

8300

GCSE MATHEMATICS

Foundation and Higher tier – Questions by Topic – Mark Scheme

Geometry

Area and perimeter – Mixed problems: Finding the area and perimeter of simple shapes

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.

22 – 4 or 18
or $22 \div 2$ or 11
or $4 \div 2$ or 2

oe

M1

their $18 \div 2$
or their 11 – their 2

oe

M1dep

9

may be seen on diagram
SC1 20 or 14

A1

Additional Guidance

Ignore units or incorrect statements
eg the lines are parallel
Condone poor notation
eg $22 - 4 \div 2 = 9$

M1M1A1

Embedded answer of 9

M1M1A0

[3]

Q2.

Alternative method 1

$$6.5 \times 9 \text{ or } 58.5$$

or

$$6.5 \times 7 \text{ or } 45.5$$

oe

M1

$$\frac{6.5 \times 9 - 2 \times 6.5}{2} \text{ or } \frac{58.5 - 13}{2}$$

$$\text{or } \frac{6.5 \times 7}{2}$$

$$\text{or } \frac{45.5}{2}$$

oe

division may be implied

$$\text{eg } \frac{7}{9} = 45.5, \frac{3.5}{9} = 22.25 \text{ scores M1M1}$$

M1dep

$$22.75 \text{ or } \frac{91}{4} \text{ or } 22\frac{3}{4}$$

oe

A1

Alternative method 2

$$6.5 \times 9 \text{ or } 58.5$$

or

$$6.5 \times 4.5 \text{ or } 29.25$$

oe

M1

$$\frac{6.5 \times 9}{2} - 6.5$$

or

$$6.5 \times 4.5 - 6.5$$

oe eg $6.5 \times (4.5 - 1)$ or 6.5×3.5

M1dep

$$22.75 \text{ or } \frac{91}{4} \text{ or } 22\frac{3}{4}$$

oe

A1

Additional Guidance

Answer 22.8 or 23 with 22.75 in working

M1M1A1

Answer 22.8 or 23 without 22.75 in working

A0

[3]

Q3.

Set of 3 points that give
area 28
and A on positive y-axis
and B on negative y-axis
and C on positive x-axis

eg1 A(0, 10) B(0, -4) C(4, 0)

eg2 A(0, 18) B(0, -10) C(2, 0)

B1 diagram labelled with numbers that give area 28

eg A labelled 20, B labelled -8,
C labelled 2

or calculation of form $\frac{b \times h}{2}$ seen that equals 28 or $b \times h$ that
equals 2×28

eg $\frac{8 \times 7}{2}$ (=28) or 8×7 (=56)

B2

[2]

Q4.

(a) $\frac{1}{2}(b + 2b)h$ or $3 \times \frac{1}{2}bh$

oe

M1

$1.5bh$ or $\frac{3}{2}bh$ or $\frac{3bh}{2}$ or $1\frac{1}{2}bh$

accept hb for bh

A1

Additional Guidance

Correct expression with $\times$, $\div$ or brackets

M1A0

Condone units within expressions for M1 only

Condone the expression given within a formula

eg $A = 1.5hb$

M1A1

Condone correct expression stated and then equated to a value or with
values substituted

M1A1

(b) $3b + 2s$
or $3b = 2s$
or $4s$

oe

M1

$6b$

oe

eg $b + b + b + b + b + b$

A1

Additional Guidance

Condone the expression given within a formula

eg $P = 6b$

M1A1

[4]

Q5.

Square drawn connecting midpoints of each square

Evidence that they know the area of the centre square is $1m^2$.

This may be marked or shown elsewhere

M1

Area of small triangle = $\frac{1}{4}$

Or all 4 triangles = 1

Must be clearly seen or stated

M1

2

Answer of 2 with no supporting evidence is 2 marks

A1

Alternative method 1

Both diagonals drawn across the middle square and 2 marked as length of at least one of them, or 1 diagonal drawn and marked as 2 and the height of one triangle shown as

