



**Examples:** 4) Use the Addition Principle to solve problems 1, 2 and 3 above.

---

### Tree Diagrams & the Multiplication Principle

**Examples** Use a tree diagram to solve the problem.

5) A retail store stocks windbreaker jackets in small, medium, large and extra-large. All are available in blue or red. What are the combined choices and how many combined choices are there?

6) How many 2 letter code words can be formed from the first 3 letters of the alphabet if a letter can be used more than once.

7) How many 2 letter code words can be formed from the first 3 letters of the alphabet if a letter cannot be used more than once.

Multiplication Principle for Counting:

If  $n$  operations  $O_1, O_2, \dots, O_n$  are performed in order, with possible number of outcomes  $N_1, N_2, \dots, N_n$ , respectively, then there are  $N_1 * N_2 * \dots * N_n$  possible combined outcomes of the operations performed in the given order.

**Example** 8) Use the Multiplication Principle to solve numbers 5, 6, and 7 above.

**Examples** Use the Multiplication Principle to solve.

9) A college offers 4 introductory courses in history, 3 in science, 3 in mathematics, 4 in philosophy and 2 in English. a) If a student takes one course in each area, how many course selections are possible? b) If a student can only take one introductory course, how many selections are possible?

10) You would like to make a salad that consists of lettuce, tomato, cucumber and croutons. At the store there are 11 varieties of lettuce, 3 varieties of tomatoes, 5 varieties of cucumbers and 4 varieties of croutons. How many different salads can you make?

11) A combination lock has 7 wheels each wheel having the digits 0 through 9.

a) How many 7-digit combinations are possible if no digit is repeated?

b) How many 7-digit combinations are possible if digits can be repeated?

12) How many different license plates are possible if the license plate contains 2 letters followed by 8 digits?

13) A corporation plans to fill 2 different positions for vice-president,  $V_1$  and  $V_2$ , from administrative officers in 2 of its manufacturing plants. Plant A has 6 officers and plant B has 8.

a) How many ways can these 2 positions be filled if the  $V_1$  position is to be filled from plant A and the  $V_2$  position is to be filled from plant B?

b) How many ways can the 2 positions be filled if the selection is made without regard to plant?

14) A survey of 1200 people indicates that 850 own DVD players, 740 own Blu-ray players, and 580 own both DVD players and Blu-ray players. Draw a Venn Diagram to answer the following:

a) How many people own either a DVD player or a Blu-ray player?

b) How many own neither a DVD player or a Blu-ray player?

c) How many own a DVD player but not a Blu-ray player?

d) How many own a Blu-ray player but not a DVD player. [Venn Diagram]

15) A cable television company has 7500 subscribers in a suburban community. The company offers two premium channels, A and B. If 2200 subscribers receive channel A, 1720 receive channel B, and 4850 do not receive any premium channel, how many subscribers receive both channel A and channel B? [Venn Diagram]