

Venn Diagram Detectives

Use set relationships to count without double-counting.

HIGH SCHOOL • MA.912.LT.5.5

MA.912.LT.5.5 "Explore relationships and patterns and make arguments about relationships between sets using Venn Diagrams."

NAME _____

DATE _____

COUNT THE OVERLAP

A Venn diagram shows where two or more sets overlap. To find the number in A or B, add the set totals and subtract the overlap once: $n(A \cup B) = n(A) + n(B) - n(A \cap B)$.

WORKED EXAMPLE

At a reading club, 43 members listen to podcasts, 28 listen to audiobooks, and 6 listen to both. How many listen to podcasts or audiobooks?

1. Add the two set totals: $43 + 28 = 71$.
2. The 6 members in both sets were counted twice.
3. Subtract the overlap: $71 - 6 = 65$.

Answer: 65 members

PRACTICE 6 problems

- 1** In a survey, 31 students are in robotics, 26 are in coding, and 9 are in both clubs. How many students are in robotics or coding?

ANSWER _____

- 2** A group has 76 students. Of them, 34 play tennis, 29 play volleyball, and 11 play both. How many play neither sport?

ANSWER _____

- 3** Set A has 32 elements, Set B has 36 elements, and $n(A \cup B) = 54$. Find $n(A \cap B)$.

ANSWER _____

- 4** At a school, 72 students were surveyed. Of them, 38 play basketball, 27 play soccer, and 12 play both. How many play neither basketball nor soccer?

ANSWER _____

- 5** An art club has 45 members who paint and 30 members who act. If 61 members paint or act, how many members do both?

ANSWER _____

- 6** In a Venn diagram, 16 elements are in Set A only, 21 are in Set B only, and 8 are in both sets. Find $n(A \cup B)$.

ANSWER _____

APPLY IT Show your work

- 1** At a digital-media showcase, 90 students attended. Of the attendees, 44 use a video-editing app, 39 use a music-making app, and 17 use both apps. How many students use neither app?

WORK SPACE

ANSWER _____

- 2** At a gaming club event, 84 students attended. Of the attendees, 52 play esports, 35 create video games, and 14 do both. How many students do neither activity?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

One hundred students attended an activities festival. Of these students, 48 joined debate, 41 joined a science demonstration, and 37 joined an art lab. Also, 15 joined both debate and science, 12 joined both debate and art, 10 joined both science and art, and 4 joined all three. How many students joined exactly one activity, and how many joined none? Explain your reasoning.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	In a survey, 31 students are in robotics, 26 are in coding, and 9 are in both clubs. How many students are in robotics or coding?	48 students
2	A group has 76 students. Of them, 34 play tennis, 29 play volleyball, and 11 play both. How many play neither sport?	24 students
3	Set A has 32 elements, Set B has 36 elements, and $n(A \cup B) = 54$. Find $n(A \cap B)$.	14
4	At a school, 72 students were surveyed. Of them, 38 play basketball, 27 play soccer, and 12 play both. How many play neither basketball nor soccer?	19 students
5	An art club has 45 members who paint and 30 members who act. If 61 members paint or act, how many members do both?	14 members
6	In a Venn diagram, 16 elements are in Set A only, 21 are in Set B only, and 8 are in both sets. Find $n(A \cup B)$.	45

PART 2 • APPLY IT

- 24 students** The number who use at least one app is $44 + 39 - 17 = 66$. Subtract from 90 to get 24 students who use neither app.
- 11 students** The number who do at least one activity is $52 + 35 - 14 = 73$. Subtract 73 from 84 to get 11.

CHALLENGE

64 students joined exactly one activity, and 7 students joined none. Exactly one: $(48 - 15 - 12 + 4) + (41 - 15 - 10 + 4) + (37 - 12 - 10 + 4) = 25 + 20 + 19 = 64$. **At least one:** $48 + 41 + 37 - 15 - 12 - 10 + 4 = 93$, so $100 - 93 = 7$ joined none.

Accept equivalent use of a Venn diagram or the inclusion-exclusion formula. For the challenge, accept any correct explanation that accounts for the students in all three activities.