

Section 6.3: The Multiplication Principle

An experiment is to flip a coin. How many outcomes are possible if the coin is flipped

A) Twice. $S = \{ HH, HT, TH, TT \}$

B) Three times. $S = \{ HHH, HHT, HTH, HTT, THH, THT, TTH, TTT \}$

C) Five times.

Example: An experiment is to draw two letters in succession from a box that has an A, B, and C. How many outcomes are there?

Definition - Multiplication Principle: An outcome consists of k successive selections with n_i choices for the i -th selection. The the total number of outcomes is

Example: There are 6 roads from town A to town B and 7 roads from town B to town C. How many ways can you go from town A to town C?

Example: How many ways can you select a president, vice-president and secretary from a group of 10 people?

Definition: A factorial, $n!$, is the product of integers from n down to 1. For example: $5! = 5*4*3*2*1$. By definition, $0! = 1$

Example: Compute the following.

A) $10!$

B) $14!$

Example: How many three digit numbers can be formed from the digits: 2, 3, 4, 5, 6, 7, 8?

- A) No restrictions.
- B) The number is even.
- C) The digits are even.
- D) The number is even and no digit is repeated.

Example: Five boys and five girls are to be seated in a row. Find how many ways can this be done if

- A) no restrictions.
- B) they alternate seats.
- C) girls sit together and boys sit together.
- D) girls sit together.
- E) Sue, Jill, or Sarah are seated in the end seats.

Example: How many 3 digit numbers have

- A) none of the digits are a 7.
- B) Exactly one digit a 7.
- C) Exactly two digit being a 7.
- D) Exactly three digits a 7.
- E) no digits repeated and the number is even.

Example: How many 5 digit numbers have at least one digit being a 7?

Example: A computer code is to be constructed with either 5 letters or 2 letters followed by three digits. How many codes are possible if no letters may be repeated in the code.

Example: Four couples are to seated in a row. How many ways can this be done if the couples are to be seated together?

Example: An ATM code contains 4 digits. How many codes are possible if the bank will not allow the codes to have all the same digits?