

13.2 Find Probabilities Using Permutations

TEKS 8.11.B



- Before** You used the counting principle.
- Now** You will use the formula for the number of permutations.
- Why?** So you can find the number of possible arrangements, as in Ex. 38.

Key Vocabulary

- permutation
- n factorial

A **permutation** is an arrangement of objects in which order is important. For instance, the 6 possible permutations of the letters A, B, and C are shown.

ABC ACB BAC BCA CAB CBA

EXAMPLE 1 Count permutations

Consider the number of permutations of the letters in the word JULY.

- a. In how many ways can you arrange all of the letters?
- b. In how many ways can you arrange 2 of the letters?

Solution

- a. Use the counting principle to find the number of permutations of the letters in the word JULY.

$$\begin{array}{r}
 \text{Number of} \\
 \text{permutations}
 \end{array}
 =
 \begin{array}{c}
 \text{Choices for} \\
 \text{1st letter}
 \end{array}
 \cdot
 \begin{array}{c}
 \text{Choices for} \\
 \text{2nd letter}
 \end{array}
 \cdot
 \begin{array}{c}
 \text{Choices for} \\
 \text{3rd letter}
 \end{array}
 \cdot
 \begin{array}{c}
 \text{Choices for} \\
 \text{4th letter}
 \end{array}$$

$$= 4 \cdot 3 \cdot 2 \cdot 1$$

$$= 24$$

► There are 24 ways you can arrange all of the letters in the word JULY.

- b. When arranging 2 letters of the word JULY, you have 4 choices for the first letter and 3 choices for the second letter.

$$\begin{array}{r}
 \text{Number of} \\
 \text{permutations}
 \end{array}
 =
 \begin{array}{c}
 \text{Choices for} \\
 \text{1st letter}
 \end{array}
 \cdot
 \begin{array}{c}
 \text{Choices for} \\
 \text{2nd letter}
 \end{array}$$

$$= 4 \cdot 3$$

$$= 12$$

► There are 12 ways you can arrange 2 of the letters in the word JULY.

REVIEW COUNTING PRINCIPLE

For help with using the counting principle, see p. 931.

GUIDED PRACTICE for Example 1

1. In how many ways can you arrange the letters in the word MOUSE?
2. In how many ways can you arrange 3 of the letters in the word ORANGE?