Name: **Key**

Date: _____ Period: _____

Fundamental Counting Principle

1. Arizona uses three letters followed by three digits for license plates.

    a.) How many license plates can be made using all letters in the alphabet and the numbers 0-9?

$$\underset{L}{26} \cdot \underset{L}{26} \cdot \underset{L}{26} \cdot \underset{\#}{10} \cdot \underset{\#}{10} \cdot \underset{\#}{10} = 17{,}576{,}000 \text{ Arizona}$$
plates

    b.) Suppose the Governor of Arizona decided that all license plates must begin with the letter A on each license plate. How many fewer license plates would Arizona be able to issue using the Governor's mandate for license plates?

$$\underset{A}{1} \cdot \underset{L}{26} \cdot \underset{L}{26} \cdot \underset{\#}{10} \cdot \underset{\#}{10} \cdot \underset{\#}{10} = 676{,}000 \text{ Arizona plates}$$

    c.) If the population of Arizona is 20,000,000, do you think the Governor made a good decision? Why or why not?

    NO, I think he would run out quickly.

2. Atlanta has 3 area codes, 404, 678, and 770. The 7 digit telephone numbers have the form ABC – XXXX, where X can be any digit 0-9, C can be any digit 2- 9, B can be any digit 0-9, and A can be 2-9.

    a.) How many possible Atlanta phone numbers are there considering there are 3 area codes to use.

$$\underset{\substack{404\\678\\770}}{3} \cdot \underset{\substack{A\\(2\text{-}9)}}{8} \cdot \underset{\substack{B\\(0\text{-}9)}}{10} \cdot \underset{\substack{C\\(2\text{-}9)}}{8} \cdot \underset{\substack{X\\(0\text{-}9)}}{10} \cdot \underset{\substack{X\\(0\text{-}9)}}{10} \cdot \underset{\substack{X\\(0\text{-}9)}}{10} \cdot \underset{\substack{X\\(0\text{-}9)}}{10} = 19{,}200{,}000 \text{ possible}$$
phone numbers

    b.) If the population of the Atlanta area is estimated to be 5,475,000 people. How many phone numbers can each person have assigned to them?

$$\frac{19{,}200{,}000}{5{,}475{,}000} = 3.5$$

Each person can have about 3 phone numbers.

3. The license plate system in California is AA#-##A.   Where the letters can be any letter A-Z and the numbers can be any number 1-9.   They do not use the number Zero because it looks too much like the letter O.

- The first letter cannot be X. X's are reserved for rental car companies to use.

- The first letter cannot be a T. T's are reserved for taxi companies to use.

- The last letter cannot be a G. G's are reserved for government vehicles.

a.) How many license plate numbers are available to the average citizen to use?

$$24 \cdot 26 \cdot 9 \cdot 9 \cdot 9 \cdot 25 = 11,372,400 \text{ possible plates}$$

b.) How many more numbers would there be if they let you use the number Zero.

$$24 \cdot 26 \cdot 10 \cdot 10 \cdot 10 \cdot 25 = 15,600,000 \text{ possible plates}$$

✱ Take the difference $\begin{array}{r} 15,600,000 \\ -11,372,400 \end{array}$ 4,227,600 more possibilities

4. The license plate system in Ohio has 5 digits AA###. Where A can be any letter A-Z and the # sign is any number 0-9.

a.) How many license plates can they have?

$$26 \cdot 26 \cdot 10 \cdot 10 \cdot 10 = 676,000 \text{ possible plates}$$

b.) They are thinking about changing to a system that will have plates in the format AAB##.   The third letter B, can be any letter except the letter O. How many more plates will they be able to assign with the new format?

$$26 \cdot 26 \cdot 25 \cdot 10 \cdot 10 = 1,014,000$$

c.) How many plates will they have issued total when they have used up all possible combinations of both styles?

✱add the previous answers

1,690,000 total possible plates

5. Phone numbers in France are 8 digits long, plus a 2 digit area code. They are in the format

AB-CDDD-XXXX

A can be any number 2-9.   B can be any number 1-9.   C can be any number 3-9

D can be any number 0-9.   X can be any number 0-9.

How many numbers can the French have?

$8 \cdot 9 \cdot 7 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 = 5,040,000,000$

French can have about 5 billion possible plates

6. New York has 6 area codes. The 7 digit telephone numbers have the form ABC – XXXF, where

X can be any digit 0-9.   C can be any digit 2-9.   B can be any digit 1-9.

A can be 3-9.   F can be any digit 0-8.

a.) How many possible New York phone numbers are there considering there are 6 area codes to use?

$6 \cdot 7 \cdot 9 \cdot 8 \cdot 10 \cdot 10 \cdot 10 \cdot 9 = 27,216,000$

NY has about 27 million possible phone #s.

b.) If the population of the New York area is estimated to be 9,600,000 people. How many phone numbers can each person have assigned to them?

$\dfrac{27,216,000}{9,600,000} = 2.84$

Each person can have about 2 phone #s assigned to them.