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:

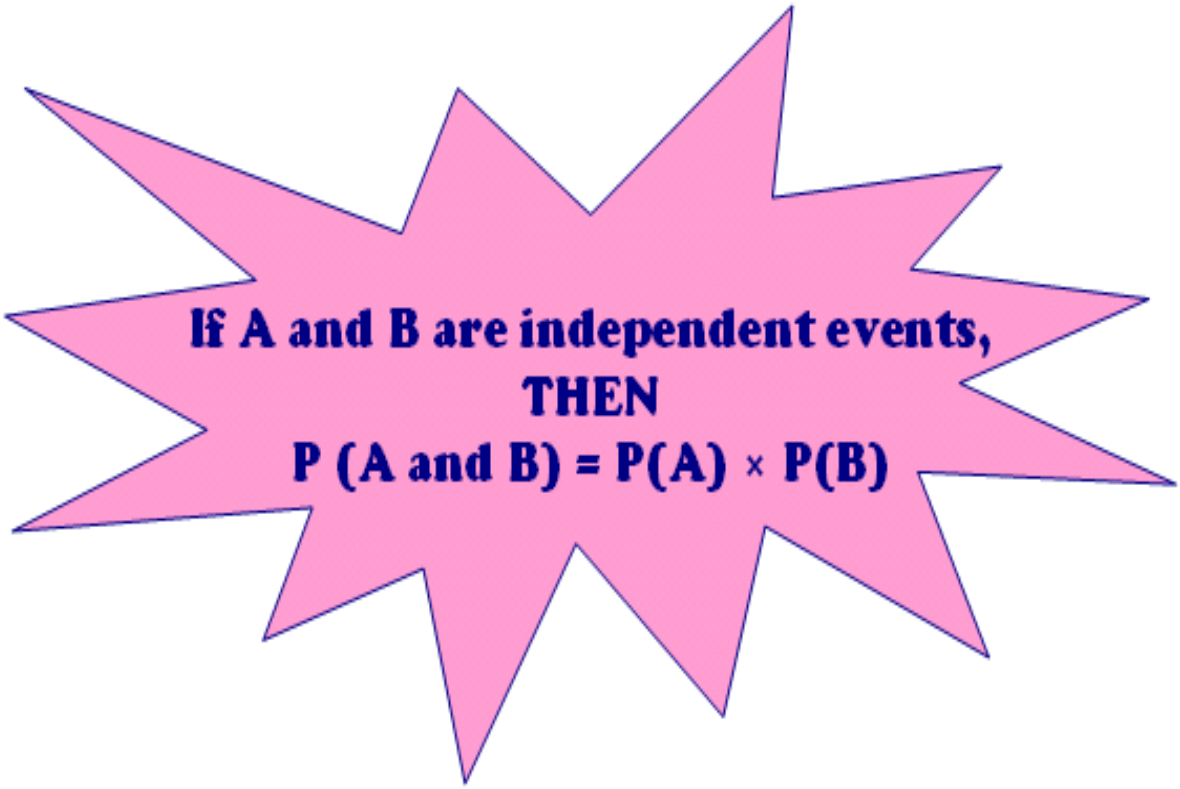
$$P(H \text{ and } H) = \frac{1}{4}$$

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

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

* and means you multiply

This result is true in general!!!


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

What is the probability of picking a King from a deck of cards and tossing a tails with a coin

$$P(\text{King and Tails}) = P(\text{King}) \times P(\text{Tails})$$

$$= \frac{1}{13} \times \frac{1}{2}$$

$$= \boxed{\frac{1}{26}}$$

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: $P(T \text{ and even}) = P(T) \times P(\text{even})$

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

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

$$= \frac{1}{4}$$

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?**

Solution: P(T and even and even)

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

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

$$= \frac{3}{12} \times \frac{3}{6}$$

$$= \frac{1}{4} \times \frac{1}{2} \quad \text{(lowest terms!!!)}$$

$$= \frac{1}{8}$$

$$P(\text{T and Even and Even}) = P(\text{T}) \times P(\text{Even}) \times P(\text{Even})$$

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

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

$$= \boxed{\frac{1}{8}}$$

① $P(C \text{ and } D) = P(C) \times P(D)$

$= 0.3 \times 0.15$

$= 0.045$