

# Selected Answers

## Chapter 11

### 11.1 Skill Practice

1. probability  
3. 12 outcomes; R1, R2, R3, R4, W1, W2, W3, W4, B1, B2, B3, B4  
5. 48; HHH1, HHH2, HHH3, HHH4, HHH5, HHH6, HHT1, HHT2, HHT3, HHT4, HHT5, HHT6, HTH1, HTH2, HTH3, HTH4, HTH5, HTH6, HTT1, HTT2, HTT3, HTT4, HTT5, HTT6, THH1, THH2, THH3, THH4, THH5, THH6, THT1, THT2, THT3, THT4, THT5, THT6, TTH1, TTH2, TTH3, TTH4, TTH5, TTH6, TTT1, TTT2, TTT3, TTT4, TTT5, TTT6  
7.  $\frac{9}{10}$  9.  $\frac{1}{10}$  11.  $\frac{3}{7}$  or 3 : 7 13. *Sample answer:* Odds in favor is the number of favorable outcomes divided by the number of unfavorable outcomes; odds in favor of a multiple of 3 =  $\frac{\text{Number of favorable outcomes}}{\text{Number of unfavorable outcomes}} = \frac{9}{1}$  or 9 : 1. 15. *Sample answer:* Rolling a standard number cube and getting a 0, flipping a coin and getting heads or tails. 17. *Sample answer:* route A; The experimental probability that he will encounter heavy traffic on route A is 0.25, and the experimental probability that he will encounter heavy traffic on route B is 0.375.

### 11.1 Problem Solving

19.  $\frac{1}{7}$  21.  $\frac{4}{9}, \frac{4}{5}$

*Sample answer:* The probability and odds of choosing a boy are related because both compare the number of boys to another number. The probability of choosing a boy compares the number of boys to the total number of outcomes, while the odds of choosing a boy compare the number of boys to the total number of outcomes minus the number of boys.

**Extension** 1. Answers will vary. 3. *Sample answer:* There are 3 prizes to win, but since the prizes do not have an equal likelihood of being won, generating a list of random integers from 1 to 3 would not represent the situation. The probability of winning a CD is  $\frac{1}{6}$ , so if there were only 3 possible outcomes in the simulation you could not represent winning a CD properly.

**11.2 Skill Practice** 1. permutation 3. a. 2 ways b. 2 ways 5. a. 24 ways b. 12 ways 7. a. 120 ways b. 20 ways 9. a. 120 ways b. 20 ways 11. *Sample answer:* 5 people are running in a race. How many different results can there be for first and second place? 13. 6 15. 120 17. 3,628,800 19. 6,227,020,800 21. 210 23. 720 25. 1 27. 6,375,600 29. The denominator should be  $(5 - 3)! = 2!$ , not 3!

$${}_5P_3 = \frac{5!}{(5-3)!} = \frac{5!}{2!} = 60.$$

**11.2 Problem Solving** 35. a.  $\frac{1}{2}$ . *Sample answer:* Make a list of possible permutations, count the number in which you are first or second, and divide it by the total number of outcomes. b.  $\frac{1}{2}$ ; the answers are the same. 37.  $\frac{1}{720}$

**11.3 Skill Practice** 1. combination 3. 20 combinations

5. *Sample answer:* The answer given is for  ${}_9P_4$ , not  ${}_9C_4$ ;  ${}_9C_4 = \frac{9!}{(9-4)! \cdot 4!} = \frac{9!}{5! \cdot 4!} = 126$ . 7. 56

9. 28 11. 330 13. 15,504 17. Permutations; since the roles are different, the order in which students are selected for the roles matters; 720 ways.

19. Permutations; the arrangement of people in the car matters; 120 ways. 21.  ${}_n C_r = \frac{{}_n P_r}{r!}$ . *Sample answer:* To find the number of combinations, you find the number of permutations and then divide by the number of ways the items being chosen can be arranged, or  $r!$ .

**11.3 Problem Solving** 23. 840 burritos

25. a. 84 combinations b.  $\frac{5}{21}$ . *Sample answer:* There are 84 possible outcomes of the choice. Find the number of combinations that include you and your 2 friends. After you and your friends are chosen, 3 other contestants from a pool of 6 can be chosen in any combination, so the number of favorable combinations is  ${}_6C_3 = 20$ . The probability that you and your friends are chosen is  $\frac{20}{84} = \frac{5}{21}$ .

