FUNDAMENTAL COUNTING PRINCIPLE

Complete the following problems to reinforce your understanding of the concept covered in this module.

Problem 1:

A restaurant's menu has a fixed price complete dinner that consists of an appetizer, a main dish, a drink, and a dessert. When one orders, they have a choice of five appetizers, ten main dishes, three drinks, and six desserts. Determine the total number of possible dinners that can be ordered.

Problem 2:

If a set of six books is placed on a shelf, in how many ways can the six books be arranged?

Problem 3:

Supposed a coin is tossed five times. What is the total number of different sequences of heads and tails?

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Solution 1:

This problem is made of 4 tasks, or events; the events make up the dinner items one will order as defined in the problem. In the first event, the choice can be 1 of 5 items (5 possible items). In the second event, the choice can be 1 of 10 items (10 possible items). In the third event, the choice can be 1 of 3 items (3 possible items). In the fourth event, the choice can be 1 of 6 items (6 possible items). Therefore:

$$n_1 = 5$$
$$n_2 = 10$$
$$n_3 = 3$$
$$n_4 = 6$$

The Fundamental Counting Principle states that the total number of different ways this task can occur is:

$$n_1 \cdot n_2 \cdot n_3 \cdot \ldots \cdot n_k$$

So:

$$5 \cdot 10 \cdot 3 \cdot 6 = 900$$

The total number of possible dinners is 900.

Solution 2:

This problem is made of 6 tasks, or events; the events make up the placement of a book on to the shelf. In the first event, the choice can be 1 of 6 items (6 possible items). In the second event, the choice can be 1 of 5 items (5 possible items). In the third event, the choice can be 1 of 4 items (4 possible items). In the fourth event, the choice can be 1 of 3 items (3 possible items). In the fifth event, the choice can be 1 of

2 items (2 possible items). In the sixth event, the choice can be 1 of 1 item (1 possible item). Therefore:

$$n_1 = 6$$
$$n_2 = 5$$
$$n_3 = 4$$
$$n_4 = 3$$
$$n_5 = 2$$
$$n_6 = 1$$

The Fundamental Counting Principle states that the total number of different ways this task can occur is:

$$n_1 \cdot n_2 \cdot n_3 \cdot \ldots \cdot n_k$$

So:

$$6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 720$$

There are 720 total number of possible arrangements for the six books.

Solution 3:

This problem is made of 5 tasks, or events; the events are made up of each flip of the coin. In the first event, the result can be heads or tails (2 possible items). In the second event, the result can be heads or tails (2 possible items). In the third event, the result can be heads or tails (2 possible items). In the fourth event, the result can be heads or tails (2 possible items). In the fifth event, the result can be heads or tails (2possible items). In the sixth event, the result can be heads or tails (2possible items). Therefore:

$$n_1 = 2$$
$$n_2 = 2$$

$$n_3 = 2$$
$$n_4 = 2$$
$$n_5 = 2$$

The Fundamental Counting Principle states that the total number of different ways this task can occur is:

$$n_1 \cdot n_2 \cdot n_3 \cdot \ldots \cdot n_k$$

So:

$$2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 32$$

There are 32 possible outcomes if you flip a coin 5 times.