{pmatrix}$ or $\begin{pmatrix} -1 \\ 4 \end{pmatrix}$

B2

Additional Guidance

Ignore fraction lines

(b) $\begin{pmatrix} 12 \\ 8 \end{pmatrix}$

B1

Additional Guidance

$4\begin{pmatrix} 3 \\ 2 \end{pmatrix}$ or $\begin{pmatrix} 12 \\ 8 \end{pmatrix}$ in working with answer $\begin{pmatrix} 3 \\ 2 \end{pmatrix}$

B0

Ignore fraction lines

(c) $\begin{pmatrix} 0 \\ -2 \end{pmatrix}$

B1

[4]

Q8.

$$\begin{pmatrix} 4 \\ -3 \end{pmatrix}$$

$$\text{B1 } \begin{pmatrix} 4 \\ \dots \end{pmatrix} \text{ or } \begin{pmatrix} \dots \\ -3 \end{pmatrix}$$

$$\text{SC1 } \begin{pmatrix} -4 \\ 3 \end{pmatrix}$$

B2

Additional Guidance

$$(4, -3) \text{ or } \begin{pmatrix} -3 \\ 4 \end{pmatrix}$$

B0

Ignore words if a vector is also seen

$$\text{eg1 Reflection } \begin{pmatrix} 4 \\ -3 \end{pmatrix}$$

B2

$$\text{eg2 4 right 3 up and } \begin{pmatrix} 4 \\ 3 \end{pmatrix}$$

B1

eg3 4 right 3 down

B0

$$\text{eg4 Rotate 4 left and 3 up and } \begin{pmatrix} -4 \\ 3 \end{pmatrix}$$

SC1

Condone any type of brackets

Condone missing brackets for B2 or B1 or SC1 but must have two numbers in a column

Condone 'fraction line' for B2 or B1 or SC1 but must have two numbers in a column

$$\begin{pmatrix} 4x \\ -3y \end{pmatrix} \text{ or } \begin{pmatrix} x4 \\ -y3 \end{pmatrix} \text{ or } \begin{pmatrix} x+4 \\ y-3 \end{pmatrix} \text{ or } \begin{pmatrix} 4 \text{ right} \\ 3 \text{ down} \end{pmatrix} \text{ or } \begin{pmatrix} 4 \text{ r} \\ 3 \text{ d} \end{pmatrix} \text{ or } \begin{pmatrix} 4 \rightarrow \\ 3 \downarrow \end{pmatrix}$$

B0

[2]

Q9.

- (a) Line $x = -2$ drawn

B1

Additional Guidance

Line does not need to be full length of grid.
Line can be solid or dashed.

- (b) Line $y = x$ drawn

B1

Additional Guidance

Line does not need to be full length of grid.
Line can be solid or dashed.

- (c) Translation

Accept Translate

B1

9 right and 8 down

or $\begin{pmatrix} 9 \\ -8 \end{pmatrix}$

Accept (9, -8)

B1

Additional Guidance

($y = -8, x = 9$) is B0 B0

[4]

Q10.

- (a) Rotation

oe

B1

90° clockwise

or 270° anti-clockwise

B1

(-1, 0)

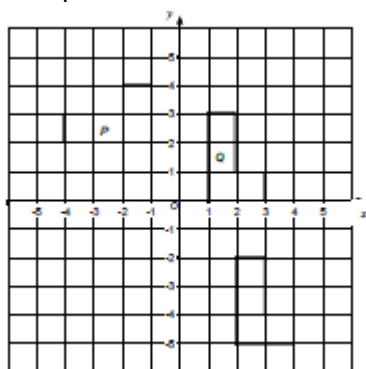
B1

Additional Guidance

More than one transformation

B0

Accept $\frac{1}{4}$ turn clockwise for 90° clockwise



- (b)

*B1 for translation 1 unit right
or for translation 5 units down*

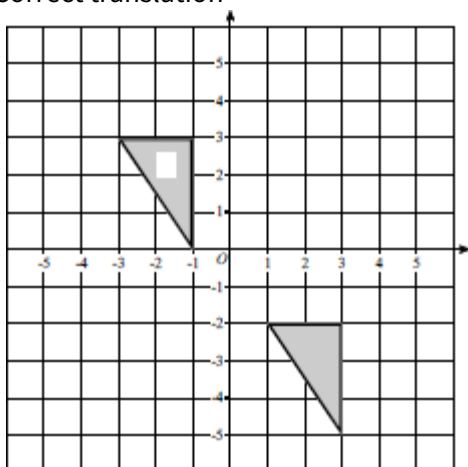
SC1 for P translated $\begin{pmatrix} 1 \\ -5 \end{pmatrix}$

B2

[5]

Q11.

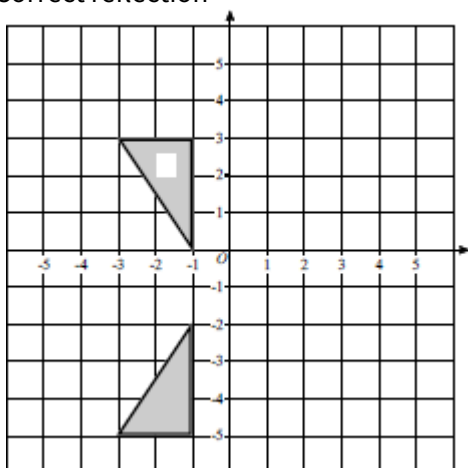
(a) Correct translation



*B1 for translation 4 right or 5 down
or for 3 correct points without the triangle*

B2

(b) Correct reflection



*B1 for reflection in $y = c$ or in $x = -1$
or for 3 correct points without the triangle*

B2

[4]

Q12.

$$\begin{pmatrix} 6 \\ -1 \end{pmatrix}$$

B1

[1]

Q13.

up

B1

[1]

Q14.

$$\begin{pmatrix} 6 \\ 1 \end{pmatrix}$$

B1

[1]

Q15.

(a) $-2\mathbf{a}$

oe e.g. $-\mathbf{a} - \mathbf{a}$ or $2(-\mathbf{a})$

B1

Additional Guidance

Do not accept in column vector form unless correct answer is also seen

Do not accept $-\mathbf{a}2$ for $-2\mathbf{a}$

(b) $\begin{pmatrix} -8 \\ 2 \end{pmatrix}$ drawn on the grid with direction shown
 $\pm 1/4$ centimetre square

B1 $\begin{pmatrix} -8 \\ 2 \end{pmatrix}$ seen in working

or

correct line drawn with incorrect direction or no direction shown

or

correctly joined vectors for $\mathbf{c}$ and $-\mathbf{d}$ with correct directions shown

B2

Additional Guidance

Mark intention, line does not need to be ruled and ignore all labelling for $\mathbf{c}$, $\mathbf{d}$ and $\mathbf{c} - \mathbf{d}$

[3]