



## Problem 1 – An introduction

A password must contain 5 unique lowercase letters. How many possible passwords are there?

- A. 3,125      B. 100,000      C. 7,893,600      D. 11,881,376

- Explain why you chose the answer you did.

## Problem 2 – Factorials and the Fundamental Counting Principle

- Evaluate the following.  $5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 =$  \_\_\_\_\_  
 $5! =$  \_\_\_\_\_  
 $0! =$  \_\_\_\_\_  
 $(5 - 2)! =$  \_\_\_\_\_  
 $5! - 2! =$  \_\_\_\_\_

- A spinner with four equal sections colored red, green, blue, and yellow is spun, and a penny is flipped. List all possible outcomes.
- A penny is flipped three times. List all possible outcomes.
- State the Fundamental Counting Principle in your own words.

## Problem 3 – $n$ objects taken $n$ at a time

- List all the ways in which the letters  $a$ ,  $b$ , and  $c$  can be arranged.
- What multiplication expression can be used to find the answer? \_\_\_\_\_
- Complete this equation:  ${}_n P_n = \square$
- Find how many different ways you can arrange the letters in the word **NUMBER**. \_\_\_\_\_



# Permutations

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## Problem 4 – $n$ objects taken $r$ at a time

- List all of the ways to arrange *two* of the following 4 letters:  $a$ ,  $b$ ,  $c$ , and  $d$ .
- What multiplication expression can be used to find the answer? \_\_\_\_\_
- Complete this equation:  ${}_n P_r = \frac{\boxed{\phantom{000000}}}{\boxed{\phantom{000000}}}$
- A collector has 16 statues. In how many ways can the collector arrange 5 of the statues on a shelf? \_\_\_\_\_

## Problem 5 – Practice

- A certain password must contain 5 unique lowercase letters. How many possible passwords are there? \_\_\_\_\_
- Use permutations to find the number of ways the letters in the word **FLOWER** can be arranged. \_\_\_\_\_
- Ten people are in a race. Use permutations to find the number of ways 1st, 2nd, and 3rd places can be awarded. \_\_\_\_\_
- CHALLENGE:** A password must have 3 unique lowercase letters and 5 unique digits. Find the number of possible passwords if the letters must stay grouped together and the digits must stay grouped together. \_\_\_\_\_

## Extension

Read p.705.

Find the number of distinguishable permutations of the letters in each of these words.

- PIZZA** \_\_\_\_\_
- COOKBOOK** \_\_\_\_\_
- SUCCESS** \_\_\_\_\_
- MISSISSIPPI** \_\_\_\_\_