# Some Definitions in Probability

**Probability:** $= \frac{Number\ of\ Favourable\ Outcomes}{Number\ of\ Possible\ Outcomes}$

**Experiment:** The work or activity that generates the results to be studied.

**Outcome:** The result of an experiment.

| Experiment | Outcome |
|---|---|
| Toss a coin | {head, tail} |
| Roll a die | {1,2,3,4,5,6} |
| Football game | {win, lose, draw} |

**Sample space:** Set of all possible outcomes. For example,when a die is rolled the sample space will be {1,2,3,4,5,6},and sample space is usually denoted by the symbol S. **S = {1,2,3,4,5,6 }**

**Event:** A collection of outcomes from a specified sample space. For example when we rolled a die,we could define an event A as odd numbers

**A = {1,3,5 }**



**The complement:** The complement of an event is the event which does not happen. For example the complement of success is failure and the compliment of failure is success. If the event is **A**, the **complement of A** is written as **A' .**

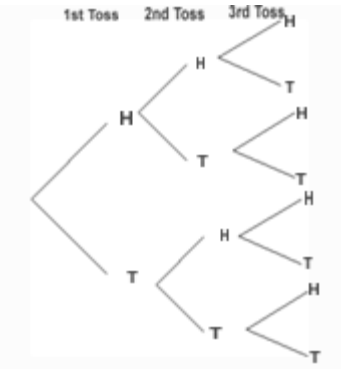
**Combined events or Multiple events:** When two experiments are conducted together and the results are considered as a combined event

When we are dealing with multiple events it is important to make a systematic list of all outcomes. Lattice diagrams or tree diagrams can also be used to list the outcomes.

**Find the sample space (set of all possible outcomes) for tossing a coin and rolling a die.**

The outcomes for tossing a coin are {Head **(H)**, Tail **(T)** }
The outcomes for rolling a die are { 1,2,3,4,5,6 }
The possible outcomes for the combined event are:
{H1, H2, H3, H4, H5, H6, T1, T2, T3, T4, T5, T6}
There are 12 possible outcomes

We can use a **tree diagram** to list the sample space.






We can use a **lattice diagram** to show the sample space.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
|  Head | **H** | **(1,H)** | **(2,H)** | **(3,H)** | **(4,H)** | **(5,H)** | **(6,H)** |
|  Tail | **T** | **(1,T)** | **(2,T)** | **(3,T)** | **(4,T)** | **(5,T)** | **(6,T)** |
| | | **1**  | **2**  | **3**  | **4**  | **5**  | **6**  |
| | | Rolling a die | | | | | |

**Mutually Exclusive Events:** When two events cannot occur at the same time, then we say that the events are mutually exclusive. If two events are mutually exclusive then the probability of either occurring is:

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

**Independent Events:** Two events, A and B, are **independent** if the fact that A occurs does not affect the probability of B occurring.

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