

**LESSON**  
**19-3**

# Combinations and Probability

## Practice and Problem Solving: A/B

Use the scenario in the box for Problems 1–4.

Calvin has enough money to get 3 new T-shirts at a buy two, get one free sale. There are 8 color choices, and he wants to get 3 different colors. How many possible combinations of 3 colors are there?

1. Explain why you should use combinations rather than permutations for this problem.

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2. Tell what the variables  $n$  and  $r$  stand for in the combinations formula,  ${}_nC_r = \frac{n!}{r!(n-r)!}$ , and identify their values for this problem.

$n$  \_\_\_\_\_  $r$  \_\_\_\_\_

3. Substitute the values of  $n$  and  $r$  into the formula and solve to find the number of combinations of 3 T-shirts.

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4. The formula for combinations is equal to the formula for permutations divided by  $r!$ . Explain how dividing by  $r!$  relates to this problem.

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5. Find the number of combinations of 7 objects taken 4 at a time.

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6. Rachel has 10 valuable baseball cards. She wants to select 2 of them to sell online. How many different combinations of 2 cards could she choose?

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7. If Rachel picked the cards at random, what is the probability that one of the 2 cards would be her Ken Griffey, Jr., card? Explain your answer.

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8. Mrs. Marshall has 11 boys and 14 girls in her kindergarten class. In how many ways can she select 2 boys to pass out a snack?

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9. In how many ways can Mrs. Marshall select 3 students to carry papers to the office? Show your calculations.

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10. What is the probability that Adam will be one of the students chosen to carry papers to the office?

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**LESSON**  
**19-2**

**Permutations and Probability**

**Practice and Problem Solving: A/B**

For Problems 1–8, give the value of each expression.

1.  $5! =$  \_\_\_\_\_      2.  $6! =$  \_\_\_\_\_      3.  $7! =$  \_\_\_\_\_

4.  $\frac{6!}{5!} =$  \_\_\_\_\_      5.  $\frac{7!}{6!} =$  \_\_\_\_\_      6.  $\frac{8!}{7!} =$  \_\_\_\_\_

7. Suppose  $n$  stands for any number. Write a fraction to show  $n$  factorial divided by  $(n - 1)$  factorial. Find its value. \_\_\_\_\_

8. What is the value of  $\frac{n!}{(n-2)!}$ ? \_\_\_\_\_

Use the Fundamental Counting Principle to solve Problems 9–11.

9. Alicia is designing a flag with 3 stripes. She has 5 different colors of fabric to use in any order she likes, but she does not want 2 stripes next to each other to be the same color. How many different color patterns can she choose from? Explain your answer. \_\_\_\_\_

10. A travel agent is offering a vacation package. Participants choose the type of tour, a meal plan, and a hotel class from the chart to the right. How many different vacation packages are offered? \_\_\_\_\_

Tour	Meal	Hotel
Walking	Restaurant	4-Star
Boat	Picnic	3-Star
Bicycle		2-Star
		1-Star

11. There are 8 marbles in a bag, all of different colors. In how many orders can 4 marbles be chosen? \_\_\_\_\_

For Problems 12–14, find the probabilities.

12. Gil's padlock can be opened by entering 3 digits in the right order (digits can be repeated). How many different orders of digits are there? What is the probability that someone could guess the right order on the first try? \_\_\_\_\_  
\_\_\_\_\_

13. A playlist includes 8 songs, including Kim's favorite and second favorite. How many different ways can the playlist be shuffled? What is the probability that Kim's favorite song will be first and her second favorite song will be second? Explain your answers. \_\_\_\_\_  
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14. What is the probability that a family with 4 children will have all girls? \_\_\_\_\_