A

1. Indicate whether a geometric distribution model can be used. If not, state why.

   a) A coin is flipped until a head appears.

   b) An NHL goalie is having shots taken on net in a shootout.

   c) Bart Simpson is opening cereal boxes in a grocery store, marking each one that does not contain the prize he is looking for as "Damaged—sell at reduced price!"

   d) You draw a card from a standard deck (without replacement) to see how soon you get an ace.

   e) Your little brother sees how many times he can jump on a frozen puddle before the ice breaks.

☆ 2. Given each probability of success, determine the probability distribution and histogram for up to six trials and determine the expected wait time.

   a) $p = 0.5$

   b) $p = 0.25$

   c) $p = 0.9$

3. For the probabilities in question 2, recalculate the probability distributions using

   a) a graphing calculator

   b) a spreadsheet

   c) Fathom™

4. Compare the geometric probability histograms for six trials using $p = \{0.2, 0.4, 0.6, 0.8\}$.

B

5. A card is drawn from a well-shuffled deck to see if it is an ace, and then it is replaced.

   a) Determine a probability distribution for drawing up to six cards.

   b) How long should it be before an ace is drawn from the deck?

6. An experienced darts player has about a 15% chance of hitting triple-20 on any individual throw.

   a) Determine a probability distribution of missing the triple-20 for throwing up to six darts.

   b) What is the expected number of throws before there would be a miss?

7. A manufacturing company had a failure rate of 30% when their compact discs were used in tests.

   a) Determine the expected wait time until you pull out a bad disc from a new box.

   b) The company improved product quality and this year achieved a failure rate of 13.5%. Compared to your answer in part a), how much longer will it be now before you expect to pull out a bad disc?

8. You work for a telemarketing company making calls to promote a new gadget. Based on company data, the following are the likely outcomes of each call.

Outcome	Percent
People hang up right away	45
No answer	38
People listen to you but do not buy	16
People purchase	1

   a) How many calls would you have to make before you get to speak to someone?

   b) Assuming that you can make 25 calls per hour and work an 8-hour shift, how many sales could you expect to make on any particular shift?

9. Sometimes statistics can be biased. A particular statistician knows that approximately 35% of people do not tell the truth when polled. If 400 people were polled in a survey, how many would be expected to answer before someone answers untruthfully?

10. Your aunt plays the 6/49 lottery, each time picking the same set of six different numbers out of 49 in the hope that those numbers will come up. You have told her the probability of her winning is quite low, but she plays twice a week, claiming that by the end of the year, her numbers "are sure to come up." How much better is the probability of her winning at the end of the year compared to the probability at the beginning of the year?

11. Your local hockey team has a contest in which spectators are chosen at random to take a single shot on net to try to score. The catch is that most of the net is blocked by a board. Organizers know that an average contestant has about a 1 in 100 chance of succeeding.

    a) What is the probability that the tenth contestant gets the puck in?

    b) What is the probability of a winner among the first ten people to play?

12. The failure rate for a professionally packed parachute is approximately 0.001.

    a) How many jumps would a person have to make before his or her probability of having a parachute failure exceeded 50%?

    b) If the failure rate increases to 1%, how many fewer jumps would a parachutist have to make before the probability of having a failure is over 50%?

13. In the game of Pig, players repeatedly roll a die to accumulate points. Players may roll as many times as they wish and quit whenever they want. The object is to be the person who quits with the highest point total. The value of each roll is added to a player's points. The catch is that if you roll a 1, you lose all your points. On average, what is the most strategic way to play this game? Justify your answer.

★14. A cereal company has a promotion offering one of five prizes in each box. Assuming that the probability of each prize is the same, determine the expected number of boxes you would have to buy to get

    a) any prize

    b) two different prizes

    c) three different prizes

    d) four different prizes

    e) five different prizes

C

15. In the Prisoners game, six prisoners are locked in separate cells. The cells are numbered 0, 1, 2, 3, 4, and 5. To get any prisoner out of jail, a player rolls two dice and calculates the difference in values. The prisoner in the cell with the number matching the difference is set free. What is the expected number of rolls needed to release all of the prisoners?

16. Go to *www.mcgrawhill.ca/links/MDM12* and select **Study Guide**. Follow the links to obtain a copy of the file **Prizes.ftm** to experimentally simulate the situation in question 14. How does the simulation support your theoretical answer?

17. A manufacturer of precision parts for the automotive industry has a prototype of a new parts machine. The machine is tested for several days and the operator keeps track of the number of parts it makes before it makes a defective one. The results are as follows: 73, 60, 70, 60, 42, 64, 61, 59, 65, 68, 105, 71, 76, 59, 69, 65, 70, 120, 74, 62, 79, 79, 57, 76, 78. How could a geometric probability distribution be used to help estimate the probability of a defect for this machine?