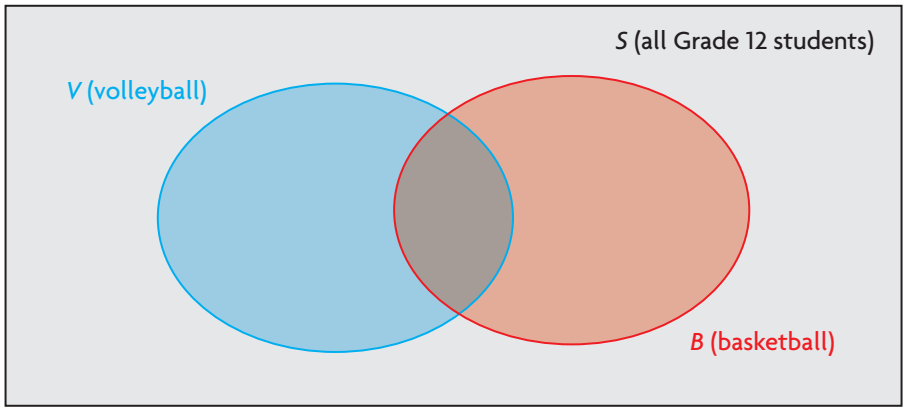
3.2 Exploring Relationships between Sets

GOAL

Explore what the different regions of a Venn diagram represent.

EXPLORE the Math

In an Alberta school, there are 65 Grade 12 students. Of these students, 23 play volleyball and 26 play basketball. There are 31 students who do not play either sport. The following Venn diagram represents the sets of students.



? How can you use this Venn diagram to determine the number of students who play volleyball only, basketball only, and both volleyball and basketball?

Reflecting

A. Consider the set of students who play volleyball and the set of students who play basketball. Are these two sets disjoint? Explain how you know.

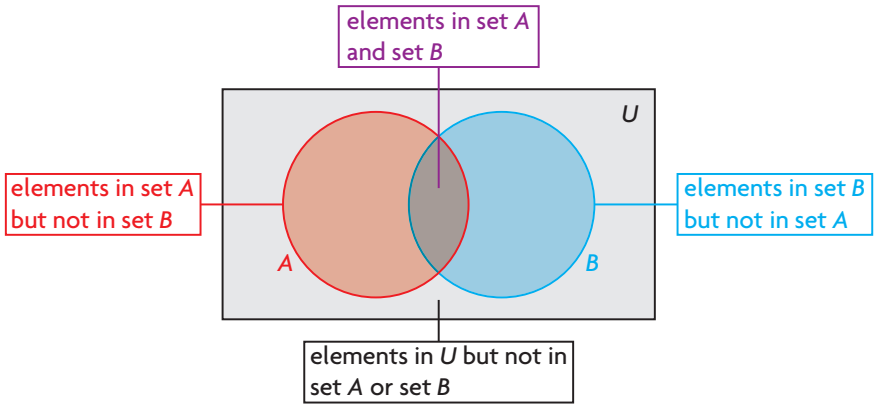
B. Describe how you solved the problem, including what each area of the Venn diagram represents.

C. Compare your solution to your classmates' solutions. Is there more than one way to solve the problem?

In Summary

Key Ideas

- Sets that are not disjoint share common elements.
- Each area of a Venn diagram represents something different.
- When two non-disjoint sets are represented in a Venn diagram, you can count the elements in both sets by counting the elements in each region of the diagram just once.



Need to Know

- Each element in a universal set appears only once in a Venn diagram.
- If an element occurs in more than one set, it is placed in the area of the Venn diagram where the sets overlap.

FURTHER Your Understanding

1. Consider the following sets:

- $U = \{2, 3, 4, 6, 8, 9, 10, 12, 14, 15\}$
- $A = \{3, 6, 9, 12, 15\}$
- $B = \{2, 4, 6, 8, 10, 12, 14\}$

a) Illustrate these sets using a Venn diagram.

b) Determine the number of elements

i) in set A.

ii) in set A but not in set B.

iii) in set B.

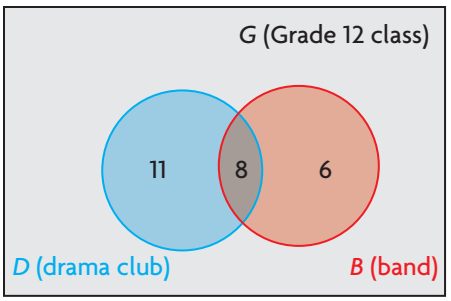
iv) in set B but not in set A.

v) in set A **and** set B.

vi) in set A **or** set B.

vii) in A'.

2. There are 38 students in a Grade 12 class. The number of students in the drama club and the band are illustrated in the Venn diagram. Use the diagram to answer the following questions.



a) How many students are in both the drama club and the band?

b) How many students are in the drama club but not in band?
How many are in the band but not in the drama club?

c) How many students are in the drama club? How many are in the band?

d) How many students are in at least one of the drama club or the band?

e) How many students are in neither the drama club nor the band?

3. Anna surveyed 45 students about their favourite sports. She recorded her results.

Favourite Sports	Number of Students
hockey	20
soccer	14
neither hockey nor soccer	16

a) Determine how many students like hockey and soccer.

b) Determine how many students like only hockey or only soccer.

c) Draw and label a Venn diagram to show the data.

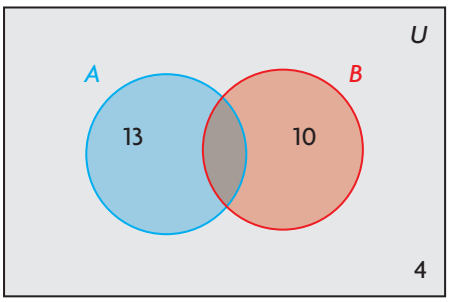
4. There are 55 guests at a ski resort in British Columbia. Of these guests, 25 plan to go skiing and 32 plan to go snowboarding. There are 9 guests who do not plan to ski or snowboard.

a) Determine how many guests plan to ski and snowboard.

b) Determine how many guests plan to only ski.

c) Determine how many guests plan to only snowboard.

5. Ryan drew the following Venn diagram incorrectly. There are 25 items in the universal set, U, and 4 items that are not in set A or set B.



a) Determine $n(A \text{ and } B)$, $n(A \text{ only})$, and $n(B \text{ only})$.

b) Redraw Ryan's Venn diagram with the data you determined in part a).