1.3.2 Venn Diagrams

Venn diagrams are used to represent groups of data. In the context of probability we may use venn diagrams to represent the sample space of outcomes, and then group together outcomes to make events. For example, consider a usual seven-sided dice roll, our sample space $\Omega = \{1, 2, 3, 4, 5, 6, 7\}$, we can visually represent the sample space as follows:

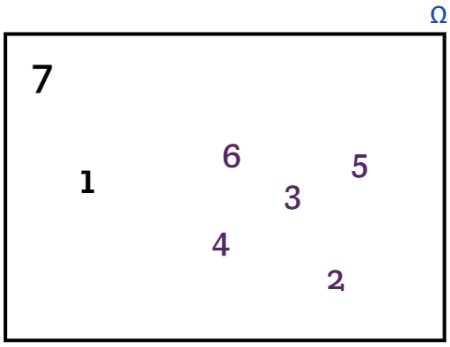

Figure 1.1: The sample space Ω

As we can see, each outcome belongs inside the rectangle denoted Ω. Suppose we now define events $A = \{1, 6, 4\}$ and $B = \{6, 4, 2, 3, 5\}$ we can indicate these events by grouping the outcomes together:

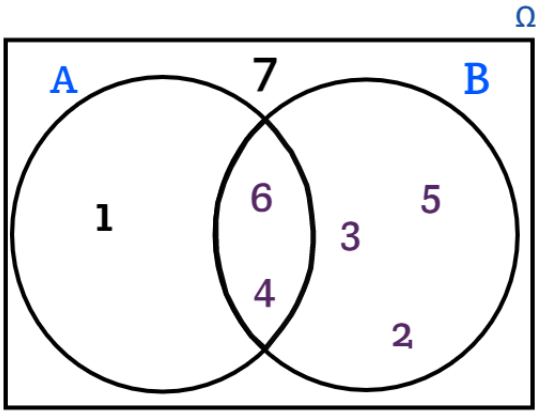

Figure 1.2: The events A and B in Ω.

We can see that $A \cap B = \{6, 4\}$ as both of these elements lie in the intersection of the two events. We also have that 7 does not belong to either A or B, therefore it does not lie in either the circles, but is still included in the sample space Ω.

To close this section we consider an arbitrary sample space Ω and two events A and B, and we will indicate the regions represented by each of combination rules from Section 1.3.1. For $A \cup B$, this is the set of all outcomes that are either in A or B, thus on a Venn diagram it is represented by the red-region:

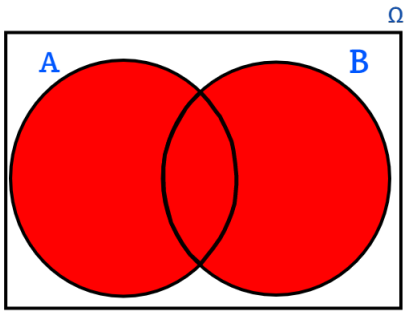

Figure 1.3: The region $A \cup B$

Similarly for $A \cap B$, this is all the outcomes that belong to both A and B, thus it is the intersection of the two circles:

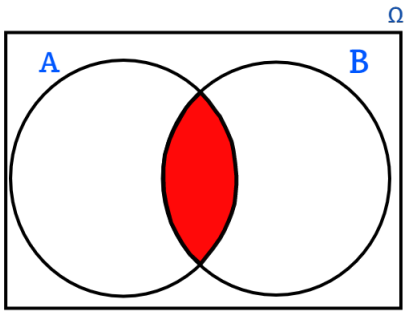

Figure 1.4: The region $A \cap B$

Finally for A^c this is all the outcomes that are not in A, so this is the entire sample space except the outcomes in A.

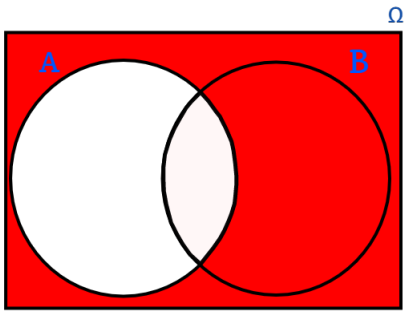

Figure 1.5: The region A^c