



In Exercises 1–4, use the multiplication counting principle to find the number of choices that are available.

- Choose apple, blueberry, or cherry pie with juice or milk.
- Choose a small, medium, large, or extra large shirt in black or white.
- Choose a hat, scarf, or gloves in gray, brown, or black.
- Choose one of 4 essay questions and one of 5 extra credit questions.

- Error Analysis** Describe and correct the error in solving the following problem: A snack stand sells small, medium, and large drinks in 4 flavors. How many drink choices are available?

$$m = 3 \text{ and } n = 4$$

There are $3 + 4 = 7$ drink choices.



- Weekend Plans** You would like to go to a movie, a play, or the zoo. You can go with your cousin, your brother, or your friend. You can go on Friday, Saturday, or Sunday. How many different options do you have?
- Lunch Cart** You want a sandwich, a side order, and a drink from a lunch cart that offers 4 types of sandwiches, 5 different side orders, and 4 drink choices. How many lunches are possible?
- Class Election** The ballot shows the candidates in a class election. Find the number of different ways a president, treasurer, and secretary can be chosen.

PRESIDENT	TREASURER	SECRETARY
<input type="checkbox"/> Amy	<input type="checkbox"/> Jessica	<input type="checkbox"/> Scott
<input type="checkbox"/> Hector	<input type="checkbox"/> Michael	<input type="checkbox"/> Nicole
<input type="checkbox"/> Lisa	<input type="checkbox"/> Carson	<input type="checkbox"/> Thomas
<input type="checkbox"/> Jeremy	<input type="checkbox"/> Isabel	<input type="checkbox"/> Angela

- Restaurant Choices** A restaurant has 84 possible meals that you can choose. A meal includes a main course, a salad, and a dessert. The menu lists 7 main courses and 3 types of salads. How many desserts are available? *Explain.*
- Lockers** The combination for your school locker consists of 3 symbols (letters and digits). How many combinations are possible if at least one digit is used?
- License Plate** You want your license plate to consist of 3 letters grouped together and 3 digits grouped together. You have no preference as to whether the letters or numbers are first. How many different license plates are possible?
- Movies** You and two friends each randomly pick a movie from 5 choices. What is the probability that you all pick the same movie?
- Passwords** A website randomly generates a password after a new user registers. The password consists of 3 letters. Find the probability that the password fits the given description. Count only a, e, i, o, and u as vowels.
 - starts with a consonant
 - contains only vowels
 - code is xyz
 - uses the same letter in each position



In Exercises 1–6, use the number of outcomes of the events to find the number of ways that the events can occur together.

- Event A: 5 outcomes
Event B: 16 outcomes
 - Event A: 14 outcomes
Event B: 15 outcomes
 - Event A: 13 outcomes
Event B: 16 outcomes
 - Event A: 27 outcomes
Event B: 9 outcomes
Event C: 3 outcomes
 - Event A: 15 outcomes
Event B: 20 outcomes
Event C: 25 outcomes
 - Event A: 26 outcomes
Event B: 26 outcomes
Event C: 10 outcomes
7. **Class Election** Your class is having an election. There are 4 candidates for president, 6 for vice president, 3 for secretary, and 7 for treasurer. How many ways can a president, vice president, secretary, and treasurer be chosen?
8. **Sandwiches** A sandwich shop has 6 types of bread, 5 types of cheese, and 3 types of ham to use on a ham-and-cheese sandwich.
- You are limited to 1 type of bread, 1 type of cheese, and 1 type of ham. How many different ham-and-cheese sandwiches are possible?
 - The shop has a pre-made ham-and-cheese sandwich. What is the probability that a randomly made sandwich has the types of bread, cheese, and ham that you want?
9. **Digital Clocks** On a digital clock, the numbers 1 through 12 are used for the hour display and the numbers 00 through 59 are used for the minute display. How many time displays are possible? If a light for A.M. and P.M. is added, how does this affect the possible number of displays?
10. **Vision** A doctor creates a vision test using lower case letters, upper case letters, and digits. The third line contains five characters, where at most one is a digit. How many different third lines are possible?
11. **Working Backward** The number of ways that events A, B, and C can occur together is 155. Event B can occur in 5 ways. The number of ways Event A can occur is less than the number of ways Event B can occur. In how many ways can Event A occur? In how many ways can Event C occur?
12. **States** You and your friend randomly choose the name of a state. What is the probability that you both choose a state whose name begins with the letter K?
13. **Code Generation** A website randomly generates a confirmation code after purchases. The code consists of 5 letters. Find the probability that the code fits the given description. Count only a, e, i, o, and u as vowels.
- starts with a vowel
 - contains no vowels
 - code is abcde
 - uses the same letter in each position
14. **Ice Cream** You work at an ice cream stand that offers 6 different flavors. On a busy day, you take orders for one-scoop cones from 5 people, but forget the flavors. How many flavors do you have to remember for the probability that you randomly get all the other flavors correct on the first try to be greater than 0.01? *Explain.*