**11.3 Graphing Calculator Activity** 1. 35 3. 120

5. 15,120 7. 6,652,800 9. a. 3276 groups b. 6 ways

**11.4 Skill Practice** 1. compound event

3. 0.4 5. 0.65 7.  $\frac{7}{12}$  9. 0.65 11. 0.21 13.  $\frac{5}{7}$  17. 1

19.  $\frac{3}{8}$  21.  $\frac{4}{13}$  23.  $\frac{2}{13}$  25.  $\frac{3}{4}$  27. The probability of a club and 9 must be subtracted instead of added;

$$P(\text{club}) + P(9) - P(\text{club and } 9) = \frac{13}{52} + \frac{4}{52} - \frac{1}{52} = \frac{4}{13}$$

29. 0.67; not disjoint 31.  $\frac{1}{5}$ ; not disjoint 33. 24%;

not disjoint 35.  $\frac{5}{36}$  37.  $\frac{5}{6}$

**11.4 Problem Solving** 43. 0.7 45. about 0.8488

47. a. 58% b. 53% c. No; what percent of the tomatoes have been fed on by insects *and* are partially rotten *and* have bite marks. 49.  $\frac{17}{20}$

# Selected Answers

**11.5 Skill Practice** 1. conditional probability

3. dependent 5. dependent 7. 0.21 9. 0.325

11.  $P(A|B) = 0.3$  and  $P(B|A) = 0.2$ ;  $A$  and  $B$  are independent because  $P(A) = P(A|B)$  and  $P(B) = P(B|A)$ . 13. 0.8 15.  $\frac{1}{10}$  17.  $\frac{4}{11}$  19. a.  $\frac{1}{16}$  b.  $\frac{13}{204}$

21. a.  $\frac{3}{169}$  b.  $\frac{4}{221}$  23. a.  $\frac{1}{2197}$  b.  $\frac{8}{16,575}$  25. *Sample answer:* Independent; the result of the first spin has no effect on the result of the second spin.

27. The probabilities should be multiplied instead of being added;  $P(A \text{ and } B) = 0.4 \cdot 0.5 = 0.2$ .

29. a.  $\frac{4}{12} = \frac{1}{3}$  b.  $\frac{6}{10} = 0.6$  c.  $\frac{6}{15} = \frac{2}{5} = 0.4$

d. *Sample answer:* In part (b), the sample space consists of all 6 ounce bottles of juice (apple or orange), but in part (c) the sample space consists of all bottles of orange juice (6 oz or 8 oz).

31. The formula can be written as  $P(B \text{ and } A) = P(B) \cdot P(A|B)$ , so  $P(A) \cdot P(B|A) = P(B) \cdot P(A|B)$ . Solve for  $P(A|B)$  to get Bayes's Theorem.

**11.5 Problem Solving** 33. a. about 22.6% b. about

36.7% c. no;  $P(\text{senior}) \neq P(\text{senior}|\text{bikes to school})$

35. 51% 37.a. 0%; about 2%; about 98% b. about 29%; about 30%; about 50% c. Yes; go for 2 points after the first touchdown. If the 2 points are scored, go for 1 point after the second touchdown. If the 2 points are not scored, go for 2 points after the second touchdown; win: about 45%, lose: about 30%.

**Extension** 1. Yes; Leon did 7 of the total of 53 completed puzzlers. He was assigned 7 of the 53 possible winning numbers. 3.a. 0.09 b. 0.12  
c. Remove the goalie.

**Chapter Review** 1. compound event 3. *Sample answer:* Theoretical probability is based on knowing the likelihood of all possible outcomes of an event.

Experimental probability is based on the results of an experiment. 5.  $\frac{2}{9}$  7. 30 9. 1,037,836,800 11. 7

13. 56 15. 126 ways 17. 0.68 19.a.  $\frac{5}{32}$  b.  $\frac{1}{6}$  21.a.  $\frac{1}{4}$

b.  $\frac{7}{30}$

## Chapter 11 Extra Practice

1. 6 possible outcomes; heads, yellow; heads, red; heads, blue; tails, yellow; tails, red; tails, blue

3. 5:3 5. 60 ways 7. 336 9. 120

11. 200 13. 35 15. 15,504 17. 0.8 19. 0.6; not

disjoint 21. 0.17; not disjoint 23.  $\frac{1}{52}$  25.  $\frac{4}{13}$

27. 0.125 29. 0.24 31. 0.2 33.a.  $\frac{1}{16}$  b.  $\frac{13}{204}$