

Probability (Mathematics)

Probability is the ratio of the number of favourable outcomes to the number of possible outcomes, assuming that the outcomes are equally likely.

The probability $P(A)$ of a particular result A is given by:

$$P(A) = \frac{\text{number of favourable outcomes}}{\text{number of possible outcomes}}$$

Probabilities lie between 0 and 1, that is:

$$0 \leq P(A) \leq 1$$

Complementary Events

$P(\bar{A})$ = Probability of not A

$$\begin{aligned} P(A) + P(\bar{A}) &= 1 \\ P(A) &= 1 - P(\bar{A}) \end{aligned}$$

Terminology

Event

A set of favourable outcomes; a set or collection of sample points

Experiment/Trial

A single recorded observation, e.g. the rolling of a die or the drawing of a card from a pack

Sample Space

All possible outcomes of an event

Note: OR = \cup = Union; AND = \cap = Intersection

Mutually exclusive events

Mutually exclusive events cannot occur simultaneously. Before adding probabilities together, make sure that none of the outcomes are shared, that is, they are mutually exclusive events.

If A and B are not mutually exclusive:

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

If A and B are mutually exclusive:

$$P(A \cup B) = P(A) + P(B)$$

Independent events

Events A and B are independent if

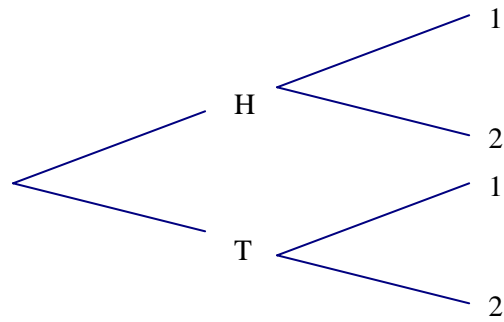
$$P(AB) = P(A) \cdot P(B)$$

The outcomes of A has no bearing on the outcomes of B .

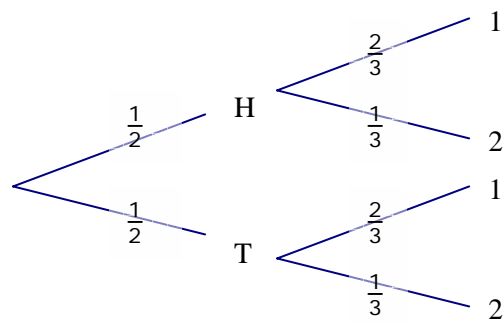
If events A and B are not independent, then

$$P(AB) = P(A) \cdot P(B | A)$$

Multiple Event Probability with Diagrams
Tree Diagrams:



Probability Tree Diagrams:



Venn Diagrams:

