

8300

GCSE MATHEMATICS

Foundation and Higher tier – Questions by Topic – Mark Scheme

Probability

Venn diagrams

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.

Valid criticism referring to one or both sets not being labelled
eg the circles should be labelled
or the labels are missing

B1

Valid criticism referring to the numbers not adding to 98

eg the numbers add to 99

or

48 should be 47

SC1 no written criticisms, but circles labelled correctly and 48 changed to 47 on diagram

B1**Additional Guidance**

Accept both statements written in one criticism

For more than two criticisms mark the best two unless contradicted

Condone written corrections as criticisms eg Add labels

B1

Criticism 1 - There is no A label and Criticism 2 - There is no F label

B1B0

Didn't label the diagram

B1

There are no subjects

B1

The diagram doesn't have labels/headings/titles

B1

The diagram doesn't have a label/heading/title

B0

It doesn't show how many study French

B0

48 is wrong/one of the numbers is wrong

B1

There's an extra student

B1

It doesn't add up correctly/the total is wrong

B1

It doesn't add up

B0

The numbers are wrong

B0

Do not accept an incorrect statement

eg The number doing Art and French should be 47

B0

If a value is used as evidence it must be correct

eg the total is 100, not 98

B0**[2]**

Q2.

- (a) (The number of students that) Have both a cat and a dog
oe
eg 9 have both

B1

Additional Guidance

They are in both sets

B1

- (b) 7 cats only

B1

8 dogs only

B1

6 neither

Must ft from their Cats and Dogs

B1ft

Additional Guidance

SC1 if all 4 entries add up to 30

[4]

Q3.

- (a) 29

B1

Additional Guidance

Accept 29 out of 50

Do not accept $\frac{29}{50}$ or 29 : 50

- (b) 4

B1

Additional Guidance

Accept 4 out of 50

Do not accept $\frac{4}{50}$ or 4 : 50

- (c) $\frac{17}{50}$ or 0.34 or 34%

oe fraction

B1

Additional Guidance

Ignore attempts to simplify or convert a correct fraction

Ignore probability words

17 out of 50 or 17 in 50 or 17 : 50 is B0

however, condone 17 out of 50 or 17 in 50 with a correct fraction, decimal or percentage (together on answer line)

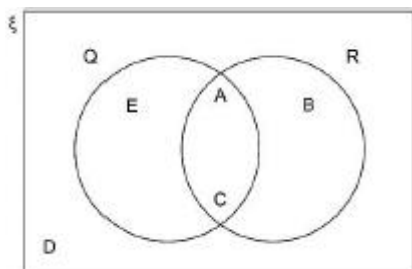
B1

but do not accept 17 : 50 with a correct fraction, decimal or percentage (together on answer line)

B0

[3]

Q4.



D can be anywhere inside the rectangle and outside the circles

B2 for 3 or 4 letter positions correct

B1 for 1 or 2 letter positions correct

B3

Additional Guidance

Accept names of shapes written on diagram but do not accept first letter only (ambiguous)

Duplicating a letter in more than one region is choice and that letter cannot be counted as correct

Ignore anything written outside the rectangle

[3]

Q5.

(a) Both Geography and History

oe

eg 7 do both

B1

Additional Guidance

They are in both sets

B1

(b) 20 Geography only

B1

12 History only

B1

11 Neither

Must ft from their Geography and History

B1ft

Additional Guidance

20, 19, 4

B1B0B1

[4]

Q6.

$120 \div 4 \times 3$ or 90. oe
implied by 90 in the box and outside the circles

M1

$14 + 19 + \text{their } 90 - 120$

or $14 + 19 - 120 \div 4$ or 3

or

$19 - \text{their } 3 \text{ in C only}$

and $14 - \text{their } 3 \text{ in D only}$

oe their 90 must be > 87

$0 < \text{their } 3 < 14$

M1

16, 3, 11 and 90 in correct positions

SC1 their 4 Venn diagram values total 120, allow a blank intersection to imply 0

A1

Additional Guidance

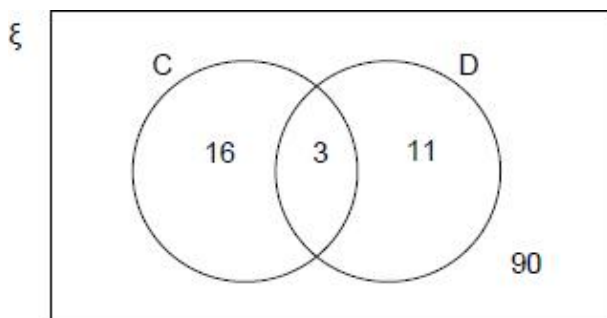
Allow up to M1M1 for working outside Venn diagram but Venn diagram takes precedence over working

