Chapter 5  "SETS AND COUNTING"

5. A railway has 20 stations. If the names of the point of departure and the destination are printed on each ticket, how many different kinds of single tickets must be printed?

6. Refer to Exercise 5. How many different kinds of tickets are needed if each ticket may be used in either direction between two stations?

7. A man has five different pairs of gloves. In how many ways can he select a right-hand glove and a left-hand glove that do not match?

8. How many license plates consisting of two letters followed by four digits are possible?

9. How many ways can five people be arranged in a line for a group picture?

10. In how many different ways can four books be arranged on a bookshelf?

11. Toss a coin six times and observe the sequence of heads or tails that results. How many different sequences are possible?

12. Refer to Exercise 11. In how many of the sequences are the first and last tosses identical?

13. Twenty athletes enter an Olympic event. How many different possibilities are there for winning the Gold Medal, Silver Medal, and Bronze Medal?

14. A sportswriter is asked to rank eight teams. How many different orderings are possible?

15. In how many different ways can a 30-member football team select a captain and an assistant captain?

16. How many different outfits can be selected from two coats, three hats, and two scarves?

17. How many different words (including nonsense words) can be formed using the four letters of the word "MATH"?

18. If you can travel from Frederick, Maryland, to Baltimore, Maryland, by car, bus, or train and from Baltimore to London by airplane or ship, how many different ways are there to go from Frederick to London?

19. An exam contains five "true or false" questions. In how many different ways can the exam be completed?

20. A company has 700 employees. Explain why there must be two people with the same pair of initials.

21. A computer manufacturer assigns serial numbers to its computers. The first symbol of a serial number is either A, B, or C, indicating the manufacturing plant. The second and third symbols taken together are one of the numbers 01, 02, ..., 12, indicating the month of manufacture. The final four symbols are digits. How many possible serial numbers are there?

22. How many four-letter words (including nonsense words) can be made from the letters l, o, t, s, m, x, and e for each of the following conditions?
   (a) Letters can be repeated.
   (b) Letters cannot be repeated.
   (c) Words must begin with an h, and repetitions are allowed.
   (d) Words must end with a vowel, and repetitions are not allowed.

23. How many four-letter words (including nonsense words) can be made from the letters h, o, t, s, m, x, and e for each of the following conditions?
   (a) Letters can be repeated.
   (b) Letters cannot be repeated.
   (c) Words must begin with an h, and repetitions are allowed.
   (d) Words must end with a vowel, and repetitions are not allowed.

24. A group of five boys and three girls is to be photographed.
   (a) How many ways can they be arranged in one row?
   (b) How many ways can they be arranged with the girls in the front row and the boys in the back row?

25. The manager of a Little League baseball team has picked the nine starting players for a game. How many different batting orders are possible under each of the following conditions?
   (a) There are no restrictions.
   (b) The pitcher must bat last.
   (c) The pitcher must bat last, the catcher eighth, and the shortstop first.

26. How many different ways can a Venn diagram with two circles be shaded?

27. How many different ways can a Venn diagram with three circles be shaded?

28. A club can elect a president as president and a different member as treasurer in 506 different ways. How many members does the club have?

29. An exam contains six true or false statements. In how many ways can the exam be completed if leaving the answer blank is also an option?

30. A psychologist wants to test the effects of exercise and meditation on blood pressure. She devises four different exercise programs and three different meditation programs. If she wants 10 subjects for each condition of exercise and meditation program, how many volunteers must she recruit?

31. A college student eats all his meals at a restaurant offering six breakfast specials, seven lunch specials, four dinner specials. How many days can he go out repeating an entire day's menu selection?

32. An area code is a three-digit number where the digit cannot be 0 or 1. How many different area codes are possible?

33. A clothing store offers three styles of sweaters, each sweater available in six colors. How many different sweaters are there?