

Probability of Compound Events

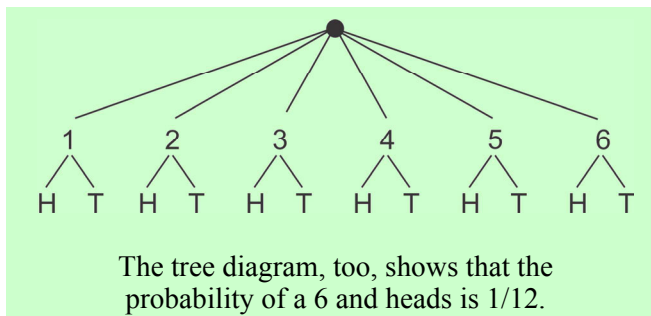
(This lesson is optional.)

A **compound event** is an event that consists of two or more events. If the outcome of any one event does not affect the outcome of the others, the events are said to be **independent**. In that case it is very easy to calculate the probability of the compound event: we simply multiply the probabilities of the individual events. Examples will make this clear.

Example 1. You roll a die and toss a coin. What is the probability of rolling a 6 and getting heads?

P(6) is $\frac{1}{6}$ and P(heads) is $\frac{1}{2}$. Clearly, whether you get heads or tails on the coin does not affect what you get on the roll, so the two events are independent. Therefore, we can multiply the two probabilities:

$$P(6 \text{ and heads}) = \frac{1}{6} \cdot \frac{1}{2} = \frac{1}{12}$$

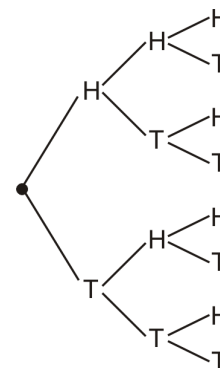


Example 2. You toss a coin three times. What is the probability of getting heads every time?

These three events—toss a coin, toss a coin, toss a coin—are independent. Getting heads on one toss doesn't affect whether you get heads or tails on the next.

$$P(\text{heads}) = \frac{1}{2}. \text{ Therefore, } P(\text{heads and heads and heads}) = \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{8}.$$

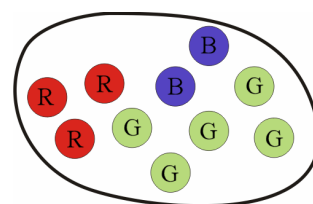
You can also see this from the tree diagram. Only one outcome out of the 8 is "HHH".



Example 3. A bag has three red marbles, two blue marbles, and five green marbles. You take one marble and put it back. Then you take a marble again and put it back. What is the probability of getting first a red marble and then a blue one?

Again, we simply multiply the individual probabilities:

$$P(\text{red, blue}) = \frac{3}{10} \cdot \frac{2}{10} = \frac{6}{100} = \frac{3}{50}.$$



1. You toss a coin three times.
 - a. What is the probability of getting tails, then heads, then tails?
 - b. What is the probability that you get heads on your second toss?
 - c. Use the tree diagram. What is the probability of getting heads twice and tails once in three tosses? Note that they can be in any order, such as THH or HTH.