

8300

GCSE MATHEMATICS

Foundation and Higher tier – Questions by Topic – Mark Scheme

Geometry

Using a pair of compasses & Constructing loci

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.

Please note, *actual measurements may have changed slightly on export/printing.*

Fully correct diagram

B1 6 cm square (3 or 4 sides drawn)

or

3 cm radius (semi) circle

or

radius half the length of their square and complete shape drawn

B2

Additional Guidance

Condone additional interior line(s)

Mark intention but whole shape must be on the grid

Shape may be in any orientation

[2]

Q2.

Please note, *actual measurements may have changed slightly on export/printing.*

Circles or at least semicircular arcs, radius 4 cm, at both ends connected by horizontal lines at top and bottom

B2 semicircles or at least semicircular arcs, radius 4 cm, at both ends

B1 semicircle or at least semicircular arc, radius 4 cm, at one end

or

correct shape for region with incorrect measurements

B3

Additional Guidance

Condone parts of circles within the region not erased

Condone dotted lines used for (part of) the perimeter

All accuracy is ± 2 mm

[3]

Q3.

Please note, *actual measurements may have changed slightly on export/printing.*

Arc, centre A, radius 4 cm on grid

at least a quarter-circle ± 2 mm radius

ignore any other arcs

B1

Correct straight line equidistant from B and C

their line must intersect any two of the five grid vertices (0, 3),

(3, 4), (6, 5), (9, 6), (12, 7)

± 2 mm

B1

Correct enclosed region identified

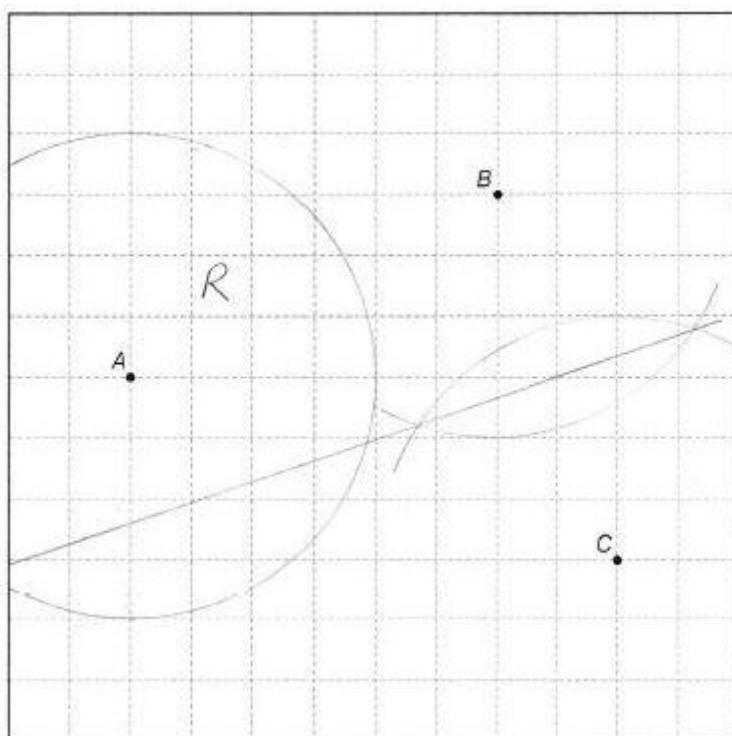
± 2 mm for the line at (0, 3), (6, 5) and the arc at (6, 6), (2, 10)

region may be identified by labelling R or by shading implies

B3

B1

Additional Guidance



B1B1B1

Arc must be drawn using compasses for the first and third marks

If a quarter-circle is in tolerance, ignore the rest of the arc for first B1

Grid points are based on the origin being bottom left

Use (6, 5) not the intersection of the arc and the line to test the region

Lines may be dotted

[3]

Q4.

Arc drawn from intersection of wall and fence cutting wall and fence
or Arc drawn from D radius hedge length

M1

Complete angle bisector with all construction arcs

A1

Point marked in correct place, with all arcs for both constructions shown

May be indicated by intersection of angle bisector and arc
SC1 Point marked in correct place but no arcs

A1

Additional Guidance

Tree need not be labelled

[3]

Q5.

Fully correct locus

B2 for two correct straight lines or two correct semi-circles
or one correct straight line and one correct semicircle
B1 for one correct straight line
or one correct semicircle
B1 for correct shape but incorrect size

B3

[3]

Q6.

Intersecting arcs on both sides of line joining sockets, of same radius centred on each socket

M1

Perpendicular bisector of sockets within tolerance (at least 3 cm long)

Tolerance is $\pm 1\text{mm}$ through their intersecting arcs.

A1

Point marked on wall 2 cm from fireplace on either side

B1

Socket marked on bottom wall where their perpendicular bisector does intersect the wall.

This mark is for showing that the socket can only be fitted on the bottom wall. If both positions marked then A0.

A1

[4]

Q7.

All the points within 20 miles of A

B1

[1]

Q8.

- (a) Fully correct constructed circle drawn with radius [5.9, 6.1]
B1 for any circle centre P (must be constructed and not freehand)

B2

- (b) Sector drawn [58°, 62°] degrees
B1 for any sector

B2

[4]

Q9.

