



THIRD SPACE
LEARNING

Diagnostic Questions

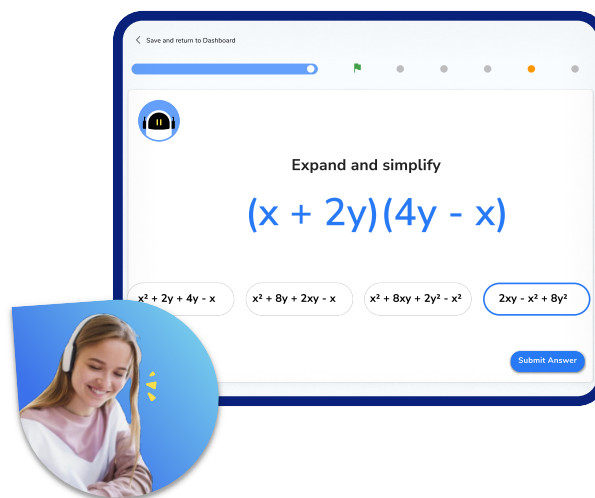
Venn Diagrams | Probability

This resource in a nutshell

Diagnostic questions are a quick and easy way of assessing your students' knowledge and understanding of a particular topic.

Students may be struggling with **Venn diagrams** for a number of different reasons. Diagnostic questions can help to identify the particular misconception that the student has and help to determine the specific support they will need in order to improve.

They are low stakes and support students developing metacognition around how their learning is progressing and what they need to do to improve further.



At Third Space Learning, we use diagnostic questions before and after online tutoring sessions to identify gaps and track progress, an example of this is shown above.

How to use the questions in this resource

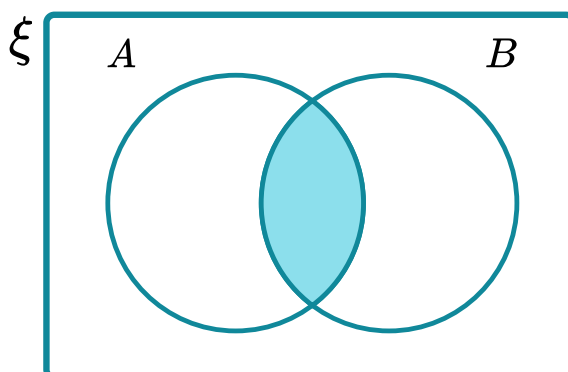
There are 16 multiple choice questions, each designed to assess each of the key skills required to master the given topic. Each question has **one correct answer** and **three carefully chosen incorrect answers** that are designed to identify and highlight fundamental misconceptions, including: **Set notation**, **Shaded regions**, and **Probability (including Conditional probability)**.

When answering these questions, students should be **encouraged to explain why they have chosen a particular answer**, and why the other three answers are incorrect. This can be done verbally in small groups, or written down on the worksheet or in their books.

This resource has been designed to be as **flexible** as possible with questions that can be easily chopped up and reordered, and come with a separate answer sheet that details all of the misconceptions highlighted in the answers.

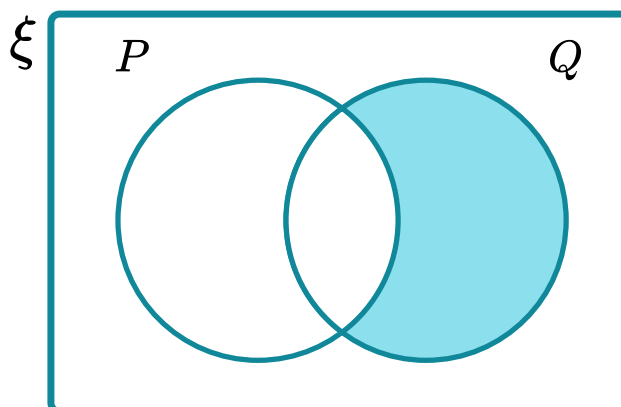
Diagnostic Questions: Venn Diagrams

1. Describe the shaded region using set notation:



A) $A \cup B$	B) $A \cap B$
C) $A' \cap B'$	D) $\{A, B\}$

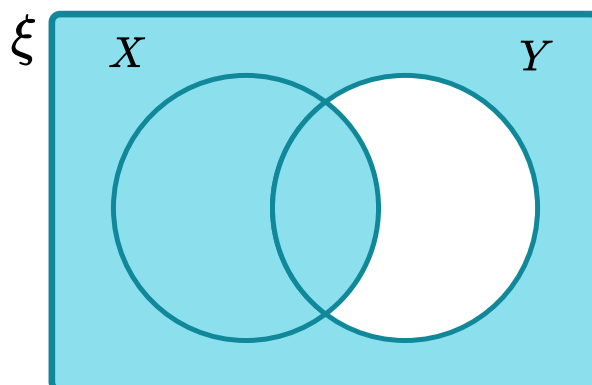
2. Describe the shaded region using set notation:



