<u>AS Statistics – Chapter 6 – Probability Distributions – Part 1: Discrete Random Variables</u>

- A **random variable** is a variable whose value depends on a random event
- The variable is **discrete** if it can only take certain numerical values
- The variable is **random** if the outcome is not known until the experiment is carried out
- The range of values that a random variable can take is called its **sample space**
- **A probability distribution fully describes the probability of any outcome in the sample space**

Discrete random variables are often denoted with an upper-case letter such as X.

The particular values the variable can take are denoted with lower-case letters, often x or r.

For example, the notation "$\boldsymbol{P(X = r) = 0.3}$" means "the probability that the variable X takes the value r is 0.3"

The sum of the probabilities of all outcomes of an event add up to 1. For a random variable X, we can write

$$\boldsymbol{\sum P(X = x) = 1 \qquad \text{for all } x}$$

If the probabilities are given in terms of a constant k, you can find the value of k by equating the sum of the probabilities to one and solving the resulting equation.

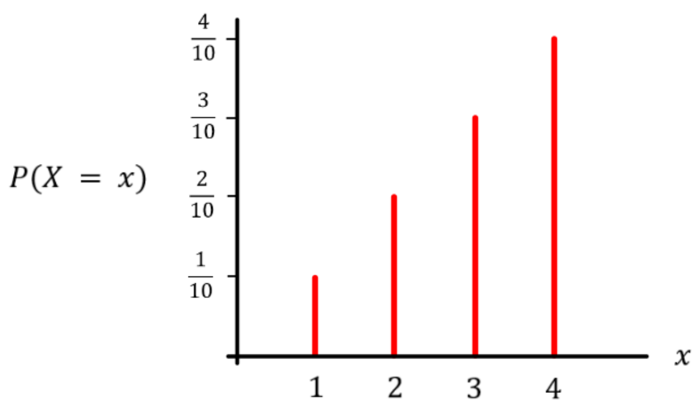
Probability distributions can be given in three forms, as in the example below:

1. Probability mass functions: $P(X = x) = \frac{x}{10}$ for $x = 1, 2, 3, 4$

2. Tables:

x	1	2	3	4
$P(X = x)$	$\frac{1}{10}$	$\frac{2}{10}$	$\frac{3}{10}$	$\frac{4}{10}$

3. Diagrams:



If the probabilities for all possible values of x are equal, then the distribution is a **discrete uniform distribution**.