1

M1

Area of half triangle = 1

or Area of small triangle = $\frac{1}{2}$

Must be clearly seen or stated

M1

2

Answer of 2 with no supporting evidence is 2 marks

A1

Alternative method 2

$$x^2 + x^2 = 1$$

$$\text{or } y^2 + y^2 = 4$$

M1

$$x^2 = \frac{1}{2} \text{ or } x = 1/\sqrt{2} \text{ or } 2x = \sqrt{2}$$

Accept $x = [0.7, 0.71]$

$$y^2 = 2, y = \sqrt{2} \text{ Accept } y = [1.4, 1.41]$$

A1

2

A1

[3]

Q6.

$$2s + 2w$$

B1

[1]

Q7.

$$5a + b + 4a + 7b + 2a + 3b$$

or

$$2(4a + 2b) + 2(a + 4b)$$

oe

M1

$$11a + 11b$$

or

$$10a + 12b$$

oe

A1

$$11a + 11b \text{ and } 10a + 12b$$

and

cannot tell

oe

with no further incorrect working

A1

Additional Guidance

Condone $22ab$ after $11a + 11b$ or $10a + 12b$ for first A mark only

M1A1A0

$11a$ and $11b$ or $10a$ and $12b$ implies M1

M1A0

$$5a + b = 6ab \text{ and } 4a + 7b = 11ab \text{ and } 2a + 3b = 5ab$$

$$\text{and } 6ab + 11ab + 5ab$$

M1A0

$6ab$ next to $5a + b$ and $11ab$ next to $4a + 7b$ and $5ab$ next to $2a + 3b$ shown on diagram

$$\text{and } 6ab + 11ab + 5ab$$

M1A0

$$5a + 4a + 2a = 15a \text{ and } b + 7b + 3b = 12b \text{ and } 15a + 12b$$

M1A0

[3]

Q8.

7 7 11 and 11 11 3

with no other answers given.

B3 7 7 11 and 3 3 19

or 11 11 3 and 3 3 19

B2 7 7 11 or 11 11 3

B1 Three primes that sum to 25

eg 3, 5, 17

or

Three primes with two equal

eg 5, 5, 11

or

Three sides with two equal that sum to 25

eg 3, 3, 19 or 8, 8, 9

B4

[4]

Q9.

9 cm

B1

[1]

Q10.

(a) Never true

B1

(b) Always true

B1

[2]

Q11.

$$x + 9 + 2x + 3x$$

oe

$$48 - 9$$

M1

$$x + 9 + 2x + 3x = 48$$

oe

$$48 - 9 \text{ and } 6 \text{ seen}$$

M1dep

$$6x = 48 - 9$$

$$\text{or } 6x = 39$$

oe

$$\text{their } 39 \div 6$$

M1dep

$$6.5 \text{ or } \frac{13}{2} \text{ or } 6\frac{1}{2}$$

$$SC3 \text{ for } 13, 19.5 \text{ and } 15.5$$

A1

[4]

Q12.

(a) 5×6.2

M1

$$31$$

A1

(b) $x + 3x + 5x + 5x$ or $14x$

$$7 (+) 3 \times 7 (+) 5 \times 7 (+) 5 \times 7$$

oe

$$\text{their } 14 \times 7$$

oe

$$7 + 3 \times 7 + 5 \times 7 + 5 \times 7$$

$$\text{or } 7 + 21 + 35 + 35$$

M1dep

$$98$$

A1

[5]

Q13.

$$12 \times 16 \div 2 \text{ or } 96$$

oe

M1

$$\text{their } 96 \div 7.5$$

M1dep

$$12.8$$

SC1 25.6 or 6.4

A1

Additional Guidance

Up to M2 may be awarded for correct work, with no answer or incorrect answer, even if this is seen amongst multiple attempts

$$12.8 \times 7.5 = 96, 96 \text{ on answer line}$$

M1M1A0

[3]

Q14.

