

SECTION 9.2: THE MULTIPLICATION PRINCIPLE

Multiplication Principle – multiply the number of ways to make each choice to find the total number of choices

Example 1: A combination lock can be set to open any 3-letter sequence. How many such sequences are possible?

Example 2: A teacher has 5 different books to be arranged side by side. How many different arrangements are possible?

FACTORIAL:

$$n! = n(n-1)(n-2)\dots(3)(2)(1)$$

$$\text{and } 0! = 1$$

SECTION 9.2: PERMUTATIONS

Permutations – a selection of items in which order is important

A permutation of r elements from a set of n elements is written as

$${}_n P_r = \frac{n!}{(n-r)!}$$

Example 3: The teacher mentioned in Example 2 wants to select only 3 of the 5 books to arrange on his desk. How many arrangements are possible?

Example 4: In 1996, eight candidates sought the Republican nomination for president. In how many ways could voters rank their first, second, and third choices?

SECTION 9.2: COMBINATIONS

Combinations – a selection of items without regard to order (order is not important)

The number of combinations of n elements taken r at a time is written as

$$\binom{n}{r} \quad \text{or} \quad {}_n C_r = \frac{n!}{(n-r)!r!} = \frac{\text{number of permutations}}{(\text{number choosing})!}$$

Example 5: A teacher selects 3 of 5 books to donate to charity. How many combinations are possible?

Example 6: How many committees of 3 people can be formed from a group of 8 people?

Example 7: Three managers are to be selected from a group of 30 to work on a special project.

- a) In how many different ways can the managers be selected?
- b) In how many ways can the group of 3 be selected if a certain manager must work on the project?