3 in the intersection with 90 in the box and outside the circles

M1M1

3 in the intersection with a different number to 90 in the box and outside the circles

M0M1



M1M1A1

[3]

Q7.

$54 \div 6 (\times 5)$ or 9 or 45 oe

M1

45 in V only and 9 in P only

A1

their $45 + x = 4(\text{their } 9 + x)$ or

their $45 + x = \text{their } 36 + 4x$

oe any letter

M1

3 in V and P

ft their 45 and their 9

Award if $V \text{ total} = 4 \times P \text{ total}$

A1ft

18 not in V or P

ft their 45 and their 9 and 3

Award if the four values total 75

B1ft

[5]

Q8.

$70 \div 5 (\times 4)$ or 14 or 56

oe

M1

56 in W only and 14 in B only

A1

their $56 + x = 3(\text{their } 14 + x)$ or

their $56 + x = \text{their } 42 + 3x$

oe any letter

M1

7 in W and B

ft their 56 and their 14

Award if $W \text{ total} = 3 \times B \text{ total}$

A1ft

23 not in W or B

ft their 56 and their 14 and 7

Award if the four values total 100

B1ft

[5]

Q9.

12 in correct position

B1

24 in correct position

B1

11 in correct position

or 33 in correct position

or their value in G only is three times their value in the intersection

or their four values sum to 80

ft $\frac{1}{4} \times (80 - 12 - \text{their } 24)$

ft $\frac{3}{4} \times (80 - 12 - \text{their } 24)$

for this mark allow non-integers or values rounded or truncated to the nearest integer

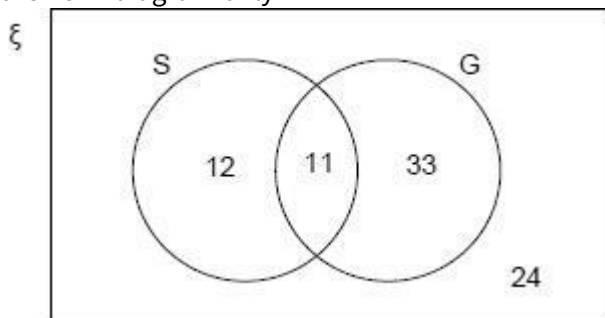
B1ft

12, 24, 11 and 33 in correct positions

B1

Additional Guidance

Mark the Venn diagram only



B1B1B1B1

[4]

Q10.

51 in A only

B1

18 in intersection

B1

60 in B only

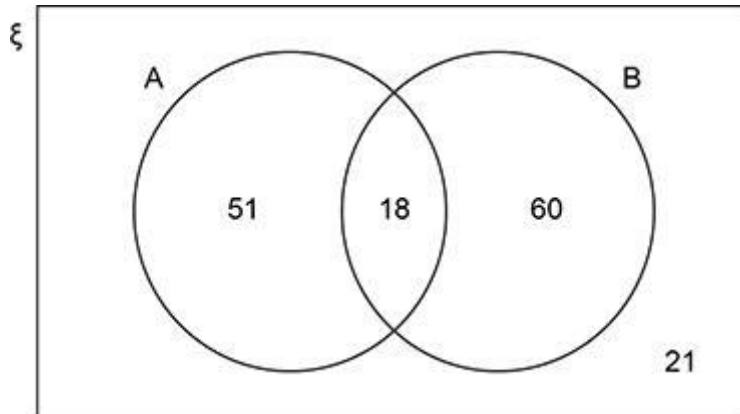
B1

21 outside circles

correct or ft 150 – their 51 – their 18 – their 60

B1ft

Additional Guidance



4 marks

If the correct numbers are given as fractions with denominator 150 (oe fraction), only withhold the mark in the first instance

