Permutations

ID: 10076

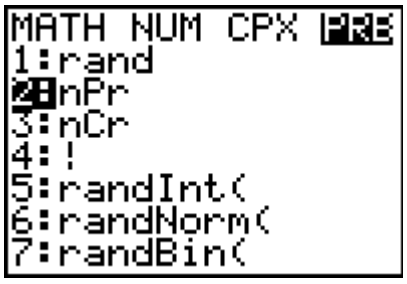
Name _____

Class _____

In this activity, you will explore:

- *Factorials*
- *The Fundamental Counting Principle*

Follow along with your teacher to work through the activity. Use this document as a reference and to record your answers.



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?
- Find how many different ways you can arrange the letters in the word **NUMBER**.
- Complete this equation: ${}_nP_n = \square$

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: ${}_nP_r = \frac{\square}{\square}$
- 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

Use the formula for the number of permutations with repetition to find the number of distinguishable permutations of the letters in each of these words.

- **PIZZA** _____
- **COOKBOOK** _____
- **SUCCESS** _____
- **MISSISSIPPI** _____