

8300

GCSE MATHEMATICS

Foundation and Higher tier – Questions by Topic – Mark Scheme

Geometry

Angles – Angles in triangles

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.

$(180 - 40) \div 2$
or $180 - (40 \times 2)$

M1

(40 and) 40 and 100

Either order

A1

(40 and) 70 and 70

SC1 Two pairs of angles totalling 140

A1

[3]

Q2.

$180 - (87 + 32)$ oe

Condone absence of brackets

M1

61

A1

[2]

Q3.

55

B1

[1]

Q4.

Fully correct table

B1 for each correct decision in a row

B4

Additional Guidance

	Must be true	Cannot be true	Might be true
The triangle is equilateral			✓
The triangle has at least one other acute angle	✓		
The triangle is right-angled			✓
The other two angles are each less than 60°		✓	

Mark intention if crosses used

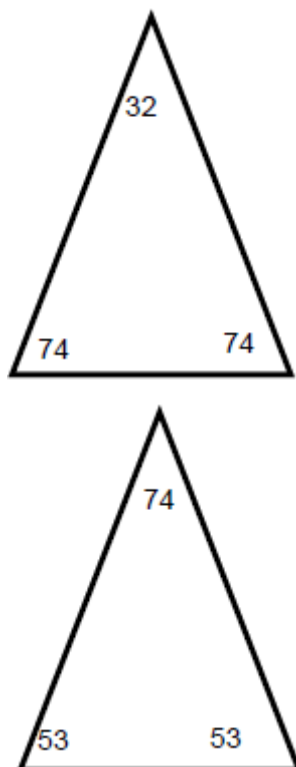
eg if a cross is the only mark in a row assume that is the answer

More than one tick in a row is choice for that decision

B0 for that row

[4]

Q5.



B2 for 1 correct triangle.

B2 for correct angles in both triangles but incorrectly positioned.

*B1 for a triangle with 74° and 2 other equal angles not totalling 180° **or** for a triangle with $2 \times 74^\circ$ and 1 other angle not totalling 180° . NB 74° must be correctly positioned.*

B3

[3]

Q6.

$$180 - 56 - 56 \text{ or } 68$$

$$2x + 56 + 56 + 90 = 360$$

oe

M1

$$90 - \text{their } 68 \text{ or } 22$$

$$360 - 56 - 56 - 90$$

$$2x = 360 - 112 - 90$$

M1dep

$$(180 - \text{their } 22) \div 2$$

$$\text{or } (360 - 56 - 56 - 90) \div 2$$

$$2x = 158$$

M1dep

$$79$$

A1

[4]

Q7.

$(180 - 70) \div 2$ or 55
or $180 - 70 - 70$ or 40
oe

M1

70, 40

any order

A1

55, 55

A1

[3]

Q8.

$180 - 112$ or 68
or
 $3y + y + 112 = 180$
oe

M1

their $68 \div (3 + 1)$

their 68
4

or their $68 \div 4$ or $y =$
or 51 or $x = 17$

oe
their 68 must be < 180 but not 112
51 or $x = 17$ imply M1M1

M1

17

A1

Additional Guidance

Check diagram for workings and answer
17 seen in diagram or working and 51 on answer line

M1M1A0

$180 \div 4$

M0M0

$68 \div 3$

M1M0

$180 - 112 = 78$ and $78 \div 4$

M1M1

$78 \div 4$

M0M1

Embedded answer eg $4 \times 17 + 112 = 180$

M1M1A0

[3]

Q9.

90 ÷ 5 or 18

M1

2 × their 18 or 36

$$M2 \frac{2}{5} \times 90$$

M1dep

180 – 90 – their 36

oe eg 90 – their 36

M1dep

90

36

54

any order

A1

Additional Guidance

Beware of incorrect methods, eg dividing 180 by 5

$$180 \div 5 = 36$$

$$180 \div 2 = 90$$

$$180 - 90 - 36 = 54$$

Answer 90, 36, 54

MOMOM0AO

Beware of 18 coming from wrong working

$$90 \div 2 = 45$$

$$90 \div 5 = 18$$

$$90 \div 7 = \dots$$

However, it is not incorrect to work with $180 \div 10$

MOMOM0AO

Trial and Improvement scores 0 or 4

[4]

Q10.

Alternative method 1

$$4x + 10 + 6x - 15 + 60 = 180$$

$$\text{or } 4x + 10 + 6x - 15 = 120$$

oe

M1

$$(x =)12.5$$

oe

A1

$$4 \times \text{their } 12.5 + 10$$

$$\text{or } 6 \times \text{their } 12.5 - 15$$

Dependent on M1

M1dep

$$(x =)12.5$$

A1

$$4 \times 12.5 + 10 = 60$$

$$\text{and } 6 \times 12.5 - 15 = 60$$

$$\text{or } 4 \times 12.5 + 10 = 60$$

$$\text{and } 180 - 60 - 60 = 60$$

$$\text{or } 6 \times 12.5 - 15 = 60$$

$$\text{and } 180 - 60 - 60 = 60$$

Strand (ii)

Accept 60, 60, 60 with 12.5 seen

Q1

Alternative method 2

$$6x - 15 = 4x + 10$$

$$\text{or } 2x = 25$$

oe

M1

$$(x =)12.5$$

oe

A1

$$4 \times \text{their } 12.5 + 10$$

$$\text{or } 6 \times \text{their } 12.5 - 15$$

Dependent on M1

M1dep

$$60$$

A1

$$4 \times 12.5 + 10 = 60$$

$$\text{and } 6 \times 12.5 - 15 = 60$$

$$\text{or } 4 \times 12.5 + 10 = 60$$

$$\text{and } 180 - 60 - 60 = 60$$

$$\text{or } 6 \times 12.5 - 15 = 60$$

$$\text{and } 180 - 60 - 60 = 60$$

Strand (ii)

Accept 60, 60, 60 with 12.5 seen

Q1

Alternative method 3

$6x - 15 = 60$

$\text{or } 4x + 10 = 60$

*oe***M1**

$(x =) 12.5$

*oe***A1**

$6 \times \text{their } 12.5 - 15$

$\text{or } 4 \times \text{their } 12.5 + 10$

*Dependent on M1***M1dep**

60

A1

$4 \times 12.5 + 10 = 60$

$\text{and } 6 \times 12.5 - 15 = 60$

$\text{or } 4 \times 12.5 + 10 = 60$

$\text{and } 180 - 60 - 60 = 60$

$\text{or } 6 \times 12.5 - 15 = 60$

$\text{and } 180 - 60 - 60 = 60$

*Strand (ii)**Accept 60, 60, 60 with 12.5 seen***Q1****Alternative method 4**

$6x - 15 = 60$

*oe***M1**

$(x =) 12.5$

*oe***A1**

$4x + 10 = 60$

*Dependent on M1***M1dep**

60

A1

Valid statement

or

$4 \times 12.5 + 10 = 60$

$\text{and } 6 \times 12.5 - 15 = 60$

$\text{or } 4 \times 12.5 + 10 = 60$

$\text{and } 180 - 60 - 60 = 60$

$\text{or } 6 \times 12.5 - 15 = 60$

$\text{and } 180 - 60 - 60 = 60$

*Strand (ii)**eg Since both x values are 12.5 then all angles are 60**Accept 60, 60, 60 with both A marks awarded***Q1****[5]**