**Sample Space: S**

List of all possible outcomes.

*Ex. Flipping Two Coins →*  **S** = { *HH, HT, TH, TT* }

**Event: A**

Subset of outcomes in the sample space. All outcomes favorable to A from S.

*Ex. Getting One Tail* → **1T** = { *HT, TH* }

**Mutual Exclusion:**

Two events A and B are mutually exclusive if they share no outcomes,

*Ex. Getting All Heads* → **He** = { *HH* }

*Getting All Tails*  → **Ta** = { *TT* }

*Note*:

*So* **He** *and* **Ta** *are mutually exclusive!*

**Classical Definition of Probability:**

The probability of an event A defined on a sample space S is,

*Ex.*

**Conditional Probability:**

If you know an event B has occurred, this knowledge reduces your sample space to the set of outcomes in B. B becomes the *reduced sample space,*

*Ex. Getting* ***At Least*** *1 Head →* **1H** *= { HT, TH, HH}*

*Note:*

**First Law of Probability** :

If **A**1, **A**2, **A**3, …. **A**n are a series of mutually exclusive events and they partition the sample space, i.e.

Then,

*Ex.*

*Mutually Exclusive:*

*Partition Sample Space:*

*Sum to 1:*

**Independence:**

Two events A and B are independent if the occurrence of one does not affect the probability of the other,

In other words, the occurrence of B gives us no extra knowledge about the probability of A.

**Law of Intersections**:

*Independent Events.* If and only if events A and B are independent, then

*Dependent Events.* For any events A and B that are not independent, then

**Law of Unions** :

For any events A and B,

**Law of Complements** :

For any event A,