A) P'	B) $P \cap Q'$
C) $P' \cap Q$	D) Q

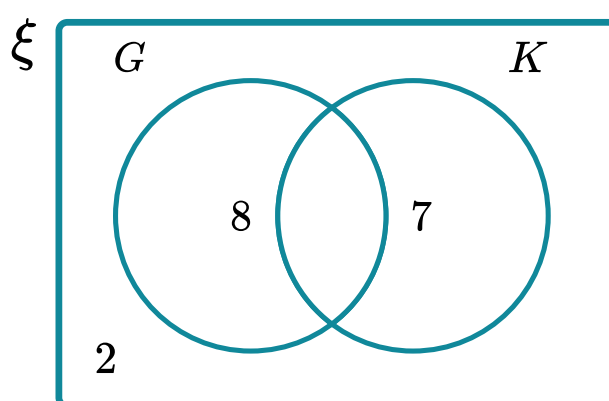
Diagnostic Questions: Venn Diagrams

3. Describe the shaded region using set notation:



A) $X \cup Y'$	B) Y'
C) $X \cap Y'$	D) $\xi - Y$

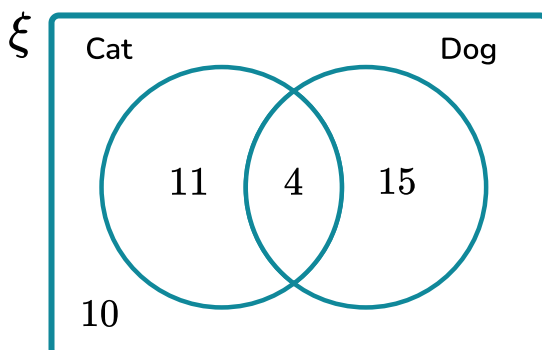
4. 20 musicians were asked if they could play guitar (G) or keyboard (K). By completing the Venn diagram, determine how many musicians could play the guitar:



A) 8	B) 5
C) 18	D) 11

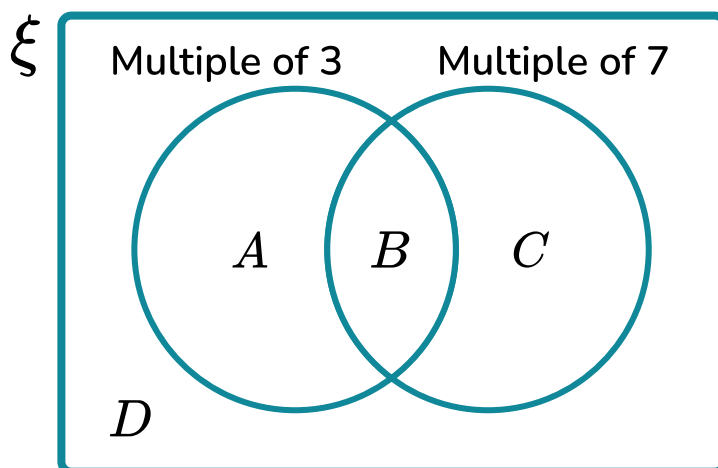
Diagnostic Questions: Venn Diagrams

5. The Venn diagram shows how many members of a youth group own pets. If a member of the youth group is chosen at random, what is the probability that they own a cat or a dog?



A) $\frac{1}{10}$	B) $\frac{1}{4}$
C) $\frac{3}{4}$	D) $\frac{17}{20}$

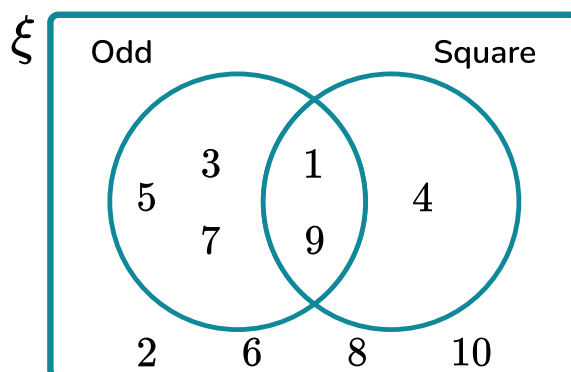
6. In this Venn diagram, ξ is the set of positive integers. Which region should the number 252 be placed?



