1.1 Introduction to Set Theory

9. T = {t, h, i, n, k, g}

11. P = {51, 52, 53, 54, 55, 56, 57, 58, 59}

13. C = {1, 2, 3, 4, 5, 6, 7, 8}

15. G = {11, 12, 13, . . . }

17. Y = {2,001, 2,002, 2,003, . . . , 2,999}

19. C = {white, red, blue, green, gray, brown, black, yellow}

21. L = {medial collateral, lateral collateral, anterior cruciate, posterior cruciate}

23. True

25. True

27. True

29. The set of multiples of 5

31. The set of multiples of 13 from 13 to 52

33. The set of letters in the name Steven

35. The set of natural numbers from 100 to 199 Answers can vary for the alternate descriptions.

37. $\{x|x$ is a multiple of 10}; the set of positive numbers that end in zero

39. $\{x|x$ is odd and x < 16}; the set of odd numbers from 1 to 15.

41. $\{x|x$ is a color in an American flag} is one possible answer; the set of colors in the flag of France

1.2 Subsets and Set Operations

11. $A' = \{2, 3, 17, 19\}$

13. $C' = \{2, 3, 5, 7, 11\}$

15. $A' = \{1, 2, 3, 5, 7, 9, 11, \ldots\}$

Note: for 17–24, the list of proper subsets is the same as the list of subsets with the original set excluded.

17. {OVI, theft, fraud}, {OVI, theft}, {OVI, fraud}, {theft, fraud}, {OVI},

{theft}, {fraud}, Ø

19. {radio, TV}, {radio}, {TV}, Ø

21. Ø

23. {fever, chills, nausea, headache}, {fever, chills, nausea}, {fever, chills, headache}, {fever, nausea, headache}, {chills, nausea, headache}, {fever, chills}, {fever, nausea}, {fever, headache}, {chills, nausea}, {chills, headache}, {nausea, headache}, {fever}, {chills}, {nausea}, {headache}, Ø

25. True

27. False

29. False

31. False

33. True

35. 8 subsets, 7 proper subsets

37. 1 subset, no proper subsets

39. 4 subsets, 3 proper subsets

41. $U = \{1, 3, 5, 7, 9, 11, 13, 15, 17, 19\}$

43. $B = \{5, 11, 13, 15\}$

45. $A \cup B = \{1, 5, 9, 11, 13, 15, 17\}$

1.3 Statements and Quantifiers

9. Not a statement

11. Statement

13. Not a statement

15. Not a statement

17. Not a statement

19. Compound statement

21. Compound statement

23. Simple statement

25. Compound statement

27. Compound statement

29. Conjunction

31. Biconditional

33. Disjunction

35. Biconditional

37. The shirt I'm wearing to my interview is not white.

39. The hospital is full.

41. You're going to flunk this class.

43. Universal

45. Existential

47. Universal

49. Existential

51. Universal

53. Existential

55. Not all fish swim in water; Some fish do not swim in water.

57. No people who live in glass houses throw stones.

59. Not every happy dog wags its tail; Some happy dog does not wag its tail.

61. I haven't seen a four-leaf clover.

1.3 Statements and Quantifiers cont.

63. Somebody has survived a fall from Mt. Catherine.

65. None of my friends have an iPhone.

67. $p \wedge q$ **69.** $\sim q \rightarrow p$ **71.** $\sim q$ **73.** $q \vee \sim p$ **75.** $q \leftrightarrow p$

77. $\sim q$ **79.** $\sim q \rightarrow p$ **81.** $p \vee \sim q$ **83.** $p \leftrightarrow q$ **85.** $\sim p \rightarrow q$

87. The plane is on time and the sky is clear.

89. If the sky is clear, then the plane is on time.

91. The plane is not on time and the sky is not clear.

93. The plane is on time or the sky is not clear.

95. If the sky is clear, then the plane is or is not on time.

97. Water sports don't cost extra.

99. This resort is all-inclusive or water sports don't cost extra.

101. If this resort is not all-inclusive, then water sports don't cost extra.

103. This resort is all-inclusive or water sports cost extra.

105. Water sports cost extra or this resort is all-inclusive.

107. It cannot be classified as true or false.

109. (a) a is less than 20.

   (b) a is not less than 20.

   (c) $a \geq 20$ (This is if we assume that a is a real number. Otherwise, the statement would be $a \geq 20$ or a is not a real number.)

111. All are sample answers.

   (a) That movie won an Academy Award.

   (b) Statistics show that the obesity rate in the United States has been rising sharply over the last thirty years.

   (c) According to FBI data, violent crime has seen a steady decrease since the early 1990s.

   (d) The average height of a player in the National Basketball Association is 6'7".

   (e) The average high temperature in Chicago for January is 21°.

   (f) That car goes from zero to 60 mph in less than five seconds.

113. There will not be any fans at any of the games.

115. There is at least one person that likes my history professor.

1.4 Truth Tables

7. FFFT

9. FFTF

11. FTTF

13. TTFF

15. TFTT

17. TTFF

19. TTFF

21. TTFFTFFF

23. TTTTTTTT

25. TFFFTFTF

27. TTTFFFTF

29. FTFTFTTT

31. FFFTTTTT

33. FFFFTFFF

35. TFTFFFFF

37. True

39. True

41. True

43. False

45. True

47. True

49. Let *p* be "if you take their daily product," *q* be "you cut your calorie intake by 10%," and *r* be "you lose at least 10 pounds in the next 4 months."

51. TFTTTTTT

53. True

55. Let *p* be "the attendance for the following season is over 2 million," *q* be "he will add 20 million dollars to the payroll," and *r* be "the team will make the playoffs the following year."

57. TFFFTTTT

59. True

1.4 Truth Tables cont.

61. The truth table for ($p \wedge q$) $\vee$ r is different than the one for $p \wedge$ ($q \vee r$).

63. The statements are equivalent.

65. Answers vary.

67. Because that's exactly what it means for a biconditional statement to be true. In that case, there'd be no reason to separate the two.