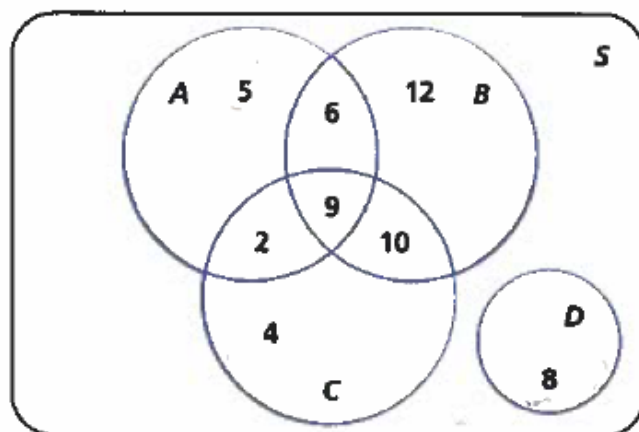


## 1.5 Venn Diagrams & Formulas

1. Using the Venn diagram below, list the elements (numbers) found in each of the following sets.



- (a)  $A \cap B$                       (b)  $A \cup B$                       (c)  $C \cap B$   
(d)  $C \cup B$                       (e)  $D \cap B$                       (f)  $A \cap B \cap C$
2. For each of the following, find the indicated probability and state whether A and B are mutually exclusive.
- (a)  $P(A) = 0.5$ ,  $P(B) = 0.2$ ,  $P(A \cup B) = 0.7$ ,  $P(A \cap B) = ?$   
(b)  $P(A) = 0.7$ ,  $P(B) = 0.2$ ,  $P(A \cup B) = ?$ ,  $P(A \cap B) = 0.15$   
(c)  $P(A) = 0.3$ ,  $P(B) = ?$ ,  $P(A \cup B) = 0.9$ ,  $P(A \cap B) = 0$
3. A sample space contains only three simple events: A, B, and C. If  $P(A) = 0.2$  and  $P(B) = 0.3$ , find
- (a)  $P(A \text{ and } B)$  if A and B are mutually exclusive  
(b)  $P(A \text{ or } B)$  if A and B are mutually exclusive  
(c)  $P(C)$  if A and B are mutually exclusive
4. The probability that Kelly will make the volleyball team is  $\frac{2}{3}$  and the probability that she will make the field hockey team is  $\frac{3}{4}$ . If the probability that she makes both teams is  $\frac{1}{2}$ , what is the probability that she makes at least one of the teams?
5. An aquarium at a pet store contains 20 guppies (12 females and 8 males) and 36 tetras (14 females and 22 males). If the clerk randomly nets a fish, what is the probability that it is a female or a tetra?

- 6 Knowledge and Understanding** A paper bag contains a mixture of three types of candy. There are ten chocolate bars, seven fruit bars, and three packages of toffee.
- (a) Draw a Venn diagram to illustrate the contents of the bag.
  - (b) Suppose a child selects one item from the bag at random. Determine the probability that the child chooses
    - (i) a chocolate bar
    - (ii) a package of toffee
    - (iii) something other than a fruit bar
7. An automobile manufacturer estimates the probability of a mechanical defect in the one-year warranty period is 0.65. The probability of any other defect is 0.35. The probability of encountering both types of defect is 0.20. What is the probability of encountering any type of defect?
8. At the start of flu season, Dr. Anna Ahmeed examines 50 patients over two days. Of those 50 patients, 30 have a headache, 24 have a cold, and 12 have neither symptom. Some patients have both symptoms.
- (a) Draw a Venn diagram and determine the number of patients that have both symptoms.
  - (b) Find the probability that a patient selected at random
    - (i) has just a headache
    - (ii) has a headache or a cold
    - (iii) does not have cold symptoms
9. Find the probability that, when you draw a single card from a well-shuffled standard deck of 52 playing cards, you choose a 9 or a 10.
10. Find the probability that, when you draw a single card from a well-shuffled standard deck of 52 playing cards, you choose an ace or a club.
11. Find the probability that when you roll two dice, the sum of the outcomes is greater than 6 or you get a 5 on one of the dice.
12. The probability it will rain today is 0.4 and the probability it will rain tomorrow is 0.3. The probability it will rain both days is 0.2. What is the probability it will rain today or tomorrow?
13. **Communication** If events  $A$  and  $B$  are mutually exclusive, explain why  $P(A \cup B)$  is the sum of the probabilities of each event. Use an example in your explanation.

- 14. Application** In a group of 45 students, 28 have dark hair, 19 are taller than 185 cm, and 5 neither have dark hair nor are taller than 185 cm. Some have dark hair and are taller than 185 cm. If a student is selected at random, determine the probability that the student is
- taller than 185 cm and has dark hair
  - taller than 185 cm or has dark hair
  - not taller than 185 cm

### Answers

1. (a) {6, 9} (b) {2, 3, 5, 6, 7, 9, 10, 12}  
 (c) {9, 10} (d) {1, 2, 4, 6, 7, 9, 10, 12}  
 (e)  $\emptyset$  (f) {9}

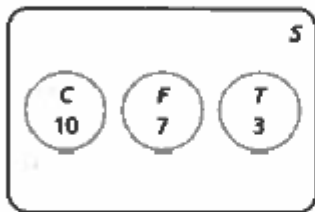
2. (a) 0; mutually exclusive  
 (b) 0.75; not mutually exclusive  
 (c) 0.6; mutually exclusive

3. (a) 0 (b) 0.5 (c) 0.5

4.  $\frac{11}{12}$

5.  $\frac{6}{7}$

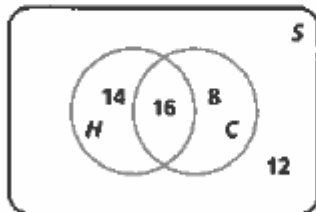
6. (a)



- (b) (i)  $\frac{1}{2}$  (ii)  $\frac{3}{20}$  (iii)  $\frac{13}{20}$

7. 0.8

8. (a)



- (b) (i)  $\frac{7}{25}$  (ii)  $\frac{19}{25}$  (iii)  $\frac{13}{25}$

9.  $\frac{2}{13}$

10.  $\frac{4}{13}$

11.  $\frac{23}{36}$

12. 0.5

14. (a)  $\frac{7}{45}$  (b)  $\frac{8}{9}$  (c)  $\frac{26}{45}$