8.1 EXERCISES

✔ CONCEPT CHECK

Determine whether each statement is true or false. If the statement is false, explain why.

1. It is always possible to list every element of a set using the roster method.

2. $\varnothing \sim \{0\}$

3. Let $U = \{\text{set of all students enrolled at Xavier University}\}$ and $A = \{x \mid x \in U \text{ and } x \text{ is a student with less than 30 earned credit hours}\}$. Then $A' = \{x \mid x \in U \text{ and } x \text{ is a student with at least 30 earned credit hours}\}$.

4. $0 \in \varnothing$

5. $x \in \{x, y, z\}$

6. $\{x\} \in \{x, y, z\}$

7. $|\varnothing| = 0$

8. Let $Y = \{\text{Tim, Emilia, Aleesa, Whit}\}$, then $|Y| = 4$.

9. Let $A = \{\text{Sounds, Angels, Ravens, Titans}\}$ and $B = \{201, 38, 46, 23\}$, then $A \sim B$.

PRACTICE

Write each set using the roster method.

10. A is the set of months of the year that have exactly 30 days.

11. B is the set of states whose names begin with the letter N.

12. C is the set of positive numbers smaller than 100 that have 2 digits that are the same.

13. D is the set of last names of people who teach this course at your school.

14. E is the set of planets in our solar system.

15. F is the set of weekdays.

Write each set using set-builder notation.

16. Let G be the set of whole numbers.

17. Let H be the set of natural numbers less than or equal to 50.

18. Let U be the set of all the states in the United States of America and J be the set of all states that border an ocean.

19. Let U be the set of all students enrolled at a school of higher education and K be the set of all collegiate athletes.

Write a description for each set. It is possible for more than one description to be correct.

20. $J = \{-11, -9, -7, -5, -3, -1\}$

21. $K = \{\$1, \$2, \$5, \$10, \$20, \$50, \$100\}$

22. $M = \{\text{Saturday, Sunday}\}$

23. $N = \{\text{January, June, July}\}$

Write each set using the roster method.

24. $A = \{x \mid x \text{ is an odd number and } 20 < x < 30\}$

25. $B = \{x \mid x \leq 15 \text{ and } x \text{ is a positive multiple of } 3\}$

26. $C = \{x \mid 2x = 4\}$

27. $D = \{x \mid x \text{ is a state that shares a common border with Colorado}\}$

Use the given sets to answer each question.

$P = \{\text{lasagna, rotini, orzo, tortellini, penne}\}$

$Q = \{x \mid x \text{ is a pasta shape}\}$

$R = \{\text{penne, tortellini, orzo, rotini, lasagna}\}$

$S = \{\text{marinara, pesto, alfredo, Bolognese, carbonara}\}$

28. Is $P = Q$? Why or why not?

29. Is $P = R$? Why or why not?

30. Is $P = S$? Why or why not?

31. Are any of P, Q, R, and S equivalent? Explain.

Use the given sets to answer each question.

$A = \{\text{Business, Physics, Psychology, Kinesiology, Graphic Design, History}\}$

$B = \{\text{History, Graphic Design, Kinesiology, Physics, Business}\}$

$C = \{\text{Art History, Education, Nursing, Biology, Statistics}\}$

$D = \{x \mid x \text{ is a university major}\}$

32. Is $A = B$? Why or why not?

33. Is $B = C$? Why or why not?

34. Is $A = D$? Why or why not?

35. Are any of A, B, C, and D equivalent? Explain.

Determine the cardinal number of each set.

36. $W = \{0, 3, 4, 5, 6, 7, 8, 9, 10\}$

37. $X = \{x \mid x \in \mathbb{Z}, x \text{ is even, and } |x| < 10\}$

38. The empty set

39. $Y = \{x \mid x \text{ is a United States president, past or present}\}$

Use the set $A = \{\text{b, a, s, k, e, t}\}$ to solve each problem.

40. Find $|A|$.

41. If $U = \{\text{a, b, c, d, …, x, y, z}\}$, find A'.

42. If $U = \{\text{a, b, c, d, …, x, y, z}\}$, find $|A'|$.

43. If $U = \{\text{a, b, c, d, …, x, y, z, A, B, C, D, …, X, Y, Z}\}$, find A'.

44. If $U = \{\text{a, b, c, d, …, x, y, z, A, B, C, D, …, X, Y, Z}\}$, find $|A'|$.

Use the set $B = \{1, 2, 3, 4\}$ to solve each problem.

45. Find $|B|$.

46. If $U = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$, find B'.

47. If $U = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$, find $|B'|$.

48. If $U = \{-9, -8, -7, -6, \ldots, 6, 7, 8, 9\}$, find B'.

49. If $U = \{-9, -8, -7, -6, \ldots, 6, 7, 8, 9\}$, find $|B'|$.

APPLICATIONS

The table shows the total number of official Olympic medals for the time period from the first modern Olympics in 1896 through the Winter Games of 2014 for the top 10 countries, some of which are no longer countries. Let the universal set consist of the 10 countries listed. Solve each problem.

Top 10 All-Time Olympic Medal Winning Countries

Team	Gold	Silver	Bronze	Combined Total
United States (USA)	1072	860	749	2681
Soviet Union (URS)	473	376	355	1204
Great Britain (GBR)	246	276	284	806
Germany (GER)	252	260	270	782
France (FRA)	233	254	293	780
Italy (ITA)	235	200	228	663
Sweden (SWE)	193	204	230	627
China (CHN)	213	166	147	526
Russia (RUS)	182	162	177	521
East Germany (GDR)	192	165	162	519

Source: Wikipedia, s.v. "All-time Olympic Games medal table," accessed July 2014, http://en.wikipedia.org/wiki/All-time_Olympic_Games_medal_table

50. Let X equal the set of countries who have won more than 1000 medals overall. Write the set X using the roster method.

51. Let Y equal the set of countries who have won between 500 and 1000 medals overall. Write the set Y using the roster method.

52. Let Z equal the set of countries who have won less than 500 medals overall. Write the set Z using the roster method.

53. Let G equal the set of countries who have won more than 200 Gold medals. Write the set G using the roster method.

54. Is $X = G$? Explain.

55. Is $X \sim G$? Explain.

WRITING & THINKING

56. Give an example of a set that cannot be represented using the roster method.

57. Describe two sets of which you are a member.

58. Let A be a set in which one of the elements is President Barack Obama. List at least three different universal sets for A.

59. Let X be a set in which one of the elements is π. List at least three different universal sets for X.