A) A	B) B
C) C	D) D

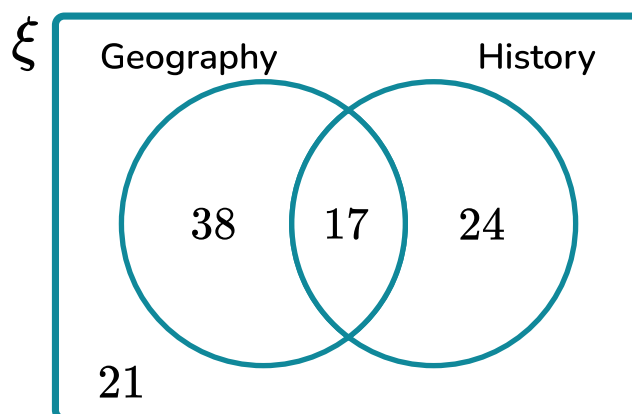
Diagnostic Questions: Venn Diagrams

7. Determine the universal set ξ :



A) $\xi = \{1, 3, 4, 5, 7, 9\}$	B) $\xi = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$
C) $\xi = \{2, 6, 8, 10\}$	D) $\xi = \{x : 0 < x < 10\}$

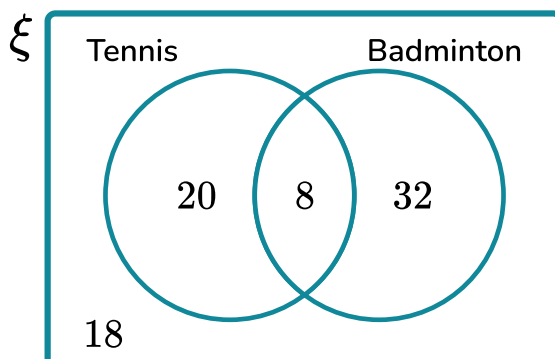
8. The Venn diagram shows which humanities subjects are studied by a year 10 cohort (ξ). What is the probability that a student from year 10 chosen at random studies Geography?



A) $\frac{11}{20}$	B) $\frac{19}{50}$
C) $\frac{55}{79}$	D) $\frac{17}{38}$

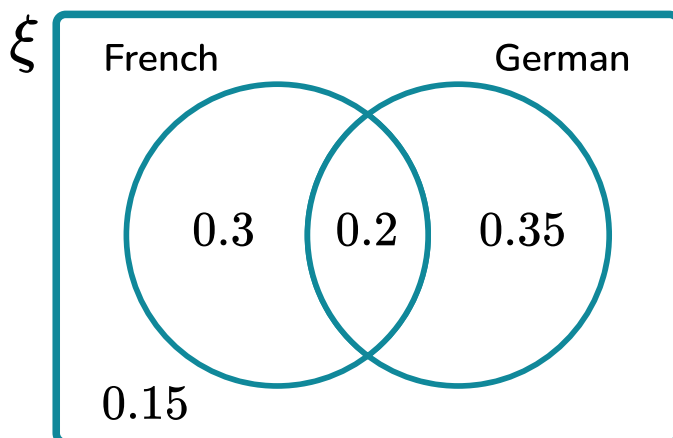
Diagnostic Questions: Venn Diagrams

9. The Venn diagram shows how many members of a youth group play tennis or badminton (ξ). What is the probability that a youth group member plays tennis given that they play badminton?



A) $\frac{1}{4}$	B) $\frac{7}{10}$
C) $\frac{4}{39}$	D) $\frac{1}{5}$

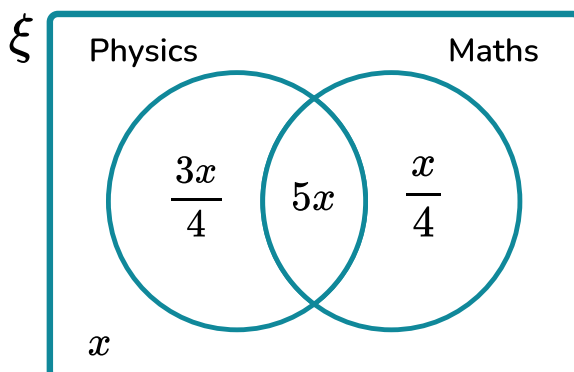
10. The Venn diagram shows the proportion of year 9 students able to speak a language. What is the probability that a year 9 student chosen at random can speak French or German, but not both?



A) 0.85	B) 0.105
C) 0.65	D) 0.45

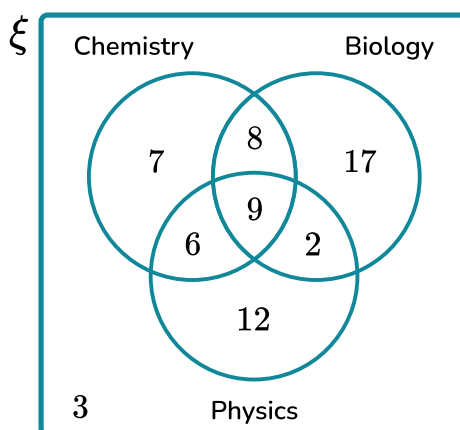
Diagnostic Questions: Venn Diagrams

11. The Venn diagram shows the distribution of year 8 students that pass their Physics and Maths tests. What is the probability that a year 8 student passes their Physics test?