Please note, *actual measurements may have changed slightly on export/printing.*

Arc radius [3.8, 4.2] cm centre P

or

arc radius [4.8, 5.2] cm centre Q

only need arcs within tolerance for the correct region

ignore other lines

M1 arc radius [3.8, 4.2] cm centre Q

and

arc radius [4.8, 5.2] cm centre P

and

correct ft region identified

M1

Arc radius [3.8, 4.2] cm centre P

and

arc radius [4.8, 5.2] cm centre Q

and

region identified

only need arcs within tolerance for the correct region

ignore other lines

A1

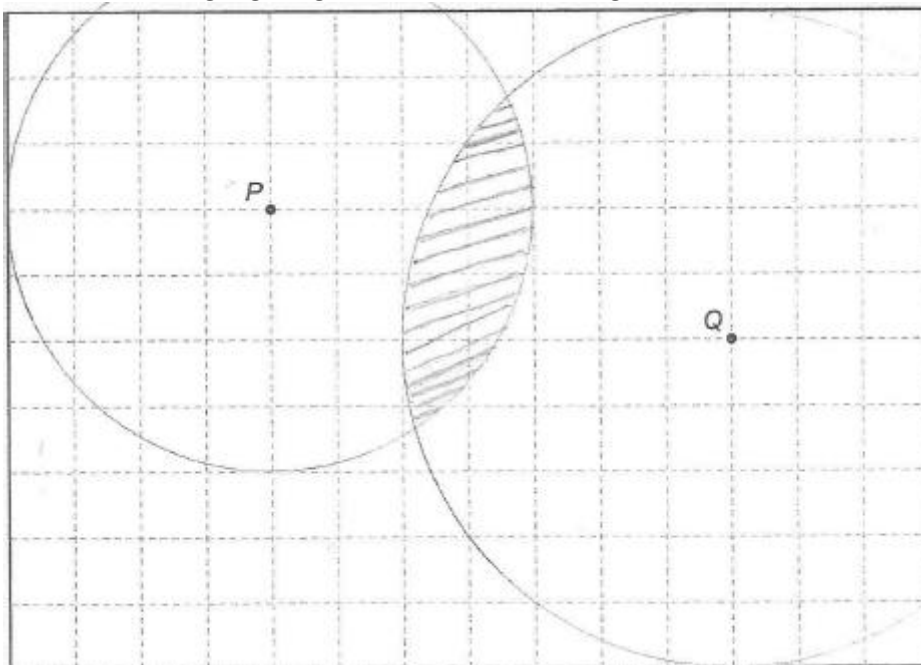
Additional Guidance

Arcs may go outside the rectangle

Allow any unambiguous indication of the region

eg labelled R or appropriate shading

Do not accept highlighting the perimeter of the region for identification of the region



M1A1

[2]

Q10.

Please note, actual measurements may have changed slightly on export/printing.

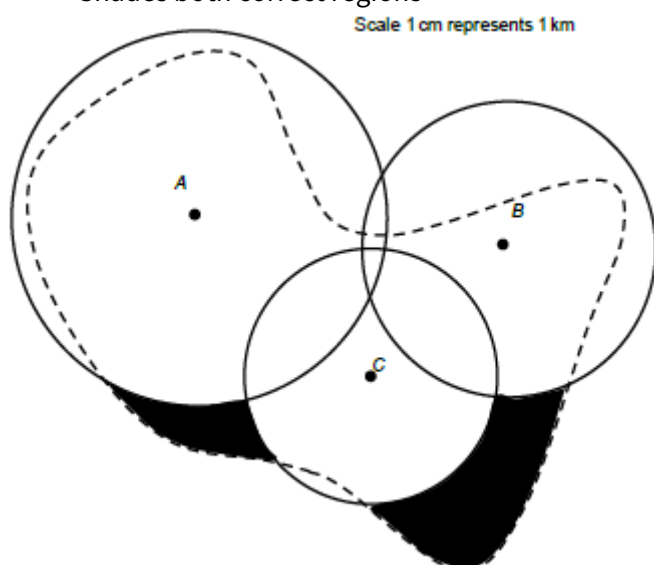
Completely correct

ie Circle radius 4.5 cm centre A

Circle radius 3.5 cm centre B

Circle radius 3 cm centre C

Shades both correct regions



All radii ± 2 mm

Full circles do not have to be drawn but arcs inside the town must be seen

B3 3 circles correct **and** only 1 correct region shaded (no incorrect regions)

or

3 circles correct **and** both correct regions shaded **and** one extra region shaded

or

2 circles correct **and** 1 incorrect **and** correct ft regions shaded

B2 3 circles correct with no or incorrect shading

or

2 circles correct **and** 1 incorrect **and** correct ft regions shaded **and** one extra region shaded

or

1 circle correct **and** 2 incorrect **and** correct ft regions shaded

or

2 circles correct **and** none incorrect **and** correct ft regions shaded

B1 3 incorrect circles **and** correct ft regions shaded

or

At least 1 circle correct

B4

[4]

Q11.

(a) 2 or 2.0

B1

(b) Circular arc drawn centre post

M1

Fully correct arc radius 5 cm
 $\pm 2 \text{ mm tolerance}$

A1

(c) 2 cm = 1 metre

Any equivalent scale

or 1 cm = 0.5 metre

Condone 1 square = 0.5 metre

M1

1 cm = 50 cm or 2 cm = 100 cm

Any order

or 2 : 100

Common units

M1

1 : 50

50 : 1 implies M1M1A0

A1

[6]

Q12.

(a) Circle drawn, centre (0, 0), radius 4

B1

(b) $x^2 + y^2 = 16$ or $x^2 + y^2 = 4^2$
oe

B1

[2]