Independent Events

When tossing a coin twice, the outcome of the second toss is not affected by the outcome of the first toss. In other words, the 2 events are independent.

When a coin is tossed twice in succession, there are 4 possible outcomes: HH, HT, TH, TT.

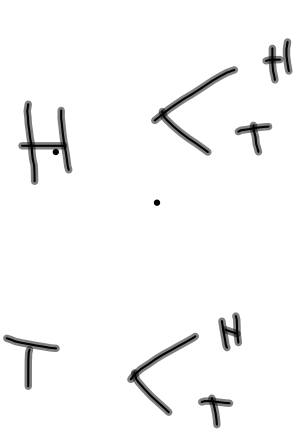
Therefore, the probability of tossing 2 heads in a row is:

$$P(\text{H and H}) = \frac{1}{4}$$

The theoretical probability, ¼ appears to be the product of the two individual probabilities.

- $P(\text{H and H}) = P(H) \times P(H)$ (and = multiply)
  $= \frac{1}{2} \times \frac{1}{2}$
  $= \frac{1}{4}$

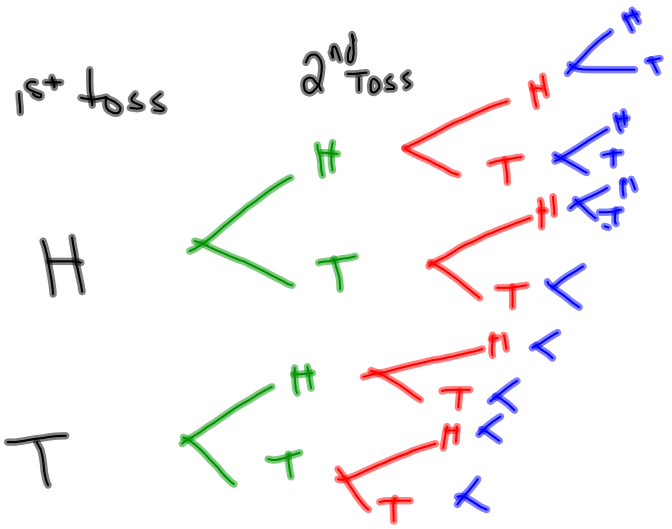
This result is true in general!!!



H H
H T

T H
T T

$P(HH) = \frac{1}{4}$



H H H H
H H H T
H H T H
H H T T

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If A and B are independent events, THEN
P (A and B) = P(A) × P(B)

Bag of Marbles 10 marbles

4 red
2 blue
1 green
3 white

$P(\text{red}) = \frac{4}{10} = \frac{2}{5}$

$P(\text{blue}) = \frac{2}{10} = \frac{1}{5}$

Independent Event

$P(\text{Red and blue}) = P(\text{red}) \times P(\text{blue})$

$= \frac{2}{5} \times \frac{1}{5}$

$= \frac{2}{25}$

Example 1: **A coin is tossed and a die is rolled. What is the probability of tossing a tail and rolling an even number?**

Solution: **P(T and even)** $= P(\text{Tail}) \times P(\text{Even})$

$= \frac{1}{2} \times \frac{3}{6}$

$= \frac{3}{12}$ always Reduce

$\frac{3 \div 3}{12 \div 3} = \frac{1}{4}$

$= \frac{1}{4}$

How to reduce Fractions

$\frac{18 \div 6}{30 \div 6} = \frac{3}{5}$

18 → 1, 2, 3, 6, 9, 18

Example 2: **A coin is tossed and a die is rolled twice. What is the probability of tossing a tail and rolling two even numbers?**

$P(\text{even}) = \frac{3}{6} = \frac{1}{2}$

Solution: **P(T and even and even)**

$= P(\text{Tail}) \times P(\text{even}) \times P(\text{even})$

$= \frac{1}{2} \times \frac{3}{6} \times \frac{3}{6}$

$= \frac{9}{72}$

$= \frac{1}{8}$

$=$

↓ or

$\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}$

$\frac{1}{8}$

Exercise 3.12

#1

#2

#3 abcd

#5 abcd

#8 a)

$P(C) = 0.3$

$P(D) = 0.15$

$P(C \text{ and } D) = P(C) \times P(D)$

$= 0.3 \times 0.15$

$= 0.045$