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GCSE MATHS

Probability

Edexcel 1MA1 | Subtopic collection Topic 54

Venn diagrams and set notation

Higher tier

Answers and examiner comments

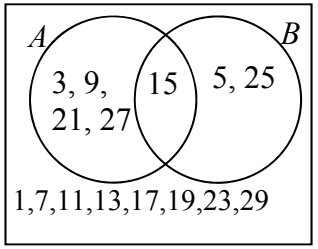
11	2017-2025	Higher
question groups	available papers	tier

Using this booklet

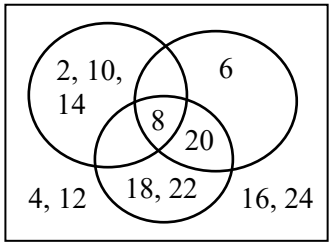
1. Answer numbers match the companion question booklet.
2. Follow the original question number on marking tables.
3. Examiner comments are included where available.

Name _____ **Date** _____

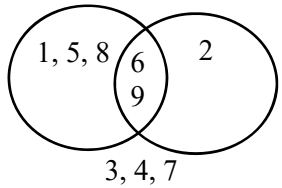
Some entries use full source marking material in an appendix. Any unavailable mark schemes are identified beside the relevant answer.

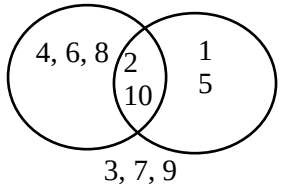
Question	Working	Answer	Mark	Notes
1 (a)		Venn Diagram	B1 M1 M1 C1	for labels on diagram for just 15 in the intersection for just 5 and 25 in only set B or just 3, 9, 21 and 27 in only set A or just 1, 7, 11, 13, 17, 19, 23, 29 in $(A \cup B)'$ for all numbers correctly placed in the Venn Diagram Ignore all entries except the region you are marking for each method mark
(b)		$\frac{7}{15}$	P1 A1	ft for $\frac{"7"}{a}$ where $a \geq$ "7" or $\frac{b}{"15"}$ where $b \leq$ "15" ft $\frac{7}{15}$ oe

Paper: 1MA1/2H

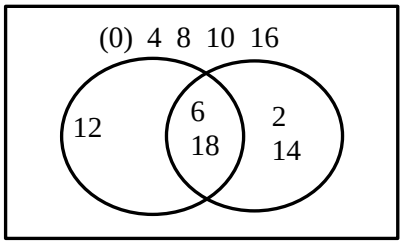
Question	Answer	Mark	Mark scheme	Additional guidance
1 (a)	Venn diagram	C4	fully correct Venn diagram	
		(C3	7 of the 8 regions correct **or** for a diagram with only one number incorrectly placed)	
		(C2	5 or 6 of the 8 regions correct)	
		(C1	3 or 4 of the 8 regions correct)	
(b)	$\frac{1}{12}$	M1	ft for identification of 1 or 12 eg from the diagram	Need not be written as a fraction or probability at this stage. eg could be a ratio 1:12
		A1	ft oe	Acceptable equivalents are (eg, could ft) any fraction equivalent to $\frac{1}{12}$, 0.08(33..) or 8(.33..)%

Paper: 1MA1/2H

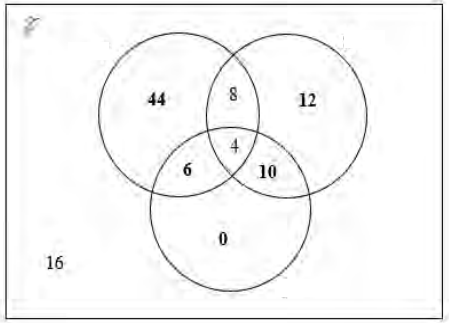
Question	Answer	Mark	Mark scheme	Additional guidance
1 (a)	6, 9	M1	for 6, 9 in the intersection only	Ignore all entries except the region you are marking for each method mark
	1, 5, 8 2 3, 4, 7	M1	for 1, 5, 8 in set A only or 2 in set B only or 3, 4, 7 in set $(A \cup B)'$ only	
		C1	for all numbers correctly placed in the Venn Diagram	
(b)	$\frac{2}{9}$	M1	ft for identification of 2 or 9 or ft diagram	Need not be written in correct form at this stage eg could be a ratio 2 : 9 Repeated digits in the diagram should be counted as 2 elements
		A1	$\frac{2}{9}$ oe or ft diagram	Accept any equivalent fraction, decimal form 0.22(22..) or percentage form 22(.22…)%

