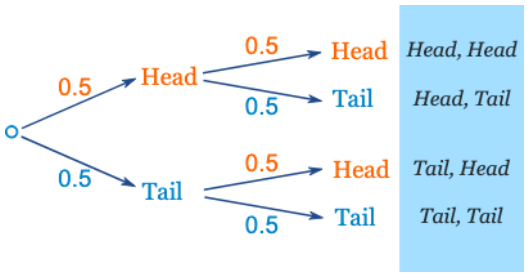
Chapter 3 - Probability

★ It is the relative frequency of an event happening

For example:
Getting a 1 when you roll a fair die once = ⅙
This is because the number one only appears once on the die and there are 6 total numbers on the die

Getting a head when flipping a coin = ½
Because there are two sides to a coin and one head it is ½

A simple way to calculate the probability of an event is with the help of a tree diagram



Steps

- Fill in the probabilities on the branches.
- Consider which outcomes are required to answer the question.
- Find the probability of those outcomes by multiplying along the branches.
- Use the probability/probabilities you have calculated to answer the question.

For example, in a tree diagram if you were to flip the coin twice

Getting head twice = ½ x ½ = ¼

Getting tail twice = ¼

Getting different outcomes on the two throws

1. Head first tail second ½ x ½ = ¼
2. Tail first head second ½ x ½ = ¼

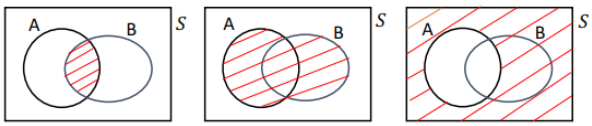
Then you add both of those outcomes

¼ + ¼ = ½

Calculating Probabilities

Probabilities can be written as decimals or fractions and are within the range of 0 (impossible) to 1 (certain). If each outcome has an EQUAL likelihood of occurring:

Probability of the event = number of possible outcomes in the event / total number of possible outcomes



Intersection of A and B shows the event in which both A and B occur

Union of A and B shows the event in which either A or B or both occur

The shaded area shows the event in which A does not occur

Venn diagrams

Venn diagrams can be used to represent events graphically. Frequencies or probabilities can be placed in the regions of a Venn diagram.

A rectangle represents the sample space (*S*). it containes closed curves that represent the events.

Mutually exclusive independent events

These are events that have no outcomes in common. For example getting heads or tails on a coin toss is a mutually exclusive event because you can't have both heads and tails at the same time. For mutually exclusive events:

$$P(A \text{ or } B) = P(A) + P(B)$$

When one event has no effect on another, it is known as an independent event. For independent events A and B, the probability of B happening is the same regardless of whether A happens or not. For independent events:

$$P(A \text{ and } B) = P(A) \times P(B)$$