

# Maximum number of simple paths generable from a graph

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## Abstract

I want to give an exact formula that represents the maximum number of simple paths generable from a graph

## 1 Formula

Let  $G = \langle V, E \rangle$  be a directed graph. The maximum number of simple paths generable from  $G$  is

$$\sum_{i=0}^{|V|} \frac{|V|!}{(|V| - i)!}$$

### 1.1 Corollary

Let  $G = \langle V, E \rangle$  be an undirected graph. The maximum number of simple paths generable from  $G$  is

$$\sum_{i=0}^{|V|} \frac{|V|!}{i! * (|V| - i)!}$$

## 2 Explanation

The formula is derived from the number of possible permutations from a set whose cardinality is  $|V|$  into a set whose cardinality is  $i$ .

If  $S$  is a sequence  $\langle s_1, s_2, \dots, s_i \rangle$  then we can generate  $\frac{|V|!}{(|V| - i)!}$  different simple paths. Then we shall sum the number of possible simple paths for any sequence whose length is 0 to  $|V|$ .