A) $\frac{23}{28}$	B) $\frac{6}{7}$
C) $\frac{3}{28}$	D) $\frac{1}{7}$

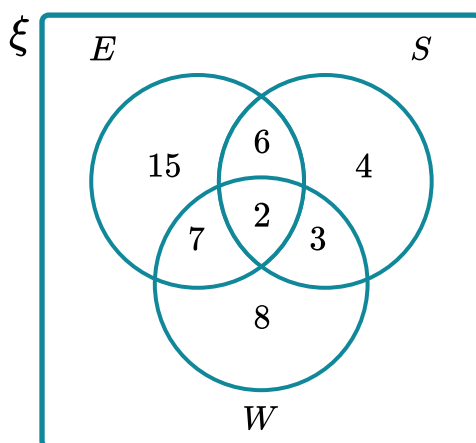
12. The Venn diagram shows the science subjects a group of students have chosen for further study. Find the probability that a student from this group selected at random chose to study two science subjects:



A) $\frac{25}{64}$	B) $\frac{7}{64}$
C) $\frac{9}{16}$	D) $\frac{1}{4}$

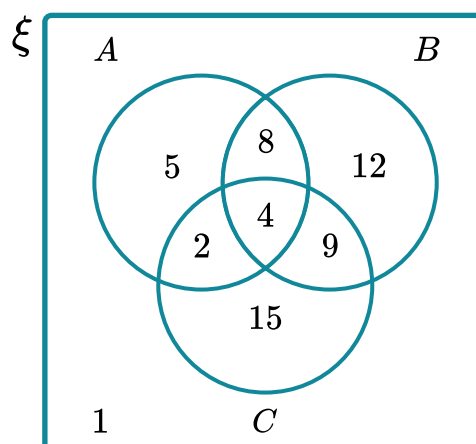
Diagnostic Questions: Venn Diagrams

13. In a survey about holidays in mainland UK, members of a tourist group are asked if they have visited England (E), Scotland (S) or Wales (W). The results are shown in a Venn diagram. What is the probability that a member has visited more than one of these countries?



A) $\frac{2}{3}$	B) $\frac{2}{5}$
C) $\frac{4}{9}$	D) $\frac{3}{5}$

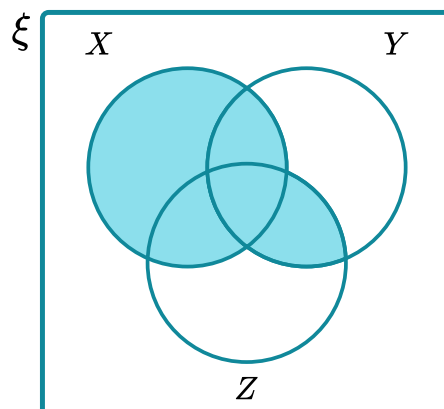
14. Determine $P(A|B \cup C)$



A) $\frac{5}{14}$	B) $\frac{4}{13}$
C) $\frac{7}{25}$	D) $\frac{14}{19}$

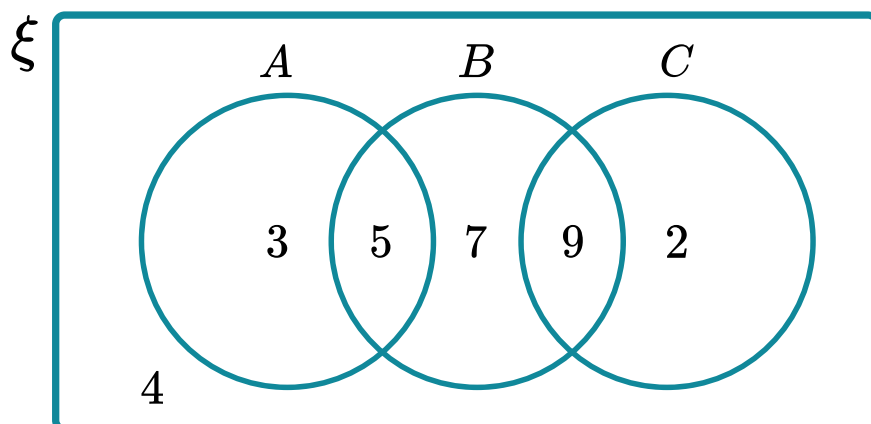
Diagnostic Questions: Venn Diagrams

15. Describe the shaded region using set notation:



A) $X \cup (Y \cap Z)$	B) $X \cap (Y \cup Z)$
C) $X \cup Y' \cup Z'$	D) $X \cap (Y \cap X)$

