Probability Distributions

A **probability distribution** assigns numerical values to each outcome (event) in a sample space.

The outcomes may be;

numeric: elements of sample space are numeric in value e.g. roll of a dice

or

categorical: elements of the sample space are names or objects e.g. blood types

A **random variable** is a function, the value of which is a real number determined by the probability associated with the occurrence of each of its outcomes.

* random variables are denoted by an uppercase letter

* their values are represented by the corresponding lowercase letter

* random variables are **continuous** if its range forms an infinite set of real numbers i.e. consists of intervals

* random variables are **discrete** if its range is countable i.e. consists of individual (discrete) values

Note: a discrete sample space may be infinitely countable

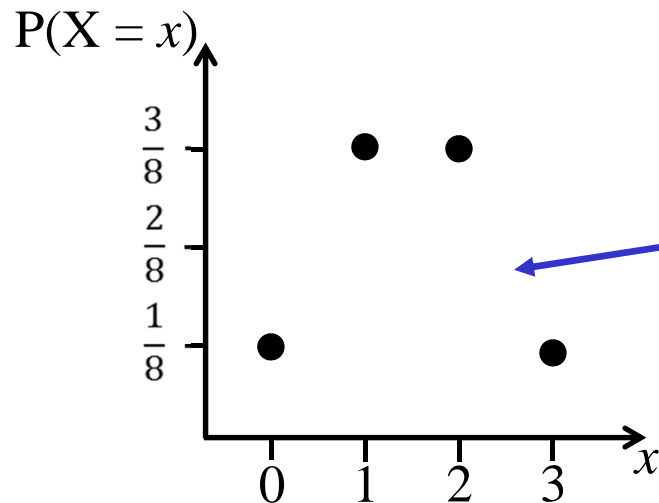e.g. X = number of times a dice is rolled before a '6' occurs

e.g. a coin is tossed three times and the random variable X is defined as the number of heads thrown

sample space of coin toss ={ HHH , HHT , HTH , THH , TTH , THT , HTT , TTT }

sample space of X = { 3 , 2 , 2 , 2 , 1 , 1 , 1 , 0 }

x	0	1	2	3
P(X = x)	$\frac{1}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{1}{8}$

probability distribution

P(X = x)

graph of the probability distribution

Properties of P(X = x)

1. $P(X = x) \geq 0$

2. $\sum P(X = x) = 1$

NOTE:
if P(X=x) is the same for all x, then the distribution is uniform

Exercise 13A; 1, 2, 3acd, 4ac, 5, 6, 7acegj, 8ad, 9bd, 10c, 11, 13, 15a, 16