Tree Diagrams

Tree Diagram

A **tree diagram** is an efficient way of showing all the possible outcomes of a random experiment with several steps.

The most common situation for which we use a basic tree diagram to display the results is **flipping a coin.**

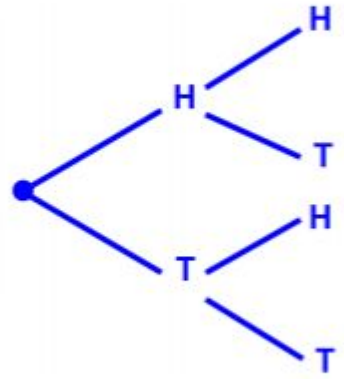
Let's say that we intended to flip a coin twice.

These two **events** are considered to be **independent** since the first coin toss will not affect the second toss.

Example 1: Flipping a Coin

Let's focus on the first coin toss.

Let's now include the second coin toss. Note that we add branches to the ends of the existing branches.

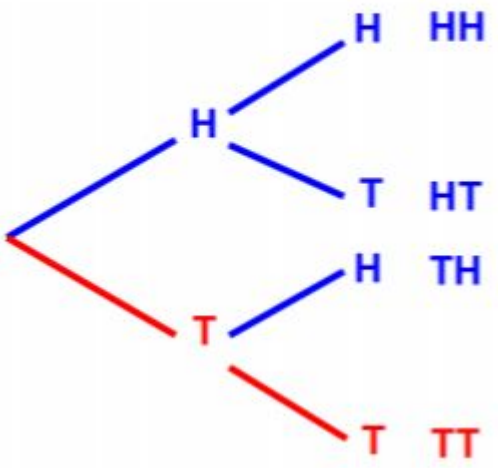


H : Heads

T : Tails

Example 1 - Continued

We will identify each one individually by highlighting the branches and outcomes in red.



So, the possible outcomes for flipping a coin twice are:

Head, Head

Head, Tail

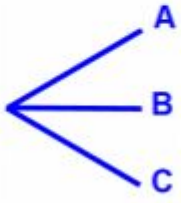
Tail, Head

Tail, Tail

Example 2

For example: Alex, Ben and Chris are racing on their bikes. By using a tree diagram, determine all of the possible outcomes (that is, who would finish first, second and third).

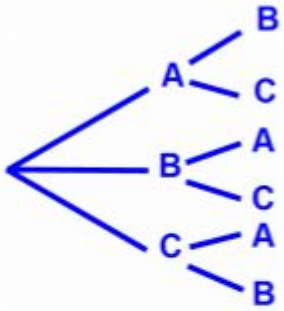
There are three possibilities for the first place finisher.



A : Alex B : Ben C : Chris

Example 2 - Continued

There are only two possibilities for the second place finisher.



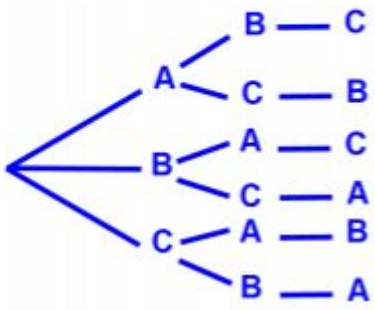
If Alex finishes first, he cannot also finish second.

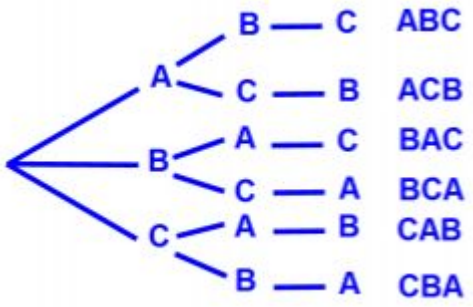
If Ben finishes first, he cannot also finish second.

If Chris finishes first, he cannot also finish second.

Example 2 - Continued

There is only one possibility for the third place finisher.





Example 2 - Continued

Here are the results:

The following table displays the possible outcomes for the bike race:

First	Second	Third
Alex	Ben	Chris
Alex	Chris	Ben
Ben	Alex	Chris
Ben	Chris	Alex
Chris	Alex	Ben
Chris	Ben	Alex