4.5 Section Exercises

Combining Probability and Counting Techniques

Use the Fundamental Counting Principle, combination formula, permutation formula, or a combination of the methods to solve each problem.

1. Suppose that license tags in a particular area of the state must begin with one of the following letters: L, D, Y, or K. The rest of the tag must contain two letters followed by three digits (0–9).

a. If characters cannot repeat, how many unique tags can be made?

b. What's the probability that you are randomly assigned a license tag that begins with the letter K? (Assume that all possible license tags are available to be assigned.)

2. Suppose that license tags in another state are made up of three letters followed by three digits (0–9), none of which can repeat. Additionally, each tag number may be assigned to a regular tag, a wildlife-conservation tag, or a veterans tag.

a. How many unique tags can be made?

b. What's the probability that you are parked next to a car from this state that has a tag that ends in a 9?

3. **a.** How many four-digit numbers can be created from the digits 0–9 if the first and last digits must be odd and no digit can repeat?

b. What's the probability that a number that starts with 5 is randomly chosen from this group?

4. How many four-digit numbers can be made from the digits 0–9 if each number created must be greater than 5000?

5. A non-profit is required by statute to keep a 6 person board of advisors from the community. The board must be comprised of 2 student representatives and 4 local leaders.

a. How many advising boards can be formed if there are 13 applicants for the student positions and 19 applicants for the local leader positions?

b. If two brothers both applied for the student positions, what is the probability that they were both chosen?

6. Suppose an orchestra needs between 16 and 18 1st violins for an upcoming performance.

a. How many possible ways can the 1st violin section be put together if there are 36 violinists able to play for the orchestra?

b. What is the probability that a 17-person 1st violin section is chosen from the possible options found in part **a.**?

7. Virginia's Veggie Café offers 5 types of homemade bread, 10 toppings, and 6 different condiments. How many different super sandwiches can be made if a super sandwich consists of 6 different toppings and 2 different condiments?

8. Mysti is picking out material for her new quilt. There are 12 possible plaids, 8 different solids, and 4 floral prints that she can choose from. If she needs 3 plaids, 2 solids, and 2 floral prints for her quilt, how many different ways can she choose the materials?

9. Because Tristan has diabetes, he must make sure that his daily diet includes 2 vegetables, 3 fruits, and 2 breads. At the grocery store, he has a choice of 20 vegetables, 8 fruits, and 5 breads.

a. In how many ways can he make up his daily requirements if he doesn't like to eat 2 helpings of the same thing in one day?

b. What's the probability that a random choice from his possibilities would yield either carrots or spinach in its menu, given that carrots and spinach are both vegetable choices at the grocery store?

10. How many different teams of 4 can be chosen from a group of 20 adults and 15 children if each team must have at least 1 child on it?

11. A football coach needs to choose 11 players to start on offense. There are 6 freshmen, 6 sophomores, 8 juniors, and 7 seniors on the team. In how many ways can the starting 11 be chosen if the coach wants all 7 seniors to play?

12. Lindsay is checking out books at the library, and she is primarily interested in mysteries and nonfiction. She has narrowed her selections down to seven mysteries and eight nonfiction books.

a. How many different combinations of books can she check out if she is only allowed three books at a time?

b. How many different combinations of books can she check out if she is only allowed three books at a time, and she wants at least one mystery?

c. If she randomly chooses three books from her selections, what's the probability that they will all be mysteries?

13. In choosing what music to play at a charity fund-raising event, Marlow has 41 Mozart, 104 Haydn, and 8 Schubert symphonies from which to choose. He is setting up a schedule of the 12 songs to be played during the show.

a. How many different schedules are possible if he needs to have an equal number of symphonies from Mozart, Haydn, and Schubert?

b. If the songs are chosen randomly, what's the probability that all 12 symphonies are by Mozart?

14. A baseball coach needs to choose 9 players to be in the batting lineup for the first game of the season. There are 5 freshmen, 4 sophomores, 7 juniors, and 4 seniors on the team.

a. In how many ways can the batting order be chosen if the coach wants no more than 2 freshmen to play?

b. In how many ways can the batting order be chosen if the coach wants all 4 seniors to play?