2	(a)	Venn diagram	M1	for correct numbers in at least one region	Ignore all entries except the region you are marking for each method mark
			M1	for correct numbers in at least two regions	
			A1	for all regions correct	
	(b)	$\frac{2}{10}$	M1	for $\frac{a}{10}$ where $0 < a < 10$ and a is an integer **or** $\frac{2}{b}$ where $b > 2$ and b is an integer **or** ft diagram	Need not be written in correct form at this stage eg could be a ratio 2 : 10 Repeated digits in the diagram should be counted as 2 elements
			A1	$\frac{2}{10}$ oe **or** ft diagram	Accept any equivalent fraction, decimal form 0.2 or percentage form 20%

Paper: 1MA1/2H

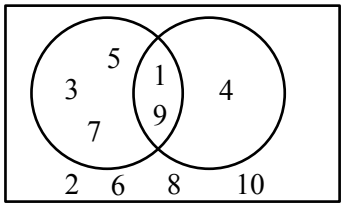
Question	Answer	Mark	Mark scheme	Additional guidance
2	Venn Diagram	C1 C1 C1	for one correct region for two correct regions for all regions correct	 Ignore all entries except the region you are marking for each mark

Paper: 1MA1/2H

Question	Answer	Mark	Mark scheme	Additional guidance
16 (a)	Venn diagram	C4	fully correct Venn diagram	 If all other regions correct, accept blank region for 0 Additional digits in the diagram should be counted as 2 elements
		(C3	6 or 7 of the 8 regions correct)	
		(C2	4 or 5 of the 8 regions correct)	
		(C1	2 or 3 of the 8 regions correct)	
(b)	$\frac{12}{62}$	M1	(ft their Venn diagram) for $\frac{"8+4"}{b}$ where $b >$ "8 + 4" or $\frac{a}{"44+8+4+6"}$ where $a <$ "44 + 8 + 4 + 6" oe	Need not be written in correct form at this stage eg could be a ratio 12 : 62
		A1	ft oe	Accept any equivalent fraction, decimal form 0.19(35...) or percentage form 19(.35…)%

Paper: 1MA1/2H

Paper: 1MA1/1H

Question	Answer	Mark	Mark scheme	Additional guidance
5 (a)	Venn diagram	B3	for a fully correct Venn diagram	Ignore all entries except the region you are marking for each method mark
		(B2	for two or three of the four regions correct)	
		(B1	for just one of the four regions correct)	
(b)	$\frac{7}{10}$	M1	(ft diagram) for $\frac{a}{10}$ where $0 < a < 10$ and a is an integer or $\frac{7}{b}$ where $b > 7$ and b is an integer **or** $1 - \frac{3}{10}$ **or** 7 : 10	Repeated digits in the diagram should be counted as 2 elements
		A1	(ft diagram) for $\frac{7}{10}$ oe	Accept any equivalent fraction, or 0.7 or 70%

Paper: 1MA1/1H

21	98	P1 P1 P1 A1	for (total number of gold =) $6x - 3$ for forming an equation, eg $\frac{x}{6x-3} = \frac{2}{11}$ (dep on P2) for correct substitution of their value into all expressions, eg $7\times"6"-11+"6"+5\times"6"-3(=64)$ 98	

Paper: 1MA1/2H				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**

Modifications to the mark scheme for Modified Large Print (MLP) papers: 1MA1 2H

Only mark scheme amendments are shown where the enlargement or modification of the paper requires a change in the mark scheme. Notes apply to both MLP papers and Braille papers unless otherwise stated.

