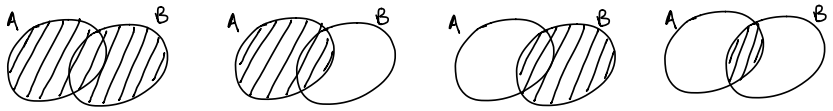
S1 - Chapter 5 - Probability - Summary

* An experiment is a repeatable process that gives rise to a number of outcomes
* An event is a collection of one or more outcomes
* A sample space is the set of all possible outcomes
* Probability is a quantity that represents how likely it is for an event to happen
  - If $P(A)=1$ then A is known as the sure event
  - If $P(A)=0$ then A is known as the impossible event.
* Even though in everyday life we are used to probabilities being expressed as percentages, In S1 you should only write them as fractions or decimals.
* Events may be represented graphically using Venn diagrams

Remember: $\cup$ = or
$\cap$ = and
$'$ or ^{c} = outside

* Addition rule of probability
For any two events, A and B

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



* Conditional rule of probability

$$P(A|B) = \frac{P(A \cap B)}{P(B)}$$

e.g. Suppose A = rains
B = I have an umbrella with me.

Now, on any given day it might be raining or not, and I could have an umbrella with me or not. Both of these events may happen or not.

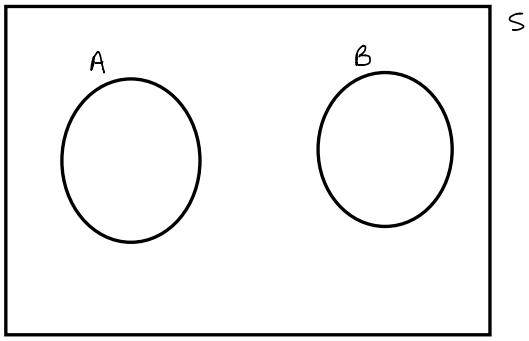
However, if I tell you that it is raining then the probability of having an umbrella with me will probably be greater.
So, $P(B|A)$ in this case represents the probability of having an umbrella given that it rains (this means that I know for sure that it rains).

You can answer conditional probability questions either using the formula or using the "shrunken" sample space approach.

* Conditional probabilities can be represented on tree diagrams. Remember that you multiply the probabilities of the branches of the tree through which you travel.

* Two events, A and B are said to be mutually exclusive if

$$P(A \cup B) = P(A) + P(B \quad \underline{\text{OR}} \quad P(A \cap B) = 0$$



* Two events, A and B are said to be independent if

$$P(A \cap B) = P(A) \times P(B)$$

NOTE: If A and B are independent then

$$P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{P(A) \times \cancel{P(B)}}{\cancel{P(B)}} = P(A)$$

In simple words, if two events are independent then the occurrence of one makes no difference to the probability of the other occurring.

* In probability questions make sure you understand the experiment and only then proceed to answering the question.