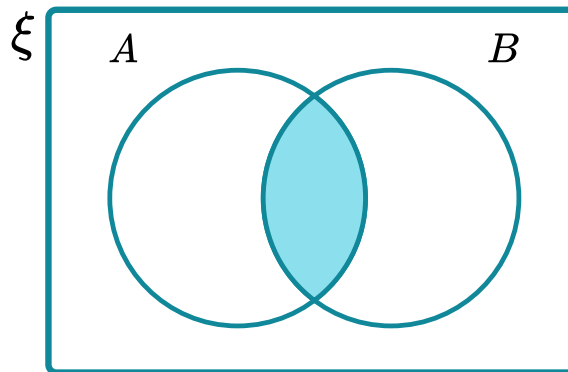
16. Determine $P(A \cap C)$



A) $\frac{7}{10}$	B) \emptyset
C) $\frac{19}{30}$	D) 0

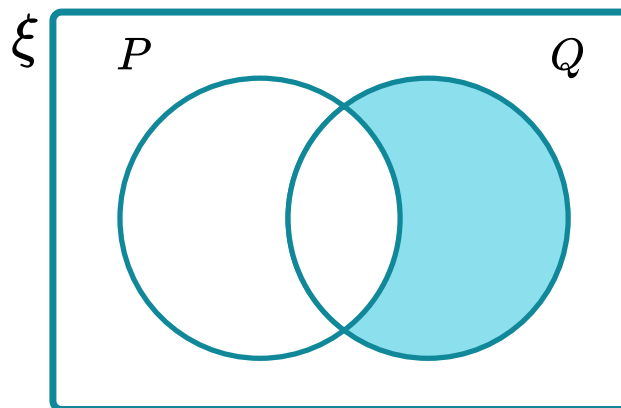
Diagnostic Questions: Venn Diagrams Answers

1. Describe the shaded region using set notation:



- A) $A \cup B$ Student confused symbols for union and intersection
- B) $A \cap B$ Correct answer
- C) $A' \cap B'$ Student does not understand the complement of a set
- D) $\{A, B\}$ Student used incorrect notation for the problem

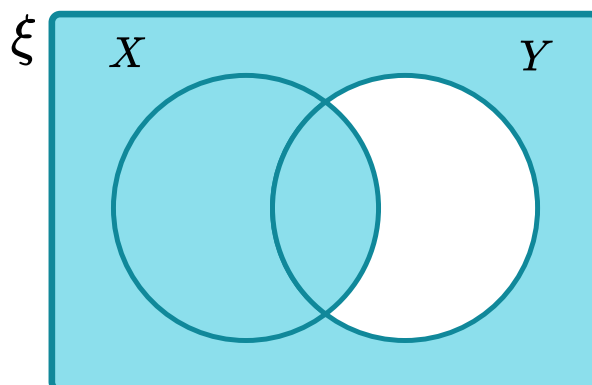
2. Describe the shaded region using set notation:



- A) P' Student did not include the elements of Q
- B) $P \cap Q'$ Student used the complement symbol incorrectly
- C) $P' \cap Q$ Correct answer
- D) Q Student assumed this was enough to denote just the elements of Q

Diagnostic Questions: Venn Diagrams Answers

3. Describe the shaded region using set notation:



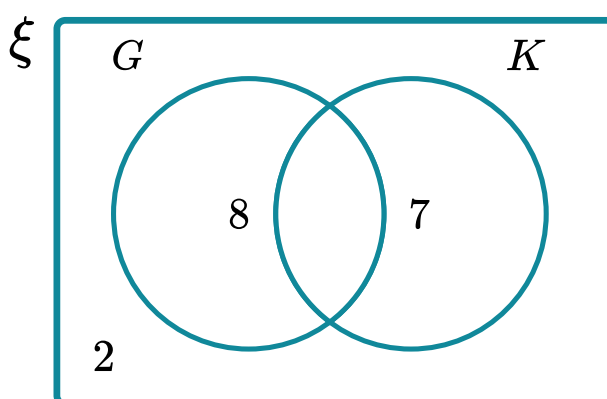
A) $X \cup Y'$ Correct answer

B) Y' Student misunderstood the complement of Y

C) $X \cap Y'$ Student confused the use of union and intersection

D) $\xi - Y$ Student lacks understanding of set notation

4. 20 musicians were asked if they could play guitar (G) or keyboard (K). By completing the Venn diagram, determine how many musicians could play the guitar:



A) 8 Student did not complete the Venn diagram

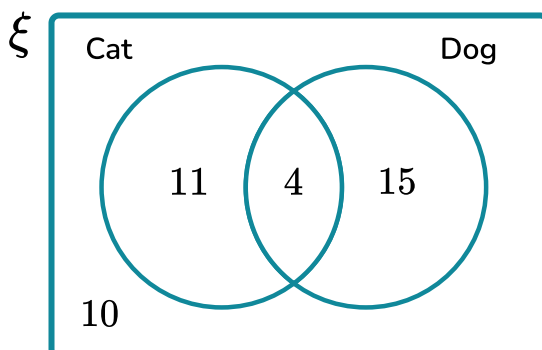
B) 5 Student subtracted the value (3) in the intersection instead of adding to 8

C) 18 Student found how many musicians could play guitar or keyboard

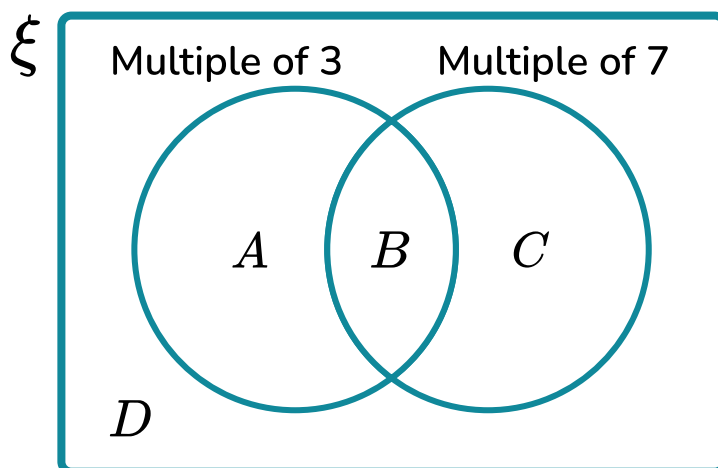
D) 11 Correct answer

Diagnostic Questions: Venn Diagrams Answers

5. The Venn diagram shows how many members of a youth group own pets. If a member of the youth group is chosen at random, what is the probability that they own a cat or a dog?



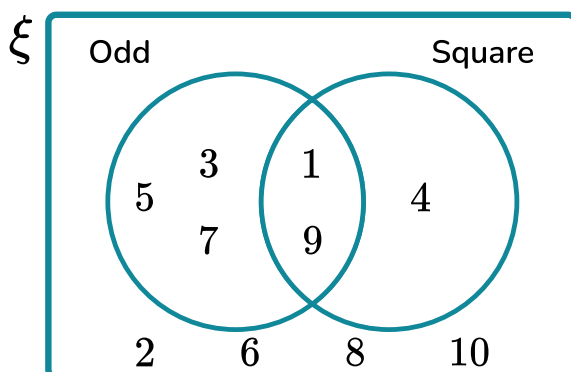
- A) $\frac{1}{10}$ Student used the intersection instead of the union
- B) $\frac{1}{4}$ Student gave the probability of not owning a cat or dog
- C) $\frac{3}{4}$ Correct answer
- D) $\frac{17}{20}$ Student counted the value (4) of the intersection twice
6. In this Venn diagram, ξ is the set of positive integers. Which region should the number 252 be placed?



- A) A Student did not test 252 for divisibility by 7
- B) B Correct answer
- C) C Student did not test 252 for divisibility by 3
- D) D Student misunderstood the subsets contained multiples of 3 or 7

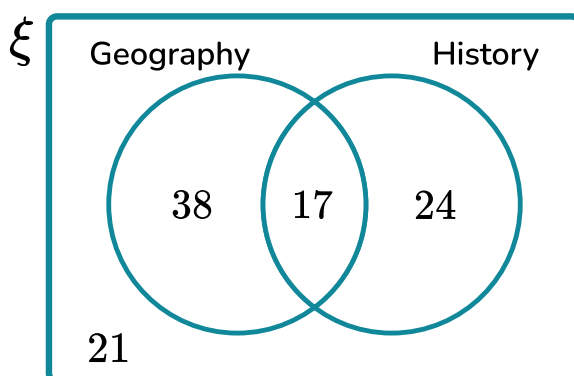
Diagnostic Questions: Venn Diagrams Answers

7. Determine the universal set ξ :



- A) $\xi = \{1, 3, 4, 5, 7, 9\}$ Student stated the elements in the union of the subsets odd, and square
- B) $\xi = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$ **Correct answer**
- C) $\xi = \{2, 6, 8, 10\}$ Student stated the elements that are not odd, or square
- D) $\xi = \{x : 0 < x < 10\}$ Student did not include 10 within the set ($0 < x \leq 10$)

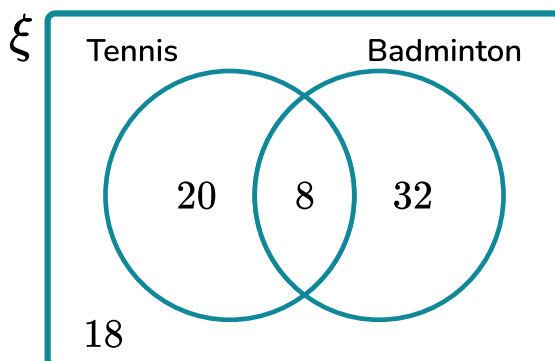
8. The Venn diagram shows which humanities subjects are studied by a year 10 cohort (ξ). What is the probability that a student from year 10 chosen at random studies Geography?