The following tolerances should be accepted on marking MLP papers, unless otherwise stated below:
Angles: ±5°
Measurements of length: ±5 mm

PAPER: 1MA1_2H			
Question		**Modification**	**Mark scheme notes**
1	(c)	Letter 'f' changed to 'p'. Letter 'g' changed to 'q'.	Standard mark scheme but note change of letter
7		Wording added 'Look at the diagram for Question 7 in the Diagram Booklet. You may be provided with a model. They show'. Wording removed 'The diagram shows'. Diagram enlarged. Radius and height labels moved to the left. Dashed lines made longer and thicker.	Standard mark scheme
9		Letter 'x' changed to 'y'.	Standard mark scheme but note change of letter
10		Wording added 'Look at the diagram for Question 10 in the Diagram Booklet. It shows an incomplete probability tree diagram.' Wording added 'There are five spaces to fill.' In (a) wording added 'in the Diagram Booklet'. Diagram enlarged. Braille: Diagram enlarged with missing answers labelled (i), (ii), (iii), (iv), (v). For Braille add 'Ans: (i)___ (ii)___ (iii)___ (iv) ___ (v) ___	Standard mark scheme
11		Wording added 'Look at the diagram for Question 11 in the Diagram Booklet. It shows four graphs.' Diagrams enlarged. Titles moved above each graph. Axis labels moved to the top of the vertical axis and to the right of the horizontal axis. Open headed arrows. Table enlarged and left aligned. Wording added 'There are four spaces to fill.' For Braille: 'Match each type of probability in the list below to the correct graph.' Remove table and make a list adding in (i) Graph ____, (ii) Graph ____, etc.	Standard mark scheme

PAPER: 1MA1_2H			
Question		**Modification**	**Mark scheme notes**
15	(a), (b)	Wording added ‘Look at the diagram for Question 15(a) and 15(b) in the Diagram Booklet. It shows an incomplete histogram.’ Wording added ‘below’. Wording added ‘in the Diagram Booklet’. Table enlarged and left aligned. Values in the table changed: Range ‘$16 < t \leq 19$’ changed to ‘$16 < t \leq 20$’ Range ‘$19 < t \leq 21$’ changed to ‘$20 < t \leq 22$’ Range ‘$21 < t \leq 26$’ changed to ‘$22 < t \leq 26$’ Value ‘15’ changed to ‘18’ Value ‘7’ changed to ‘6’. Grid lines changes on the grid to go up in increments of 4 on the x axis. Diagram enlarged. Axis labels moved to the top of the vertical axis and to the left of the horizontal axis. Open headed arrows. Shading changed. Right axis labelled. Third bar changed width and height to match modified values. Grid cut at x = 28. Wording added ‘There is one space to fill.’	(a) Standard mark scheme (b) bars of height 9 cm and 3 cm (c) Standard mark scheme
15	(c)	Wording added ‘Look at the diagram for Question 15(c) in the Diagram Booklet. It is a histogram giving’. Wording removed ‘The histogram below gives’. Grid lines changes on the grid to go up in increments of 4 on the x axis. Right axis labelled. Diagram enlarged. Shading changed. Open headed arrows. Grid cut at x = 28. Axis labels moved to the top of the vertical axis and to the left of the horizontal axis.	Standard mark scheme
16		Wording added ‘Look at the diagram for Question 16 in the Diagram Booklet. It shows trapezium ABCD.’ Wording removed ‘ABCD is a trapezium.’ Wording added ‘AB = 7.9 cm BC = 15.3 cm Angle BAD = 112° Angle ADB = 42°’ Diagram enlarged. Angles moved outside of angle arcs and angle arcs made smaller.	Standard mark scheme

PAPER: 1MA1_2H			
Question		**Modification**	**Mark scheme notes**
18		Wording added 'Look at the diagram for Question 18 in the Diagram Booklet. It shows quadrilateral ABCD.' Wording removed 'ABCD is a quadrilateral.' Diagram enlarged. EFGH joined with dashed lines.	Standard mark scheme
21		Wording added 'Look at the diagram for Question 21 in the Diagram Booklet. It shows a Venn diagram.' Diagram enlarged. '34' moved left in the Venn diagram. Circles A and B labelled 'set A' and 'set B'.	Standard mark scheme

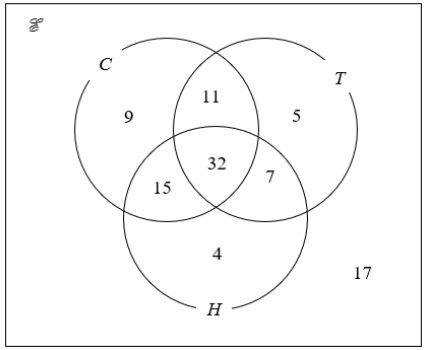
Question	Answer	Mark	Mark scheme	Additional guidance
4 (a)	10, 11, 13, 14, 16, 17	B1	cao	
(b)	$\frac{5}{9}$	M1	for identification of 10, 12, 14, 15, 18 **or** for $\frac{a}{9}$ where $1 \leq a \leq 8$, a an integer, or $\frac{5}{b}$ where $b > 5$, b an integer **or** for incorrect form, eg 5 : 9	
		A1	oe	Accept any equivalent fraction, decimal form, 0.55(5...) or 0.56 or percentage form, 55.(5...)% or 56%

