CONCEPT AND VOCABULARY CHECK

Fill in each blank so that the resulting statement is true.

1. If you can choose one item from a group of M items and a second item from a group of N items, then the total number of two-item choices is _____.
2. The number of ways in which a series of successive things can occur is found by _____ the number of ways in which each thing can occur. This is called the _____ Principle.
3. The number of possible permutations if r objects are taken from n items is $_nP_r = $ _____.
4. The number of possible combinations if r objects are taken from n items is $_nC_r = $ _____.
5. The formula for $_nC_r$ has the same numerator as the formula for $_nP_r$ but contains an extra factor of _____ in the denominator.

EXERCISE SET 8.6

Practice Exercises

In Exercises 1–8, use the formula for $_nP_r$ to evaluate each expression.

1. $_9P_4$
2. $_7P_3$
3. $_8P_5$
4. $_{10}P_4$
5. $_6P_6$
6. $_9P_9$
7. $_8P_0$
8. $_6P_0$

In Exercises 9–16, use the formula for $_nC_r$ to evaluate each expression.

9. $_9C_5$
10. $_{10}C_6$
11. $_{11}C_4$
12. $_{12}C_5$
13. $_7C_7$
14. $_4C_4$
15. $_5C_0$
16. $_6C_0$

In Exercises 17–20, does the problem involve permutations or combinations? Explain your answer. (It is not necessary to solve the problem.)

17. A medical researcher needs 6 people to test the effectiveness of an experimental drug. If 13 people have volunteered for the test, in how many ways can 6 people be selected?
18. Fifty people purchase raffle tickets. Three winning tickets are selected at random. If first prize is $1000, second prize is $500, and third prize is $100, in how many different ways can the prizes be awarded?
19. How many different four-letter passwords can be formed from the letters A, B, C, D, E, F, and G if no repetition of letters is allowed?
20. Fifty people purchase raffle tickets. Three winning tickets are selected at random. If each prize is $500, in how many different ways can the prizes be awarded?

Practice Plus

In Exercises 21–28, evaluate each expression.

21. $\dfrac{_7P_3}{3!} - _7C_3$
22. $\dfrac{_{20}P_2}{2!} - _{20}C_2$
23. $1 - \dfrac{_3P_2}{_4P_3}$
24. $1 - \dfrac{_5P_3}{_{10}P_4}$
25. $\dfrac{_7C_3}{_5C_4} - \dfrac{98!}{96!}$
26. $\dfrac{_{10}C_3}{_6C_4} - \dfrac{46!}{44!}$
27. $\dfrac{_4C_2 \cdot _6C_1}{_{18}C_3}$
28. $\dfrac{_5C_1 \cdot _7C_2}{_{12}C_3}$

Application Exercises

Use the Fundamental Counting Principle to solve Exercises 29–40.

29. The model of the car you are thinking of buying is available in nine different colors and three different styles (hatchback, sedan, or station wagon). In how many ways can you order the car?
30. A popular brand of pen is available in three colors (red, green, or blue) and four writing tips (bold, medium, fine, or micro). How many different choices of pens do you have with this brand?
31. An ice cream store sells two drinks (sodas or milk shakes), in four sizes (small, medium, large, or jumbo), and five flavors (vanilla, strawberry, chocolate, coffee, or pistachio). In how many ways can a customer order a drink?
32. A restaurant offers the following lunch menu.

Main Course	Vegetables	Beverages	Desserts
Ham	Potatoes	Coffee	Cake
Chicken	Peas	Tea	Pie
Fish	Green beans	Milk	Ice cream
Beef		Soda	

If one item is selected from each of the four groups, in how many ways can a meal be ordered? Describe two such orders.

33. You are taking a multiple-choice test that has five questions. Each of the questions has three answer choices, with one correct answer per question. If you select one of these three choices for each question and leave nothing blank, in how many ways can you answer the questions?
34. You are taking a multiple-choice test that has eight questions. Each of the questions has three answer choices, with one correct answer per question. If you select one of these three choices for each question and leave nothing blank, in how many ways can you answer the questions?
35. In the original plan for area codes in 1945, the first digit could be any number from 2 through 9, the second digit was either 0 or 1, and the third digit could be any number except 0. With this plan, how many different area codes were possible?
36. How many different four-letter radio station call letters can be formed if the first letter must be W or K?