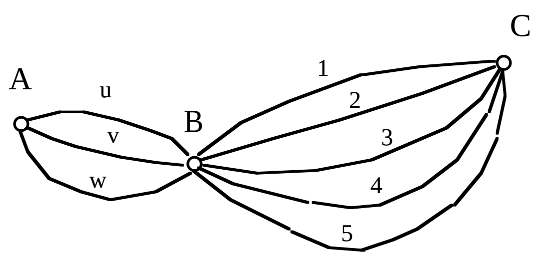
Math 12 Fundamental Counting Principle-10

The **Fundamental Counting Principle** states that: If one item can be selected in M different ways, and a second item can be selected in N different ways, then the two items can be selected in MxN different ways.

Example 1:

Suppose that we have three towns; A, B, and C. There are three routes from A to B. There are five routes from B to C. How many ways are there to get from A to C?

The answer is 3x5 = 15. This can be seen in the diagram below.



The 15 routes are; u1, u2, u3, u4, u5, v1, v2, v3, v4, v5, w1, w2, w3, w4, and w5.

The counting principle can be extended to three items or more. If the three items can be selected in respectively; M, N, and R different ways, then, the total number of ways in which the three items can be chosen is: MxNxR.

Example 2:

Suppose that you go into a restaurant. The main course is chicken, fish, beef or pork. The main vegetable can be rice or a potato. The remaining vegetable can be peas, carrots or corn.

How many different meals are possible?

Answer: 4x2x3 = 24.

Example 3:

How many two digit numbers are there?

Answer: 9x10 = 90. The first digit can’t be a zero.

Problems:

1) Suppose that you toss a coin and roll a six-sided die. How many outcomes are possible?

2) There are two routes from town X to town Y. There are three routes from town Y to town Z.

a) How many routes are there from X to Z?

b) How many routes are there from X to Z and back to X?

3) A computer password consists of three digits followed by two different letters. How many different passwords are there?

4) A boy has five pairs of pants, seven shirts and 2 sweaters. How many different outfits does he have?

5)a) How many three digit numbers are there? (the first digit can’t be a zero)

b) How many three digit odd numbers are there?

c) How many three digit numbers have five as the middle digit?

6) Canadian postal codes consist of three letters and three digits. The alphanumeric order is letter, numeral, letter, numeral, letter, numeral. How many different codes are possible?

Answers: 1) 2x6 = 12, 2)a) 6, b) 36, 3) 650,000, 4) 5x7x2 = 70, 5)a) 9x10x10 = 900, b) 9x10x5 = 450, c) 9x1x10 = 90, 6) 26x10x26x10x26x10 = 17,576,000.