Paper: 1MA1/1H

Question	Answer	Mark	Mark scheme	Additional guidance
4	statements	C1	for identifying that the number 17 should only be in the intersection **Acceptable examples** 17 should only be in the middle Take 17 out of (set) A only appropriate 17 crossed out on the Venn diagram **Not acceptable examples** Tom should put 17 in B Should have two 17's in the middle Take 17 out of (set) A Needs to remove a 17 17 is on twice	Accept correct descriptions using correct set notation for both marks Diagram may be used to support statements
		C1	for identifying that the number 1 is missing from the diagram **Acceptable examples** 1 should be in the outside region He should put 1 outside the circles Tom needs to put the number 1 on the diagram include 1 (outside $A \cup B$) 1 added to the diagram in the correct region **Not acceptable examples** Add the remaining numbers There are missing odd numbers between 0 and 20 put all the odd numbers outside the circles add the odd numbers in the $\mathscr{E}$ box include the even numbers 1 should be outside the Venn diagram	

Paper: 1MA1/2H

Question	Answer	Mark	Mark scheme	Additional guidance
18 (a)	Venn diagram	C4	fully correct Venn diagram	Ignore all entries except the region you are marking for each C mark Repeated digits in the diagram should be counted as 2 elements
		(C3	6 or 7 of the 8 regions correct)	
		(C2	4 or 5 of the 8 regions correct)	
		(C1	2 or 3 of the 8 regions correct)	
(b)	$\frac{47}{67}$	M1	for $\frac{47}{b}$ where $b > 47$ or ft $\frac{"47"}{b}$ where $b >$ "47" or $\frac{a}{67}$ where $0 < a < 67$ or ft $\frac{a}{"67"}$ where $0 < a <$ "67"	Need not be written in correct form at this stage eg could be a ratio 47 : 67 "47" = "15" + "32" "67" = "9" + "11" + "32" +"15"
		A1	for $\frac{47}{67}$ oe or ft $\frac{"47"}{"67"}$ oe	Accept any equivalent fraction, decimal form 0.70(14..) or percentage form 70(.14…)%



Paper: 1MA1/3H

Question 1

This question provided a good start to the paper. Nearly all students gained some credit for their answers with most students scoring at least four of the five marks available. Part (a) of this question requiring students to complete the Venn diagram was generally well done though some students did make careless errors when placing the numbers within set A and/or set B. A significant number of students wrote all of the numbers 1 to 9 in the region $(A \cup B)'$.

Part (b) of the question was answered quite well and many students benefited from the mark scheme which allowed a follow through from part (a). It was not unusual for students to gain part marks in part (a) followed by full marks in part (b). Some students reverted to using the sets listed rather than their Venn diagram to answer part (b). A common error was for students to give $\frac{6}{9}$ as their answer to this part presumably because students had confused intersection with union.

Question 2

Part (a) tested students' ability to place values into a Venn diagram. The mark scheme awarded marks for correct regions. 1 correct region gained one mark, 2 correct regions gained two marks and all regions correct gained full marks. Most students were able to score some marks, with a large number getting at least two marks, for 2 correct regions. It was quite common to see the outer region missing altogether.

Part (b) allowed students to carry though mistakes in part (a) for their probability. A majority got at least one mark for a partially correct fraction with a good number gaining both marks for a fully correct probability.

Question 2

Those students who started by writing 6 and 18 in the intersection generally went on to answer this question quite well and often placed all five numbers correctly inside the circles to gain the first two marks. Some students, however, wrote 6 and 18 in more than one region or wrote just 18 in the intersection with 6 written in two different regions. The outside region, $(A \cup B)'$, proved to be more

problematic. It was common to see either no numbers at all in this region or many of the numbers that had been placed inside the circles. Those who did attempt to put the rest of the even numbers in this region sometimes failed to include all four numbers.

