1.4 Tree Diagrams

6. Suppose the two joker cards are left in a standard deck of cards. One of the jokers is red and the other is black. A single card is drawn from the deck of 54 cards, returned, and then a second card is drawn. Determine the probability of drawing

(a) one of the jokers on the first draw and an ace on the second

(b) the red joker on the second draw and a numbered card of any suit on the first

(c) a queen on both draws

(d) any black card on both draws

(e) any numbered card less than 10 on the first draw and a card with the same number on the second

(f) the red joker or a red ace on either draw

7. **Application** An airplane can make a safe landing if at least half of its engines are working properly. Suppose that engine failure is a random event. Determine whether a two-engine plane is safer than a four-engine plane if the chance that an engine fails is 1 in 2.

8. A health and safety committee is to be selected from all the people who work at a local factory. The committee is to consist of four members selected randomly from a list of ten names submitted by the shop leader. The list has the names of five union members and five workers who are not union members.

(a) What is the probability that the first person selected from the list is a union member?

(b) What is the probability that the first two people selected from the list are union members?

(c) What is the probability that all the committee members are union members?

(d) What is the probability that three of the four committee members are union members?

9. A paper bag contains a mixture of 3 types of candy. There are ten chocolate bars, seven fruit bars, and three packages of toffee. Suppose a game is played in which a candy is randomly taken from the bag, replaced, and then a second candy is drawn from the bag. If you are allowed to keep the second candy only if it was the same type as the one that was drawn the first time, calculate the probability of each of the following.

(a) you will be able to keep a chocolate bar

(b) you will be able to keep any candy

(c) you won't be able to keep any candy

10. At the beginning of each month, the president of a small manufacturing company decides whether to spend \$1000 or \$2000 on advertising for the month. Suppose she makes her decision by tossing a coin.

(a) What is the probability that she will spend \$3000 on advertising during the first three consecutive months of this year?

(b) What is the probability that she will spend more than \$4000 on advertising during the first three consecutive months of this year?

(c) What is the probability that she will spend more than \$3000 on advertising during the first three consecutive months of this year?

11. **Knowledge and Understanding** A lottery uses a clear plastic drum that contains 100 ping-pong balls numbered from 0 to 9. There are 10 of each number in the drum. A ball is drawn from the drum and then returned after its number is written down. The process is repeated three times. The drawn numbers are used in their order of drawing to create a three-digit number.

(a) Determine how many three-digit numbers can be created in this way.

(b) Determine the probability that any number drawn in this way will end in a 5.

(c) Determine the probability that any number drawn in this way will start with either a 1 or a 2.

Answers

6. (a) $\frac{2}{729}$ (b) $\frac{1}{81}$ (c) $\frac{4}{729}$ (d) $\frac{1}{4}$ (e) $\frac{32}{729}$ (f) $\frac{35}{324}$

7. Two-engine plane is safer, $\frac{3}{4}$ vs. $\frac{11}{16}$.

8. (a) $\frac{1}{2}$ (b) $\frac{2}{9}$ (c) $\frac{1}{42}$ (d) $\frac{5}{84}$

9. (a) $\frac{1}{4}$ (b) $\frac{79}{200}$ (c) $\frac{121}{200}$

10. (a) $\frac{1}{8}$ (b) $\frac{1}{2}$ (c) $\frac{7}{8}$

11. (a) 1000 (b) $\frac{1}{10}$ (c) $\frac{1}{5}$

12. (a) 17 576 000 (b) $\frac{1}{26}$ (c) $\frac{1}{17\,576\,000}$

13. (a) (i) $\frac{128}{625}$ (ii) $\frac{2944}{3125}$ (iii) $\frac{1}{3125}$ (iv) $\frac{64}{3125}$