The random variables X and Y are **identically distributed** if for every set A$\in$ $S$, P(X$\in$A) =P(Y$\in$A)

Note that two random variables that are identically distributed are not necessarily equal. That is, the above definition does not say that X=Y.

Consider the experiment of tossing a fair coin three times. Define the random variables $X$ :=number of heads observed and $Y$ :=number of tails observed.

The distribution of $X$ is:

| $\omega$ | HHH | HHT | HTH | THH | TTH | THT | HTT | TTT |
|---|---|---|---|---|---|---|---|---|
| X($\omega$) | 3 | 2 | 2 | 2 | 1 | 1 | 1 | 0 |

The distribution of $Y$ is:

| $\omega$ | TTT | TTH | THT | HTT | HHT | HTH | THH | HHH |
|---|---|---|---|---|---|---|---|---|
| Y($\omega$) | 3 | 2 | 2 | 2 | 1 | 1 | 1 | 0 |

That is for each $A = \{0, 1, 2, 3\}$, we have P($X \in A$) =P($Y \in A$). So $X$ and $Y$ are identically distributed but for no point $\omega$ we have that $X(\omega) = Y(\omega)$.

**Theorem 4:** The following two statements are equivalent.
(1) The random variable X and Y are identically distributed,
(2) $F_X(x) = F_Y(x)$ for every $x$.