

Counting Principles

Counting principles describe the total number of possibilities or choices for certain selections. The two fundamental counting principles are listed below.

Definition: *Fundamental Counting Principle 1*

The Fundamental Counting Principle is the guiding rule to find the number of ways to accomplish two tasks.

If there are m ways to do one thing, and n ways to do another, then there are $m \times n$ ways of doing both.

If the number of events is n , and the number of outcomes for each event in an experiment is t_i (such that $i = 1$ for the first event, 2 for the second event... and n for the n th event), then the total number of outcomes for all events is $t_1 \times t_2 \times \dots \times t_n$.

Example 1: How many different outcomes can be obtained when you flip a coin and roll a die?

There are 2 outcomes when you flip a coin and 6 outcomes when you roll a die.

⇒ The total number of outcomes = $2 \times 6 = 12$.

Example 2: If you want to hit one note on a piano and play one string on a banjo, What is the total number of outcomes obtained?

There are 88 notes on a piano

There are 5 strings on a banjo

⇒ The total number of outcomes = $88 \times 5 = 440$ ways to do both.

Example 3: Mona wants to draw 2 cards from a standard deck of playing cards without replacement. What is the total number of outcomes?

There are 52 cards ⇒ the number of possible ways to draw the first card is 52.

Without replacement:

⇒ The number of cards left after the first draw is 51.

⇒ The number of possible ways to draw the second card is 51.

Hence, the total number of outcomes = $52 \times 51 = 2652$ ways to draw the two cards.