Venn Diagrams

KS3 Maths · Follows the national curriculum

Name _____ Class _____ Date _____

1. Worked example

|A|=12, |B|=9, |A∩B|=4. Find |A∪B| and the number in A only.

Step 1 · Apply the union formula

$|A \cup B| = 12+9-4 = 17$

Step 2 · Find 'A only' (A minus the overlap)

$12 - 4 = 8$

Answer: |A∪B|=17, A only = 8

Check: A only (8) + both (4) + B only (5) = 17, matching the union ✓

2. Now try one with the steps

ξ = {1, 2, ..., 10}. P = {prime numbers}, O = {odd numbers}. Fill in the Venn diagram.

Step 1 · List each set

Step 2 · Overlap (in both)

Step 3 · Only P, only O, then the rest outside

Answer:

3. Practice

Show your working. The marks tell you how much is expected.

1. In a class of 30, 18 like football (F) and 12 like tennis (T), with 6 liking both. Find the number who like ONLY football. [2]

2. Using the same data, find the number who like NEITHER football nor tennis. [3]

3. What does the symbol ∩ mean, and what does ∪ mean? [2]

4. A Venn diagram shows $|A|=15$, $|B|=20$, $|A\cap B|=8$. Find $|A\cup B|$. [2]

5. In a survey of 50 people, 28 own a cat, 19 own a dog, 10 own both. How many own NEITHER pet? [3]

6. Explain why we subtract the intersection when calculating $|A\cup B| = |A|+|B|-|A\cap B|$. [3]

7. ξ = {whole numbers from 1 to 10}. A = {even numbers}. List the members of A. [1]

8. A = {1, 2, 3, 4, 5} and B = {4, 5, 6, 7}. List $A \cap B$. [1]

9. For the same sets, list $A \cup B$. [1]

10. Set A has 9 members and $A \cap B$ has 3 members. How many members are in A only? [1]

11. ξ = {1, 2, …, 12}. A = {multiples of 3} and B = {multiples of 4}. List $A \cap B$. [1]

12. For the same sets, how many numbers in ξ are in neither A nor B? [2]

13. 50 people: 18 own only a cat, 9 own only a dog, 10 own both and 13 own neither. One person is chosen at random. Find P(they own a dog). [2]

14. Using the same 50 people, find P(they own a cat but not a dog). [2]

15. $\xi = \{1, 2, \ldots, 10\}$ and $A = \{2, 3, 5, 7\}$. How many members does A' (the complement of A) have? [1]

16. In a class of 32, 20 study French, 15 study Spanish and 7 study neither. How many study both? [3]

4. Before you hand it in

Adding |A| and |B| without subtracting the overlap to find the total in either set

Always use $|A \cup B| = |A| + |B| - |A \cap B|$. The subtraction corrects for counting the overlapping items twice.

Confusing the value placed in the 'A only' region with the total size of set A

The number written inside circle A but OUTSIDE the overlap is 'A only'. The TOTAL |A| = (A only) + (overlap). Always check which region a question is asking about.

Forgetting the numbers outside both circles

The rectangle is the universal set ξ. Anything in neither set goes inside the rectangle but outside both circles — and it still counts in the total.