- A) $\frac{11}{20}$ **Correct answer**
- B) $\frac{19}{50}$ Student counted the students who study only geography
- C) $\frac{55}{79}$ Student did not count the 21 students who study neither geography or history
- D) $\frac{17}{38}$ Student used values from the Venn diagram without understanding their meaning

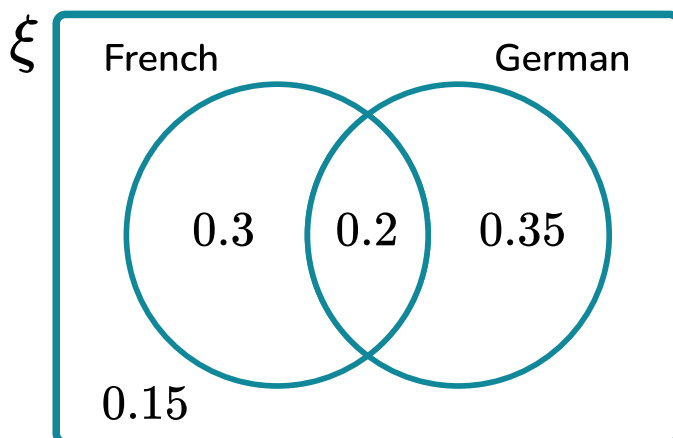
Diagnostic Questions: Venn Diagrams Answers

9. The Venn diagram shows how many members of a youth group play tennis or badminton (ξ). What is the probability that a youth group member plays tennis given that they play badminton?



- A) $\frac{1}{4}$ Student calculated the probability using 8 out of 32
- B) $\frac{7}{10}$ Student used total who play tennis and total who play badminton
- C) $\frac{4}{39}$ Student used the intersection of tennis and badminton out of the universal set
- D) $\frac{1}{5}$ Correct answer

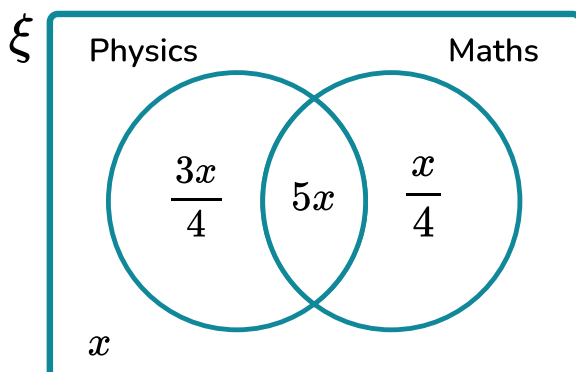
10. The Venn diagram shows the proportion of year 9 students able to speak a language. What is the probability that a year 9 student chosen at random can speak French or German, but not both?



- A) 0.85 Student included students that can speak both French and German
- B) 0.105 Student found the product of probabilities instead of the sum
- C) 0.65 Correct answer
- D) 0.45 Student subtracted the intersection from the correct answer

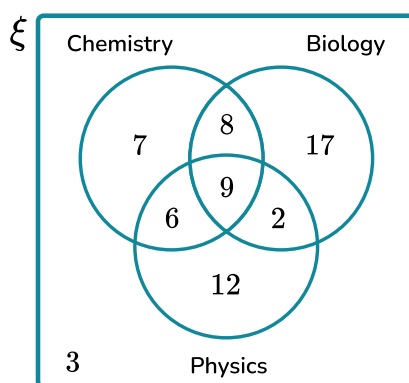
Diagnostic Questions: Venn Diagrams Answers

11. The Venn diagram shows the distribution of year 8 students that pass their Physics and Maths tests. What is the probability that a year 8 student passes their Physics test?