If the three values inside the circles sum to 150, award the 4th mark for 0 written outside the circles, but not for no value written

If the three values inside the circles sum to more than 150, the 4th mark cannot be awarded on ft

[4]

Q11.

$$480 \times 0.4 \text{ or } 192$$

oe
implied by 2400

M1

$$480 \times \frac{3}{8} \text{ or } 180$$

oe
implied by 1440

M1

$$480 - \text{their } 192 - \text{their } 180 - 67 \text{ or } 41$$

oe
implied by 287

M1

$$\text{their } 192 \times 12.5 + \text{their } 180 \times 8 + \text{their } 41 \times 7$$

$$\text{or } 2400 + 1440 + 287$$

M1

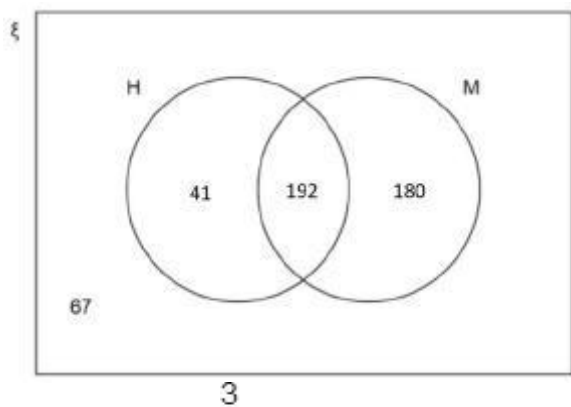
$$4127$$

A1

Additional Guidance

Method marks may be awarded for correct work seen on Venn diagram or in working, with no or incorrect answer, even if this is seen amongst multiple attempts

For the 4th method mark, incorrectly placed values from their Venn diagram may be used or values connected to the correct category eg if house only and museum only values transposed on the Venn diagram accept their $192 \times 12.5 + \text{their } 41 \times 8 + \text{their } 180 \times 7$



$$40\% \text{ of } 413 = 165, \frac{3}{8} \text{ of } 165 = 62, 413 - 62 - 165 = 186$$

$$165 \times 12.50 + 62 \times 8 + 186 \times 7 = 3860.50$$

MOMOM1M1A0

$$H = 154.875, H \& M = 165.2$$

$$480 - 67 - 154.875 - 165.2$$

MOMOM1

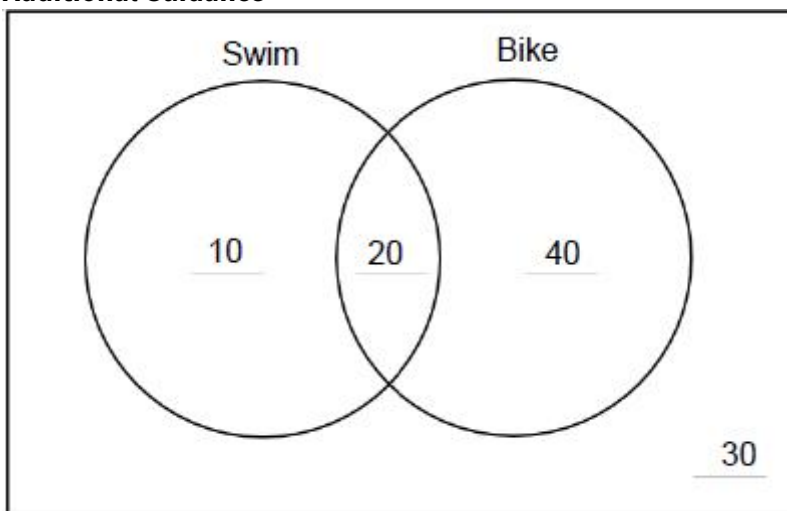
[5]

Q12.

Fully correct Venn diagram with 4 correct values and labels for swim and bike
B3 correct values in Venn but no labels or 3 correct values and labels
B2 10 who can swim only or 40 who can ride a bike only
B1 20 in the intersection and 30 in the area outside the circles

B4

Additional Guidance



[4]