

Fundamental Principle of Counting

If one event can occur in  $m$  ways, and a second event can occur in  $n$  ways, and a third event can occur in  $p$  ways, and so on, then the sequence of events can occur in  $m \times n \times p \times \dots$  ways.

Practice Exercises

- A. Find the number of possible outcomes for each scenario using the tree diagram and the fundamental counting principle.
- Boys and girls in a family with two children.
  - Choosing a cellphone that comes in black, white, or transparent that is 3G or 4G.
  - A choice of muffin or toast bread with coffee, milk, or juice.
  - Basketball uniform in white, red, or green which comes in sizes small, medium, or large.
  - A die is rolled and a coin is tossed.
- B. Solve each problem completely.
- In how many ways can 1 out of 4 blue flags, 1 out of 3 red flags, and 1 out of 2 green flags be arranged on a pole?
  - A teacher wants to write an ordered 4-question test from a pool of 12 questions. How many different forms of the test can the teacher write?
  - A lock contains 3 dials, each with ten digits. How many possible sequences of numbers exist?
  - Four students are to be chosen from a group of 9 to fill the positions of president, vice-president, treasurer and secretary. In how many ways can this be accomplished?
  - How many 5-number license plates can be made using the digits 0, 1, 2, 3, 4, 5, if:
    - repetitions ARE allowed?
    - repetitions are NOT allowed?
  - Bill has three pairs of pants, 5 shirts and 2 pairs of shoes. How many outfits can he make?
  - In how many ways can 6 different cards be laid out on a table in a row?
  - How many ways can the letters MATH be arranged?

Problem Set

- A. Find the number of possible outcomes for each scenario using the tree diagram and the fundamental counting principle.
- Clocks come in 2 styles: wall or desk. They come in 5 colors: white, black, red, blue, or orange.
  - Elias has a choice of a queen or king with a choice of hearts, diamonds, clubs, or spades.
  - A coin is tossed three times.
  - A coin is tossed and a die is rolled.
  - Notebooks come in 4 colors: red, yellow, green, and blue. They come in 2 types: 5-subject and 7-subject.
- B. Solve each problem completely.
- A restaurant offers four sizes of pizza, two types of crust, and eight toppings. How many possible combinations of pizza with one topping are there?
  - How many ways can 5 paintings be lined up on a wall?
  - Rob has 4 shirts, 3 pairs of pants, and 2 pairs of shoes that all coordinate. How many outfits can you put together?
  - Grace loves to eat salad! How many salads can she put together if she can pick out one type of lettuce from 2 choices, one vegetable from 4 choices and one dressing from 7 choices?
  - Motorcycle license plates have 2 letters followed by 4 numbers.
    - If the same letter or number can be repeated, how many can be made?
    - If the same letter CANNOT be repeated, how many can be made?
  - How many 5-digit numbers can be formed (using 0 – 9)?
  - How many 5-digit numbers can be formed if each one uses all the digits 0, 1, 2, 3, 4 without repetition?
  - In how many ways can 6 bicycles be parked in a row?

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