Chhetri Academy

chhetriacademy.com

GCSE MATHS

Probability

Edexcel 1MA1 | Subtopic collection Topic 54

Venn diagrams and set notation

Foundation tier

Answers and examiner comments

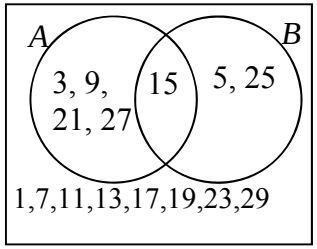
9	2017-2024	Foundation
question groups	available papers	tier

Using this booklet

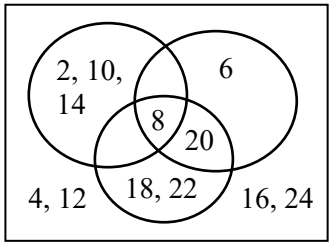
1. Answer numbers match the companion question booklet.
2. Follow the original question number on marking tables.
3. Examiner comments are included where available.

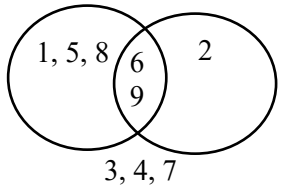
Name _____ **Date** _____

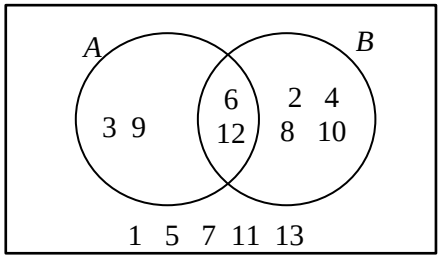
Some entries use full source marking material in an appendix. Any unavailable mark schemes are identified beside the relevant answer.

Question	Working	Answer	Mark	Notes
15 (a)		Venn Diagram	B1 M1 M1 C1 Ignore all entries except the region you are marking for each method mark	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
(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

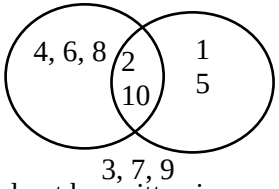
Paper: 1MA1/2F

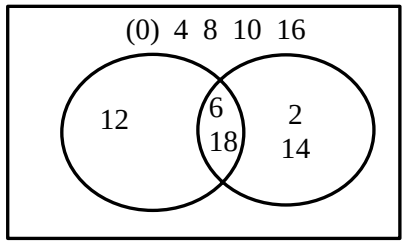
Question	Answer	Mark	Mark scheme	Additional guidance
20 (a)	Venn diagram	C4	fully correct Venn diagram	
		(C3	7 of the 8 regions correct **or** for a diagram with only one number incorrectly placed)	
		(C2	5 or 6 of the 8 regions correct)	
		(C1	3 or 4 of the 8 regions correct)	
(b)	$\frac{1}{12}$	M1	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..)%

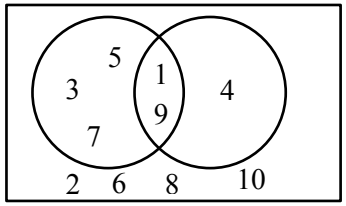
Question	Answer	Mark	Mark scheme	Additional guidance
24 (a)	6,9	M1	for 6, 9 in the intersection only	Ignore all entries except the region you are marking for each method mark
	1,5,8 2 3, 4,7	M1	for 1, 5, 8 in set A only or 2 in set B only or 3, 4, 7 in set $(A \cup B)'$ only	
		C1	for all numbers correctly 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…)%

20	Venn Diagram	B1 M1 M1 A1	for labelling diagram, accept “multiples of 3” and “even numbers” for labels for correct numbers in at least one region for correct numbers in at least two regions for all regions correct	Ignore all entries except the region you are marking for each method mark 

Paper: 1MA1/2F

Question	Answer	Mark	Mark scheme	Additional guidance
22 (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%

Question	Answer	Mark	Mark scheme	Additional guidance
21	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

24	(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: 1MA1/1F

Paper: 1MA1/1F

Question	Answer	Mark	Mark scheme	Additional guidance
23 (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: 1MA1/1F

Question	Answer	Mark	Mark scheme	Additional guidance
23	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: 1MA1/2F

Question 24

Many students were able to complete the regions within sets A and B correctly but often included all 1 to 9 numbers in the outer region. A significant minority of students incorrectly wrote their numbers on the circumference of the circles.

