5. What is a probability distribution? Explain how to make a table of a probability distribution.
6. Explain the common usage of the term *odds* and its usage in gambling.

DOES IT MAKE SENSE?

Decide whether each of the following statements makes sense (or is clearly true) or does not make sense (or is clearly false). Explain your reasoning.

7. When I toss four coins, there are four different outcomes that all represent the event of one head and three tails.
8. The probability that my sister will get into the college of her choice is 3.7.
9. I estimate that the probability of my getting married in the next 3 years is 0.7.
10. Because either there is life on Mars or there is not, the probability of life on Mars is 0.5.
11. The probability that Jonas will win the race is 0.6 and the probability that he will not win is 0.5.
12. Based on data showing that we've had snow on Christmas in 27 of the past 100 years, the probability of snow this year is 0.27.

BASIC SKILLS & CONCEPTS

13–20: Review of the Multiplication Principle. Use the skills covered in the Brief Review on p. 420 to answer the following questions.

13. How many different choices of car do you have if a particular model comes in 15 colors and three styles (sedan, station wagon, or hatchback)?
14. A local ski sale features nine types of skis, eight types of bindings, and twelve types of boots. How many different ski/binding/boot packages are available?
15. A restaurant has a special menu that features three choices of soup, six choices of entree, and five choices of dessert. How many different three-course meals could you order?
16. Three districts each elect one representative to the County Commission. There are two candidates in District 1, three candidates in District 2, and four candidates in District 3. How many different Commissions are possible?
17. The local paint store offers 28 basic colors, each of which can be combined with four different textures. How many different paint combinations are available?
18. You are required to take five courses, one each in humanities, sociology, science, math, and music. You have a choice of four humanities courses, three sociology courses, five science courses, two math courses, and three music courses. How many different sets of five courses are possible?
19. In designing your new home entertainment center, you have a choice of seven different flat-screen TVs, nine different DVD players, and eleven different speaker sets. How many different systems could you design?
20. The car model you are considering comes with or without air conditioning, with or without a sun roof, with or without a CD player, and in eight stock colors. How many different versions of the car are available?

21–38: Theoretical Probabilities. Use the theoretical method to determine the probability of the given outcomes and events. State any assumptions that you make.

21. Drawing a queen from a standard deck of cards
22. Drawing a black card (club or spade) from a standard deck of cards
23. Rolling a single die and getting a 1 or 2
24. Rolling two dice and getting a sum of 4
25. Drawing a royalty card (jack, queen, king) from a standard deck of cards
26. Rolling a single die and getting an even number
27. Drawing an ace of hearts or an ace of diamonds from a standard deck of cards
28. Rolling two dice and getting the same number on both dice
29. Randomly meeting someone with a phone number that ends in a 1 or 2
30. Randomly meeting someone born on a Sunday
31. Randomly meeting someone born between 2:00 p.m. and 3:00 p.m.
32. Randomly meeting someone born in April or October (assume 365 days in a year)
33. Randomly selecting a two-child family with one boy and one girl
34. Randomly selecting a three-child family with exactly two girl children
35. Randomly selecting a three-child family with three girls
36. Randomly selecting a pair of white socks from a drawer that holds five pairs of black socks, nine pairs of blue socks, and eight pairs of white socks
37. Randomly meeting someone whose address ends in the same digit as yours
38. Waiting longer than 15 minutes when you arrive randomly at a bus stop at which the bus arrives promptly on the hour and on the half hour

39–44: Empirical Probabilities. Use the empirical method to estimate the following probabilities.

39. After recording the forecasts of your local weatherman for 30 days, you conclude that he gave a correct forecast 18 times. What is the probability that his next forecast will be correct?
40. What is the probability of a 200-year flood this year?
41. Halfway through the season, a basketball player has hit 72% of her free throws. What is the probability that her next free throw will be successful?
42. You count 42 heads when you toss a coin 100 times. If you don't know whether the coin is fair, what is the probability that the next toss will be a tail?

