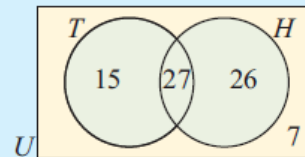


1.2 Venn Diagrams

Example 11



If the Venn diagram alongside illustrates the number of people in a sporting club who play tennis (T) and hockey (H), determine the number of people:



- a** in the club
- c** who play both sports
- e** who play at least one sport

- b** who play hockey
- d** who play neither sport

a Number in the club
 $= 15 + 27 + 26 + 7 = 75$

b Number who play hockey
 $= 27 + 26 = 53$

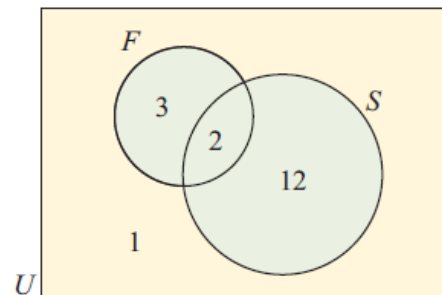
c Number who play both sports $= 27$

d Number who play neither sport $= 7$

e Number who play at least one sport
 $= 15 + 27 + 26 = 68$

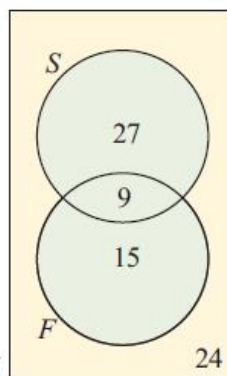
- 1** The Venn diagram alongside illustrates the number of students in a particular class who study French (F) and Spanish (S). Determine the number of students:

- a** in the class
- b** who study both subjects
- c** who study at least one of the subjects
- d** who only study Spanish.



- 2** In a survey at a resort, people were asked whether they went sailing (S) or fishing (F) during their stay. Use the Venn diagram to determine the number of people:

- a** in the survey
- b** who did both activities
- c** who did neither activity
- d** who did exactly one of the activities.



- 3** In a class of 30 students, 19 study Physics, 17 study Chemistry and 15 study both of these subjects. Display this information on a Venn diagram and hence determine the number of students who study:
- a** both subjects
 - b** at least one of the subjects
 - c** Physics, but not Chemistry
 - d** exactly one of the subjects
 - e** neither subject
- 4** In a class of 40 students, 19 play tennis, 20 play netball and 8 play neither of these sports. Determine the number of students in the class who:
- a** play tennis
 - b** do not play netball
 - c** play at least one of the sports
 - d** play one and only one of the sports
 - e** play netball, but not tennis
- 5** In a class of 25 students, 15 play hockey and 16 play basketball. If there are 4 students who play neither sport, determine the number of students who play both hockey and basketball.
- 6** In a class of 40, 34 like bananas, 22 like pineapples and 2 dislike both fruits. Find the number of students who:
- a** like both fruits
 - b** like at least one fruit
- 7** In a group of 50 students, 40 study Mathematics, 32 study Physics and each student studies at least one of these subjects. From a Venn diagram find how many students:
- a** study both subjects
 - b** study Mathematics but not Physics
- 8** In a class of 40 students, 23 have dark hair, 18 have brown eyes, and 26 have dark hair, brown eyes or both. How many students have:
- a** dark hair and brown eyes
 - b** neither dark hair nor brown eyes
 - c** dark hair but not brown eyes?
- 9** 400 families were surveyed. It was found that 90% had a TV set and 60% had a computer. Every family had at least one of these items. How many of the families had both a TV set and a computer?

Challenging Questions

- 1** Explain with the aid of a Venn diagram why the *commutative* laws $A \cap B = B \cap A$ and $A \cup B = B \cup A$ are valid.
- 2** Explain with the aid of a Venn diagram why the *idempotent* laws $A \cap A = A$ and $A \cup A = A$ are valid.
- 3** Explain with the aid of a Venn diagram why the *associative* laws $A \cap (B \cap C) = (A \cap B) \cap C$ and $A \cup (B \cup C) = (A \cup B) \cup C$ are valid.
- 4** Explain with the aid of a Venn diagram why the *complement* law $(A')' = A$ is valid.
- 5** What is the simplification of **a** $A \cap A'$ **b** $A \cup A'$?
- 6** Use the laws for the algebra of sets to show that:
 - a** $A \cup (B \cup A') = U$ for all B **b** $A \cap (B \cap A') = \emptyset$ for all B
 - c** $A \cup (B \cap A') = A \cup B$ **d** $(A' \cup B')' = A \cap B$ **e** $(A \cup B) \cap (A' \cap B') = \emptyset$
 - f** $(A \cup B) \cap (C \cup D) = (A \cap C) \cup (A \cap D) \cup (B \cap C) \cup (B \cap D)$