

Answer on Question #64432 – Math – Combinatorics | Number Theory

Question

If there are 3 roads from town A to town B And 4 roads from town B to town C, in how many ways can one go from town A to town C and back to town A, through town B, without passing through the same road twice?

Solution

There are 3 ways to travel from A to B and 4 ways to travel from B to C.

Using the product rule there are

$$N_1 = 3 \cdot 4 = 12$$

ways to travel from A to C through B.

There are 3 ways to travel from C to B, because one road is already used during the journey from A to B.

There are 2 ways to travel from B to A, because one road is already used during the journey from A to B.

Using the product rule there will be

$$N_2 = 3 * 2 = 6$$

ways to travel from C to A through B.

Using the product rule finally there will be

$$N = N_1 N_2 = 12 * 6 = 72$$

ways to travel from town A to town C and back to town A, through town B, without passing through the same road twice.

Answer: 72.