- A) $\frac{23}{28}$ Correct answer
- B) $\frac{6}{7}$ Student found the probability of a student passing physics or maths
- C) $\frac{3}{28}$ Student found the probability of a student passing physics but not maths
- D) $\frac{1}{7}$ Student found the value of x , but went no further

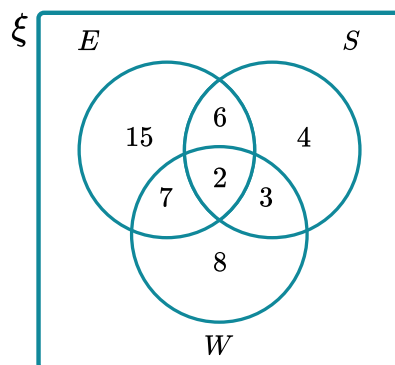
12. The Venn diagram shows the science subjects a group of students have chosen for further study. Find the probability that a student from this group selected at random chose to study two science subjects:



- A) $\frac{25}{64}$ Student included students studying all three science subjects
- B) $\frac{7}{64}$ Student subtracted the number of students studying all three science subjects from those studying two
- C) $\frac{9}{16}$ Student used the frequencies of students studying one science subject
- D) $\frac{1}{4}$ Correct answer

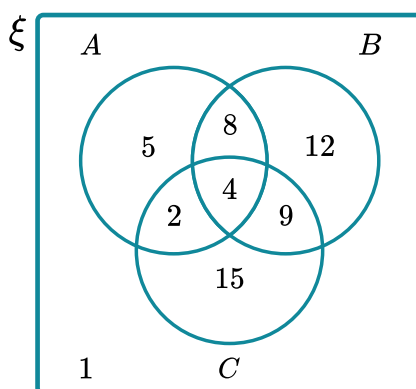
Diagnostic Questions: Venn Diagrams Answers

13. In a survey about holidays in mainland UK, members of a tourist group are asked if they have visited England (E), Scotland (S) or Wales (W). The results are shown in a Venn diagram. What is the probability that a member selected at random has visited more than one of these countries?



- A) $\frac{2}{3}$ Student used number of tourists to only one country as the denominator
- B) $\frac{2}{5}$ Correct answer
- C) $\frac{4}{9}$ Student counted the “2” twice in the numerator
- D) $\frac{3}{5}$ Student found the probability someone has visited exactly one of these countries

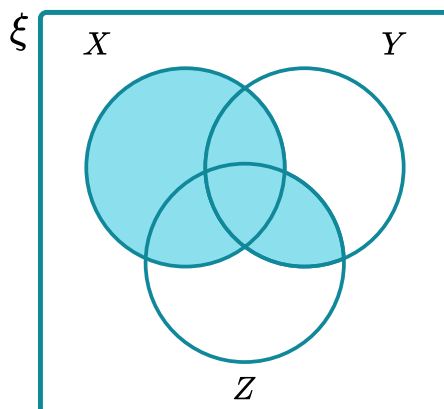
14. Determine $P(A|B \cup C)$



- A) $\frac{5}{14}$ Student used numbers solely that belong to A
- B) $\frac{4}{13}$ Student used the intersection (not union) of B and C
- C) $\frac{7}{25}$ Correct answer
- D) $\frac{14}{19}$ Student calculated $P(B \cup C|A)$

Diagnostic Questions: Venn Diagrams Answers

15. Describe the shaded region using set notation:



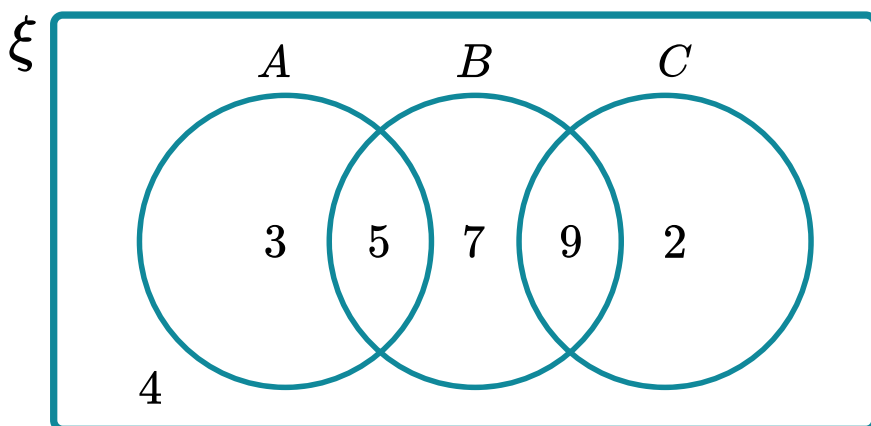
A) $X \cup (Y \cap Z)$ Correct answer

B) $X \cap (Y \cup Z)$ Student confused union / intersection symbols

C) $X \cup Y' \cup Z'$ Student misused the complement symbol

D) $X \cap (Y \cap X)$ Student left out elements of X

16. Determine $P(A \cap C)$



A) $\frac{7}{10}$ Student thought B was the intersection of A and C

B) \emptyset Student declared the empty set, not the probability

C) $\frac{19}{30}$ Student used the union of A and C

D) 0 Correct answer

Where to go next?

For more diagnostic questions, and GCSE maths revision resources and worksheets to support students in fixing any misconceptions take a look at the free Third Space Learning [GCSE maths revision](#) pages.

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