mathematical techniques beyond the scope of this book, it can be shown that Equation D-1 reduces to

$$E(i) = \frac{1}{1 - x}$$

3-9 The expected value of a theoretical probability distribution is analogous to and calculated in the same way as the expected value of an empirical probability distribution.

$$E(x_i) = \sum_{\text{values}} v_i p(v_i)$$

PROBLEMS

1. Billy and Bobby Jones set up a lemonade stand. They have five sizes of lemonade that sell for 5, 10, 15, 25, and 30 cents. The numbers of each size of lemonade they sell on the first day are, respectively, 10, 7, 8, 5, and 5. Considering the number sold for each size as one observation (that is, $n = 5$), calculate:
   a. The mean number of lemonades sold.
   b. The median number of lemonades sold.
   c. The mode number of lemonades sold.
   d. The variance and standard deviation of the number of lemonades sold.
   e. The range of the number of lemonades sold.
   f. Suppose the 30-cent size is ignored. Now calculate the median number of lemonades sold.

2. A drugstore is keeping tabs on the number of Cokes it sells during nine hours of a business day. The data turn out as follows:

Hour	1	2	3	4	5	6	7	8	9
Number of Cokes	3	2	3	6	5	7	8	9	11

   a. Compute the mean number of Cokes sold per hour.
   b. Compute the median number of Cokes sold per hour.
   c. Compute the mode number of Cokes sold per hour.
   d. Compute the variance and standard deviation of the number of Cokes sold per hour. *Use the deviation-score formula.*
   e. Recompute the variance *using the raw-score formula.*
   f. Suppose the first hour of the day is ignored, leaving only the last eight hours. Recompute the median and mode.

1 The number of Pepsi Colas (in millions) sold in the United States each year for the 10 past years is shown in the following table:

1963: 3.0
1964: 7.5
1965: 5.0
1966: 2.5
1967: 7.5
1968: 2.0
1969: 1.0
1970: 2.0
1971: 7.5
1972: 1.0

a. What is the *median* number of Pepsi Colas sold over the past 10 years?
b. What is the *mode* number of Pepsi Colas sold over the past 10 years?

4 For problems 1 and 2 of Chapter 2, compute the mean, median, mode, variance, standard deviation, and range of the scores.

5 For problems 3, 4, 5, 6, 7, 8, and 9 of Chapter 2, compute the expected value and variance of these distributions.

6 For problem 14 of Chapter 2, compute the expected value and variance of this probability distribution.

7 For problem 15 of Chapter 2, compute the expected value and variance of the probability distributions for a, b, x, and y.

8 The St. Petersburg game works as follows. A coin is flipped until a head comes up. The amount of money paid by the flipper to the player is then equal to $\$2^N$, where N is the number of flips prior to obtaining a head.
a. What is the expected amount of money that a player will win in this game?
b. Suppose that the total amount of money that a flipper is in a position to pay is $\$1,073,741,842$ ($\$2^{30}$). Now what is the expected amount of money that a player will win in this game?

9 The city of Walla Walla has a lottery. In this lottery, 1000 people enter, and the following prizes are awarded to randomly selected entrants:

One vacation trip to Pocatello worth $600.
Five Sears 10-speed bicycles worth $100 apiece.
Twenty Timex wristwatches worth $10 apiece.
Two hundred solid aluminum medallions worth 50 cents apiece.

Consider a random variable that assigns to each lottery entrant some value in dollars.

a. What are the members of V, where V is the set of values that this random variable could assign?

b. What is the expected value and variance of the probability distribution of this random variable?

10. Joe Smith is playing the Bellingham Game, which works as follows. Two dice are thrown and the sum s is noted. Joe now wins x dollars, where

$$x = 4s \text{ if } s \text{ is odd and 7 or greater}$$

$$= 3s \text{ if } s \text{ is even and 8 or greater}$$

$$= s \text{ if } s \text{ is less than 7}$$

a. What is V, the set of values (in dollars) that Joe can earn?
b. Compute the probability of each member of V.
c. Suppose that Joe plays this game 10 times. What is the total amount of money that he expects to win?
   (*Hint:* Consider the expected value per trial.)
d. What is the variance of the amount of money won per trial?