Question 16

This Venn diagram question allowed most students to gain at least some credit. However, this example was challenging so that only a minority of students were able to score all 4 marks. The region most often incorrect was B only due to the fact it was the region that required the

most working out. 0 was often omitted which cost students a mark unless they had the other 7 sections correct.

Part (b) required students to pull values from the diagram. Many students scored 1 mark for a correct numerator or denominator (more commonly numerator). There was a follow through on this question, which meant that students could gain credit for pulling the correct values from their incorrect Venn diagram. Many students did not understand the 'given uses A' and had 100 as the denominator.

Question 5

A good proportion of students scored full marks in part (a) for correctly placing the ten numbers in the Venn diagram. The most common error was not recognising that 1 is a square number and writing 1 in the region $A \cap B'$ rather than in the region $A \cap B$. Students who

wrote the correct numbers in two or three of the four regions gained 2 marks. It should be emphasised to students that each number in the universal set should appear just once in a Venn diagram and it might be advisable for students to cross off numbers as they are being added to the Venn diagram.

In part (b) many students scored one mark for the correct denominator of 10 or for a denominator that followed through from their Venn diagram. A correct numerator was seen less frequently. It was evident that many students were unable to identify the region B' and the most common mistake was to give the probability that the number is in set B.

Question 21

This question proved too hard for most candidates, which is to be expected for a question at this level. The conditional aspect of the probabilities was normally missed, and very few were able to gain the first mark for finding the number of gold medals. Failure to gain this first mark meant no marks were awarded at all.
A small number were awarded 1 mark for a correct expression for the number of golds.
Those who went one step further and formed the correct equation typically completed the problem and gained all 4 marks,

Summary

Based on the performance on this paper, students should:

- Remember correct money notation when working with problems involving currency.
- Practise further with solving equations that involve negative coefficients.
- Spend more time working with bearings and be encouraged to form diagrams to support.
- Ensure they read questions carefully so, like in the iteration questions, they complete the question as it is asked.
- Ensure they are familiar with the formula sheet as it will be available in Summer.

Question 4

In part (a) almost half of the students correctly identified the numbers that are in set P'. The most common errors were to list the three numbers in set P or the two numbers, 12 and 15, that are only in set P. Some students wrote down the correct six numbers but also included 18 and gained no mark.

In part (b) many students scored one mark for writing a probability with the correct denominator of 9. A correct numerator was seen less frequently. Some students identified the members of the set $P \cup Q$ and scored one mark but then added the five numbers. It was evident that many students were unable to identify the region $P \cup Q$ and the most common mistake was to give the probability that the number is in set $P \cap Q$. Another incorrect method was finding P(P) × P(Q).

Question 4

The first of the written response questions and one that did cause problems. In many cases, learners understood the errors but a lack of clarity in their response let them down. The first mark was for realising and articulating that 17 should only occur in the intersection and not in the set $A \cap B'$. Many simply said that 17 needed to be removed from A, which did not gain the credit as it was too ambiguous (17 obviously is in set A). The second mark was for realising that the number 1 was missing from the diagram and stating where it should be. Many failed to gain the credit as they said things such as ‘include the other odd numbers’ and needed to specify the 1. Also, those that said ‘1 needs to go outside’ did not gain the mark as this could refer to outside of the rectangle.

Question 18

In part (a), many responses gained at least one mark by correctly placing two or three of the given values 5, 32, and 15, into the appropriate regions of the Venn diagram. These values were provided in the question and did not require calculation, so were generally placed accurately. However, difficulties were often seen in interpreting the language used, particularly in distinguishing between phrases such as “like coffee and tea,” “like coffee and hot chocolate but not tea,” and “like coffee.” This led to values being placed in incorrect regions, especially within overlapping sections. Some responses went further and correctly calculated all remaining regions, though a common issue was omitting the value 17, despite it being calculated correctly in the working. Another frequent error involved placing the value 67, representing the total number who like coffee. into the “coffee only” section, rather than

using it to derive values across the coffee set. This often resulted in Venn diagrams totalling more than 100.

Learners should be encouraged to check that the sum of all values matches the total frequency.

The second part of the question involved conditional probability, where one mark could be awarded for a partially correct response. This was most often achieved by identifying 47 as the correct numerator. The denominator was less frequently accurate, with many responses using 100 instead of the restricted sample space of 67. This led to common incorrect answers such as $\frac{47}{100}$.