Part (b) was usually well done and did not rely on getting all the marks in part (a). Some students did not understand the set notation for the intersection.

Question 20

The Venn diagram question was answered really well by many students and the award of three or four marks was common. Generally speaking a good proportion of students were able to score at least three marks, normally for a correctly labelled diagram with at least 2 regions correct. When mistakes were made, it was often from values in more than one region, or quite commonly, for the region $(A \cup B)'$ to be either incomplete, or containing all the values.

Question 22

In part (a) the principles underlying Venn diagrams seemed to be well understood, with the vast majority of students able to place some elements in the correct regions, with the modal mark for this part of the question being two marks. The main errors seen were incorrectly placing "1" and forgetting to place 3, 7, 9 outside the intersecting circles.

In part (b) students were again quite successful, with a majority gaining at least one mark, usually for $x/10$ but x was often not 2 nor did it relate to their diagram. Many students seemed to show an understanding of what was meant by the intersection symbol and were thus able to gain at least one if not two marks for this part of the question.

Question 21

Many students were able to gain at least one mark, and often more in this question. The universal set was often incomplete with the omission of the numbers 4, 8, 10 and 16. Some students lost marks by duplicating entries in each region, so it was not uncommon to see, for example, the intersection containing, 6, 6, 18 and 18 or 6 (18) in all three sections.

Question 24

The completion of a fully correct Venn diagram in part (a) was rare. Many did not recognise "1" as a square number and many ignored the remaining numbers 2, 6, 8 and 10 from the universal set. Often students duplicated values in more than one section.
In part (b), it was very clear that only a very few students understood the complement notation preferring instead to just give the probability that the number chosen was in set *B*. Many students gave their probability as a decimal without previously writing it as a fraction out of 10. 0.7 the correct answer of course gained full marks but an answer of say 0.3 alone begs the question, where has it come from, $\frac{3}{10}$? or $\frac{6}{20}$? etc.

Question 23

The first part of this question was not well answered. Only a minority of candidates could write down the numbers that were in set P' of the Venn diagram. The most common incorrect answer was to give the elements of set P suggesting that candidates were not familiar with the notation for 'not'.

In part (b) of this question candidates were asked to find the probability that a number chosen at random from the universal set ξ was in the set $P \cup Q$. There were only a minority of candidates who could give a fully correct answer. A greater proportion of candidates were able to gain partial marks for answer of the form $\frac{a}{9}$ with $1 \leq a \leq 8$ having correctly identified that there were 9 values in the universal set. $\frac{1}{9}$ was a common response with candidates seemingly confusing union and intersection of sets. A smaller number of candidates were able to identify the values in the set $P \cup Q$ but did not know what to do in order to find the required probability, often adding the values in the set $P \cup Q$ and the values in the universal set and using these as the numerator and denominator of the probability that they gave as the answer. Common incorrect answers included 0, $\frac{1}{4}$ and $\frac{2}{4}$ together with likelihood words and giving the answer as a ratio.

Question 23

As with many questions requiring a written explanation about errors made in the way information is presented, this question appears to have been challenging for many learners. To gain the marks, learners needed to give clear statements about both the incorrectly placed 17 and the omission of 1 from the diagram. General comments such as “add the missing odd numbers” were incomplete and gained no credit. Many also gave ambiguous comments about “removing the 17 from the ‘A’ circle”, which suggested that they thought the overlap was not part of Set A and was considered to be a contradiction. When comments were not fully clear, credit could still be awarded if the diagram contained evidence to support the statements, for example in cases where learners had clearly indicated which 17 they wanted to remove or had added the number 1 in the right place.