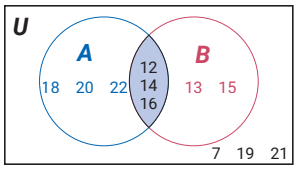
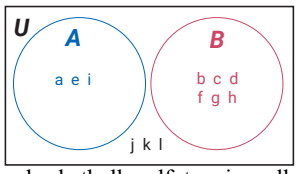
6.



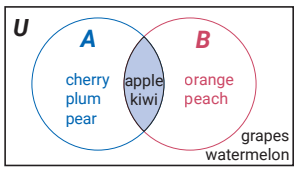
7.



8. $A \cup B = \{\text{football, baseball, hockey, basketball, golf, tennis, volleyball}\}$

9. $X \cup Y = \{12, 15, 16, 18\}$

10.



11. $A' = \{\text{penny, nickel, half-dollar, dollar}\}$

12. $A' = \{12, 13, 14, 16, 18, 19, 20\}$

8.2 Exercises

Concept Check

Fill-in-the-Blank. Complete the sentences using information found in this section.

1. In a Venn diagram, the large rectangle represents the _____ _____.
2. In a Venn diagram, the circles represent _____.
3. Sets that have no elements in common are said to be _____.
4. The set operation _____ is used to find the elements that two sets have in common.
5. The set operation _____ corresponds to the word "or" because it is used to find all the elements in one set or the other set.
6. The _____ of a set contains all the elements of the universal set that are not contained in the set itself.

True/False. Determine whether each statement is true or false. If a statement is false, explain how it can be changed so the statement will be true. (**Note:** There may be more than one acceptable change.)

7. A Venn diagram illustrates the relationship between sets.
8. The union of a set and its complement is the universal set.
9. A set and its complement always have at least one element in common.
10. The sets in a Venn diagram are subsets of the universal set.

Practice

Given:

$U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$

$A = \{1, 2, 3, 4\}$

$B = \{2, 4, 6, 8, 10\}$

$C = \{1, 3, 5\}$

$D = \{7\}$

Write the elements of the sets below using roster notation.

1. $A \cap B$

2. $A \cup B$

3. A'

4. $A \cap B'$

5. $A' \cap B$

6. $C \cup D$

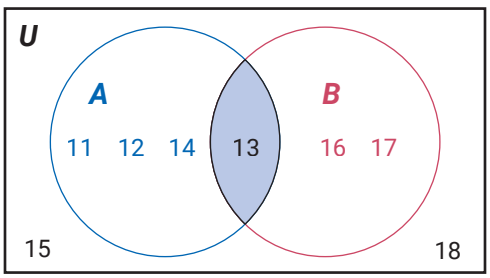
7. $C \cap D$

8. $C \cap D'$

9. $C \cup \varnothing$

10. $D \cap \varnothing$

Given:



Write the elements of the sets below using roster notation.

11. $A \cap B$

12. $A \cup B$

13. A'

14. $A \cap B'$

15. $A' \cap B$

16. U

17. U'

18. $A \cup B'$

19. $A' \cap B'$

20. $A' \cap \varnothing$

Given:

$U = \{ x \mid x \text{ is a natural number} \leq 20\}$

$A = \{ x \mid x \text{ is a prime number} \leq 20\}$

$B = \{ x \mid x \text{ is an odd number} \leq 20\}$

Write the elements of the sets below using roster notation. It may be helpful to first rewrite the sets in roster notation.

21. $A \cap B$

22. $A \cup B$

23. A'

24. $A \cap B'$

25. $A' \cap B$

26. U

27. U'

28. $A \cup B'$

29. $A' \cap B'$

30. $A' \cap \varnothing$

Given:

U is the set of states in New England.

A is the set of New England states that beginning with the letter "M".

B is the set of New England states north of Massachusetts.

Write the elements of the sets below using roster notation.

31. U

32. A

33. B

34. $A \cup B$

35. $A \cap B$

36. A'

37. B'

Applications

Use the following situation for Exercises 38 through 50.

Professor Summers teaches a Math class with ten students: Ann, Ben, Carol, David, Emily, Frank, George, Harry, Ian, and Joe. To help her students prepare for a test, she posts an online practice test and conducts a weekend review session. Ann, Carol, David, Harry, Ian, and Joe complete the online practice test, while Ann, Ben, David, and Emily attend the weekend review session. Let T be the set of students who complete the online practice test and R be the set of students who attend the weekend review.

38. Draw a Venn diagram to represent the above scenario. Using the Venn diagram, represent each set by roster notation or use appropriate notation to indicate the empty set.

39. Set of students who completed the online practice test and attended the weekend review.

40. Set of students who completed the online practice test but did not attend the weekend review.

41. Set of students who did not complete the online practice test.

42. Set of students who did not attend the weekend review.

43. $\{x \mid x$ is a student who did not complete the online practice test and did not attend the weekend review$\}$

44. $\{x \mid x$ is a student who attended the weekend review but did not complete the online practice test$\}$

45. $R' \cup T$

46. $R \cap T'$

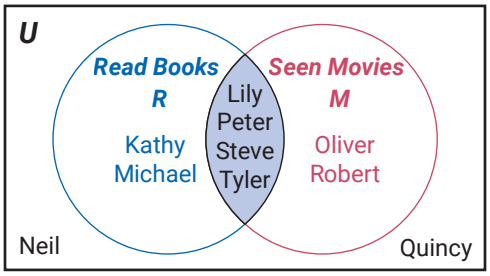
47. $R' \cup T'$

48. $U \cup \varnothing$

49. $R' \cap \varnothing$

50. U'

The Venn Diagram below shows the students of Professor Horn's English class who have read Harry Potter books, seen Harry Potter movies, or have both read Harry Potter books and seen Harry Potter movies. Use the Venn Diagram to represent each set by roster notation or use appropriate notation to indicate the empty set.



51. The set of students who have both read the books and seen the movies.

52. The set of students who have read the books, but not seen the movies.

53. The set of students who have neither read the books nor seen the movies.

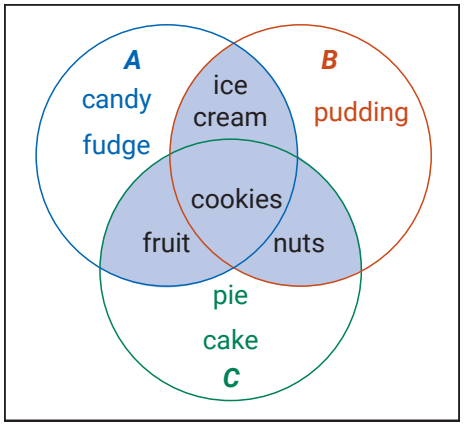
54. $\{x \mid x$ is a student who has seen the movies, but not read the books$\}$

55. $\{x \mid x$ is student who has not read the books$\}$

56. U

Writing and Thinking

A Venn Diagram can also be used to show the relationships among three sets.



Refer to the Venn Diagram above to answer these questions.

57. Use roster notation to list the elements of the set $A \cap B \cap C$. (**Hint:** Where do the three circles intersect?)

58. Use roster notation to list the elements of the set $(A \cap B) \cap C$. (**Hint:** List the elements of $A \cap B$. Now, list the elements of C. What elements do the two have in common?)