# Random Variables

- A random variable is defined as a numerical event whose value is determined by a chance process.
- When probability values are assigned to all possible numerical values of a random variable $X$, either by a listing or by a mathematical function, the result is a **probability distribution**.

# Random Variables

- The sum of the probabilities for all the possible numerical outcomes must equal one.
- Individual probability values may be denoted by the symbol $f(x)$, which indicates that a mathematical function is involved, by $P(X = x)$, which recognizes that the random variable can have various specific values, or simply by P(x).

## Discrete Random Variables

- For a discrete random variable observed values can occur only at isolated points along a scale of values. In other words, observed values must be integers.
- Consider a six sided die: the only possible observed values are 1, 2, 3, 4, 5 and 6.
- It is not possible to observe values that are real numbers, such as 2.091.
- *(Remark: it is possible for the average of a discrete random variable to be a real number.)*

## Discrete Random Variables

- Therefore, it is possible that all numerical values for the variable can be listed in a table with accompanying probabilities.
- There are several standard probability distributions that can serve as models for a wide variety of discrete random variables involved in business applications.

# Discrete probability distributions

The discrete probability distributions that described in this course are

- the binomial distribution,
- the geometric distribution,
- the hypergeometric distribution,
- the Poisson distributions.