

Two Basic Counting Principles

Q. There are **5** different Spanish books, **6** different French books, and **8** different German books. How many ways are there to pick an (unordered) pair of two books not both in the same language?

TWO BASIC COUNTING PRINCIPLES

The Addition Principle

If there are r_1 different objects in the first set, r_2 different objects in the second set, \dots , and r_m different objects in the m th set, and *if the different sets are disjoint*, then the number of ways to select an object from one of the m sets is $r_1 + r_2 + \dots + r_m$.

The Multiplication Principle

Suppose a procedure can be broken into m successive (ordered) stages, with r_1 different outcomes in the first stage, r_2 different outcomes in the second stage, \dots , and r_m different outcomes in the m th stage. If the number of outcomes at each stage is independent of the choices in previous stages and *if the composite outcomes are all distinct*, then the total procedure has $r_1 \times r_2 \times \dots \times r_m$ different composite outcomes.

How many ways are there to form a three-letter sequence using the letters a, b, c, d, e, f

a) with repetition of letters allowed?

(b) without repetition of any letter?

(c) without repetition and containing the letter e
use multiplication or additional principle

(d) with repetition and containing e

How many nonempty different collections can be formed from five (identical) apples and eight (identical) oranges?

Ans. 53

