

Lesson 1 - Counting Principles Marked

Multiplication Counting Principle

If one event can occur in m ways and another event can occur in n ways, then both events can occur in mn ways

A nearby deli has a lunch special which consists of a sandwich, soup, dessert, and drink for \$4.99. Orders can be customized by choosing from four different types of sandwich, three types of soup, two desserts, and five different drinks. How many possible lunch specials are there?

$$4 \cdot 3 \cdot 2 \cdot 5$$
$$= 120 \text{ POSSIBLE LUNCH SPECIALS}$$

A company places a 6-symbol code on each unit of product. The code consists of 4 digits, the first of which is the number 5, followed by 2 letters, the first of which is NOT a vowel.

How many different codes are possible?

$$\underbrace{\frac{1}{\quad} \frac{10}{\quad} \frac{10}{\quad} \frac{10}{\quad}}_{\text{DIGITS}} \underbrace{\frac{21}{\quad} \frac{26}{\quad}}_{\text{LETTERS}}$$

$$= 546000$$

Lesson 1 - Counting Principles Marked

Addition Counting Principle

If the possibilities being counted can be divided into groups with no possibilities in common, then the total number of possibilities is the sum of the numbers of possibilities in each group.

When ordering a one-topping pizza special, you are having trouble deciding whether you want a meat topping or a veggie topping. If the restaurant has seven different meats and twelve different veggies to choose from, then how many different one-topping pizzas are possible?

$$7 + 12 = 19$$

Every purchase made on a company's website is given a randomly generated confirmation code. The code consists of three symbols (letters and digits). How many different codes can be generated if at least one letter is used in each?

$$\begin{aligned}\text{ONE LETTER: } & \underline{26} \quad \underline{10} \quad \underline{10} = 2600 \\ & \underline{10} \quad \underline{26} \quad \underline{10} = 2600 \\ & \underline{10} \quad \underline{10} \quad \underline{26} = 2600 \\ & \hline \text{TOTAL: } & 7800\end{aligned}$$

$$\begin{aligned}\text{TWO LETTERS: } & \underline{10} \quad \underline{26} \quad \underline{26} = 6760 \\ & \underline{26} \quad \underline{10} \quad \underline{26} = 6760 \\ & \underline{26} \quad \underline{26} \quad \underline{10} = 6760 \\ & \hline \text{TOTAL: } & 20280\end{aligned}$$

$$\begin{aligned}\text{THREE LETTERS: } & \underline{26} \quad \underline{26} \quad \underline{26} \\ & = 17576\end{aligned}$$

$$\begin{aligned}\therefore \# \text{ OF POSSIBLE CODES} \\ & = 7800 + 20280 + 17576 \\ & = 45656\end{aligned}$$