Probability Rules: Takeaways ⤴

Concepts

- In probability theory, the outcomes of a random experiment are usually represented as a **set**. A set is a collection of *distinct* objects, which means each outcome must occur only once in a set.

- In probability theory, the set of all possible outcomes is called a **sample space**. A sample space is often denoted by the capital Greek letter Ω (read "omega"). This is how we represent the sample space of a die roll:

\begin{equation} \Omega = \{1, 2, 3, 4, 5 ,6\} \end{equation}

- Events can also be represented as sets and can be understood as subsets of the sample space.

- The probability of any event ranges between 0 and 1:

\begin{equation} 0 \leq P(Event) \leq 1. \end{equation}

- **Mutually exclusive** events can't happen both at the same time — if one of the events happens, the other cannot possibly happen and vice-versa. The events "a coin lands heads" and "a coin lands tails" are mutually exclusive — it's impossible for a coin to land both heads and tails.

- **Mutually non-exclusive** events can happen at the same time. When rolling a six-sided die the event "getting a number greater than 2" and the event "getting an odd number" are mutually non-exclusive we could get a 5, which is both greater than 2 and odd.

- We can use the **addition rule** for both mutually exclusive and non-exclusive events:

$$\begin{equation} P(A \cup B) = P(A) + P(B) - P(A \cap B) \end{equation}$$

Resources

- [The addition rule for three events](#)
- [A good and short introduction to sets](#)
- [A nice and short tutorial that bridges sets with Venn diagrams](#)