Rectangle: 4

B1

$$\text{Triangle: } 0.5 \times ? \times 16 = 24$$

$$\text{or } (2 \times) 24 \div 16$$

$$\text{or } (2 \times) 1.5$$

$$\text{or } 2 \times 24 \text{ or } 48$$

oe

M1

$$3$$

A1

Additional Guidance

Ignore any units given

[3]

Q15.

$$4x + 5 = 6x - 10$$

$$\text{or } 4x + 5 = 10(x - 4)$$

$$\text{or } 6x - 10 = 10(x - 4)$$

oe

$$\text{eg } 4x + 5 + 6x - 10 = 2 \times 10(x - 4)$$

$$\text{condone } 10x - 4 \text{ for } 10(x - 4)$$

M1

$$4x - 6x = -10 - 5$$

$$\text{or } -2x = -15$$

$$\text{or } 4x - 10x = -40 - 5$$

$$\text{or } -6x = -45$$

$$\text{or } 6x - 10x = -40 + 10$$

$$\text{or } -4x = -30$$

oe collection of terms

$$\text{eg } 4x + 6x - 20x = -80 - 5 + 10$$

$$\text{or } -10x = -75$$

$$\text{condone } 10x - 4 \text{ for } 10(x - 4)$$

$$\text{eg } 4x - 10x = -4 - 5$$

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

M1dep

$$(x =) 7.5$$

oe

may be implied by (side length =) 35

or (perimeter =) 105

A1

$$(6 \times \text{their } 7.5 - 10) \times 3$$

or

$$(4 \times \text{their } 7.5 + 5) \times 3$$

or

$$10 \times (\text{their } 7.5 - 4) \times 3$$

or

$$35 \times 3$$

or

$$6 \times \text{their } 7.5 - 10 + 4 \times \text{their } 7.5 + 5 + 10 \times (\text{their } 7.5 - 4)$$

or

$$20 \times \text{their } 7.5 - 45$$

or

$$105$$

oe

dep on M1M1

$$\text{condone } 10x - 4 \text{ for } 10(x - 4)$$

must show working if M1M1A0

M1dep

105 and Yes

oe eg 1.05 and Yes

A1

Additional Guidance

$$4x + 5 = 6x - 10 = 10(x - 4)$$

M1

Condone $10x - 4$ for $10(x - 4)$ for up to M3

[5]

Q16.

11×3 or 33

or $10 + 10 + 14(.14)$ or 34

or $12 + 8 + 9$ or 29

Accept 3rd side > 10

M1

33 and 34(.14) and 29

or 33 and > 30 and 29

oe

Accept 3rd side > 10

or perimeter > 30

A1

$\frac{1}{3}$ or 0.33...

oe

ft their 33, 34 and 29

A1ft

Additional Guidance

Do not accept 1 in 3, 1 out of 3, unlikely, etc.

Accept $\frac{1}{3}$ plus words unless contradictory, e.g. $\frac{1}{3}$, unlikely is ok

$\frac{1}{3}$ with no working scores no marks

Accept an accurate scale drawing of the middle triangle showing that the hypotenuse is greater than 10

[3]

Q17.

(horizontal =) $8 \cos 42 (= [5.9, 6])$ **or**

(horizontal =) $8 \sin 48 (= [5.9, 6])$

$$M1 \cos 42 = \frac{x}{8} \text{ or } \sin 48 = \frac{x}{8}$$

(x is the horizontal)

M2

(vertical =) $8 \sin 42 (= [5.35, 5.4])$ **or**

(vertical =) $8 \cos 48 (= [5.35, 5.4])$ **or**

(vertical =) $\sqrt{8^2 - \text{their } [5.9, 6]^2} (= [5.35, 5.4])$

$$M1 \sin 42 = \frac{y}{8} \text{ or } \cos 48 = \frac{y}{8}$$

(y is the vertical)

or

$$8^2 - \text{their } [5.9, 6]^2$$

M2

[35.4, 35.5]

A1

Alternative method

(vertical =) $8 \sin 42 (= [5.35, 5.4])$

(vertical =) $8 \cos 48 (= [5.35, 5.4])$

$$M1 \sin 42 = \frac{y}{8} \text{ or } \cos 48 = \frac{y}{8}$$

(y is the vertical)

M2

(horizontal =) $8 \cos 42 (= [5.9, 6])$ **or**

(horizontal =) $8 \sin 48 (= [5.9, 6])$ **or**

(horizontal =) $\sqrt{8^2 - \text{their } [5.35, 5.4]^2} (= [5.9, 6])$

$$M1 \cos 42 = \frac{x}{8} \text{ or } \sin 48 = \frac{x}{8}$$

(x is the horizontal)

or

$$8^2 - \text{their } [5.35, 5.4]^2$$

M2

[35.4, 35.5]

$$SC2 [31.8, 31.9]$$

A1

[5]