

Fundamental Principles of Counting

(1) **Addition principle:** Suppose that A and B are two disjoint events (mutually exclusive); that is, they never occur together. Further suppose that A occurs in m ways and B in n ways. Then A or B can occur in $m + n$ ways. This rule can also be applied to more than two mutually exclusive events.

(2) **Multiplication principle:** Suppose that an event X can be decomposed into two stages A and B . Let stage A occur in m ways and suppose that these stages are unrelated, in the sense that stage B occurs in n ways regardless of the outcome of stage A . Then event X occur in mn ways. This rule is applicable even if event X can be decomposed in more than two stages.

Note: The above principle can be extended for any finite number of operations and may be stated as under :

If one operation can be performed independently in m different ways and if second operation can be performed independently in n different ways and a third operation can be performed independently in p different ways and so on, then the total number of ways in which all the operations can be performed in the stated order is $(m \times n \times p \times \dots)$