

Mini-Lecture 11.1

The Fundamental Counting Principle

Example:

1. Solve using the Fundamental Counting Principle with two groups of items.

- a. A restaurant offers 9 appetizers and 15 main courses. In how many ways can a person order a two-course meal?

$$\underline{9} \times \underline{15} = \boxed{135}$$

- b. A movie theater offers 4 flavors of popcorn and 3 sizes. In how many ways can customers order popcorn?

$$\underline{4} \times \underline{3} = \boxed{12}$$

- c. There are 26 red cards and 26 black cards in a deck. In how many ways can a person pick a red card and a black card?

$$\underline{26} \cdot \underline{26} = \boxed{676}$$

- d. A pizza can be ordered in three sizes (small, medium, large) and 8 choices of toppings (cheese only, green peppers, sausage, pepperoni, onion, mushrooms, olives, and ground beef). How many one-topping pizzas can be ordered?

$$\underline{3} \cdot \underline{8} = \boxed{24}$$

2. Solve using the Fundamental Counting Principle with three or more groups of items.

- a. A car model comes in 6 colors, 3 different models, with or without AC, with or without a moon roof, with or without power windows, with or without a security alarm, and with or without spoiler. In how many ways can the car be ordered with regard to these options?

$$\underline{6} \cdot \underline{3} \cdot \underline{2} \cdot \underline{2} \cdot \underline{2} \cdot \underline{2} \cdot \underline{2} = \boxed{576}$$

- b. You are taking a multiple choice test that has 20 questions. Each of the questions has four answer choices with one correct answer per question. If you select one of these four choices for each question and leave nothing blank, in how many ways can you answer the questions?

$$\underline{4} \cdot \underline{4} \cdot \underline{4} \cdot \underline{4} \dots = 4^{20} = \boxed{1.0995 \times 10^{12}}$$

- c. License plates in a particular state display four letters and then three numbers. How many different license plates can be manufactured for this state?

$$\frac{26}{L} \frac{26}{L} \frac{26}{L} \frac{26}{L} \frac{10}{N} \frac{10}{N} \frac{10}{N} = \boxed{456,976,000}$$

- d. A restaurant offers 8 appetizers, 3 soups, 6 main courses, 5 desserts, and 20 beverage options. If one item is selected from each group, in how many ways can a meal be ordered?

$$\underline{8} \cdot \underline{3} \cdot \underline{6} \cdot \underline{5} \cdot \underline{20} = \boxed{14,400}$$