45. A doctor diagnosed pneumonia in 250 patients and 225 of them actually had pneumonia. What is the probability that the next patient diagnosed with pneumonia will actually have pneumonia?

46. What is the probability that a baseball player with a .300 batting average will get a hit at his next at-bat?

45–46: Subjective Probability. State your estimate of the subjective probability, and explain how you arrived at your estimate.

45. The probability that you'll graduate from college within the next four years

46. The probability that you'll get an A on the final exam in this course

47–54: Event *Not* Occurring. Determine the probability of the following events. State any assumptions that you use.

47. What is the probability of not rolling a 2 with a fair die?

48. What is the probability of not tossing three tails with three fair coins?

49. What is the probability that an 75% free-throw shooter will miss his next free throw?

50. What is the probability that the next person you meet was not born in July? (Assume 365 days in a year.)

51. What is the probability of not rolling a sum of 7 with two fair dice?

52. What is the probability of a sunny day after a forecast of a 30% chance of rain?

53. What is the probability of not having a 100-year flood this year?

54. What is the probability of randomly meeting someone not born in May or June? (Assume 365 days in a year.)

55–56: Probability Distributions. Make a probability distribution for the given set of events.

55. The number of heads when four fair coins are tossed

56. The sums that appear when two fair four-sided dice (tetrahedrons) are tossed

57–60: Odds. Use the definition given in the text to find both the *odds for* and the *odds against* the following events.

57. Rolling a fair die and getting a 1 or a 2

58. Flipping two fair coins and getting two tails

59. Rolling a fair die and getting a 5 or a 6

60. Flipping two fair coins and getting a head and a tail

61–62: Gambling Odds. Use the definition of odds in betting to find the following odds.

61. The odds on (against) your bet are 3 to 4. If you bet $20 and win, how much will you gain?

62. The odds on (against) your bet are 5 to 4. If you bet $20 and win, how much will you gain?

FURTHER APPLICATIONS

63. **Gender Politics.** The following table gives the gender and political party of the 100 delegates at a political convention. Suppose you encounter a delegate at random.

	Women	Men
Republicans	21	28
Democrats	25	16
Independents	6	4

a. What is the probability that you meet a woman?

b. What is the probability that you meet an Independent?

c. What is the probability that you do not meet a Democrat?

d. What is the probability that you meet a female Republican?

e. What is the probability that you meet someone who is not a male Democrat?

64. **Senior Citizens.** In 2010, there were 40 million people over 65 years of age out of a U.S. population of 310 million. By 2050, it is estimated that there will be 82 million people over 65 years of age out of a U.S. population of 439 million. Would your chances of meeting a person over 65 at random be greater in 2010 or 2050? Explain.

65. **Fair Coins?** You toss three coins 1000 times; the following table shows the results. Compute the empirical probability for each event. Compare the empirical probabilities to the theoretical probabilities for three tossed coins. Do you have reason to believe the coins are unfair? Explain.

Result	Number of Occurrences
0 heads	260
1 head	495
2 heads	245
3 heads	0
Total	1000

66. **Marriage Age.** The following table gives percentages of all married women and men who were married for the first time in each age category. What is the probability that a randomly encountered married woman was married, for the first time, between the ages of 35 and 44? Make a probability distribution for ages of first marriage for men and women.

Age at First Marriage	Women (%)	Men (%)
Under 20	16.6	6.6
20–24	40.8	36.0
25–29	27.2	34.3
30–34	10.1	14.8
35–44	4.5	7.1
45–64	0.7	1.1
65 and over	0.1	0.1

67. **Deceptive Odds.** Suppose event *A* has a 0.99 probability of occurring and event *B* has a 0.96 probability of occurring—both high probabilities. Compute the odds for event *A* and the odds for event *B*. Comment on the relative difference between the odds for the two events compared to the relative difference between the probabilities. How are the odds deceptive in this case?