

PROBABILITY DISTRIBUTIONS

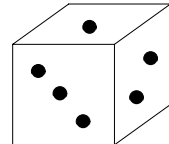
A probability distribution shows all the values that data can take together with the probabilities.

An experimental probability distribution shows experimental probabilities or relative frequencies.

A theoretical probability distribution shows theoretical probabilities.

RANDOM VARIABLE

Consider a throw of a six-faced die. Let X be the value shown on the die. X is called a random variable ie. it takes different values at random.



DISCRETE PROBABILITY DISTRIBUTION

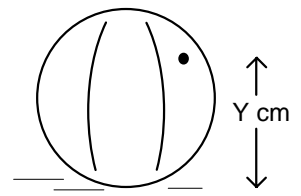
X is a discrete random variable and has a discrete probability distribution. This is because X only takes the discrete values 1, 2, 3, 4, 5, 6 ie. values which are clearly separated from each other. The theoretical probability distribution for X is:

value of X	probability
1	$\frac{1}{6}$
2	$\frac{1}{6}$
3	$\frac{1}{6}$
4	$\frac{1}{6}$
5	$\frac{1}{6}$
6	$\frac{1}{6}$
	1

NB. The total of the probabilities for a discrete probability distribution is 1.

CONTINUOUS PROBABILITY DISTRIBUTION

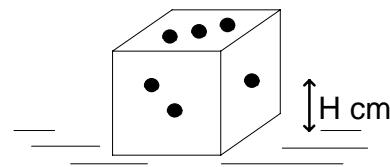
Consider a spherical ball of diameter 5 cm with a spot marked on the surface. Roll the ball along the floor. When the ball stops, let Y be the height of the spot above the floor in centimetres.



Y is a continuous random variable as Y can take any value between 0 and 5 (Y can be 4.7, 3.28, 2, 0.53, ...).

GRAPHS OF PROBABILITY DISTRIBUTIONS

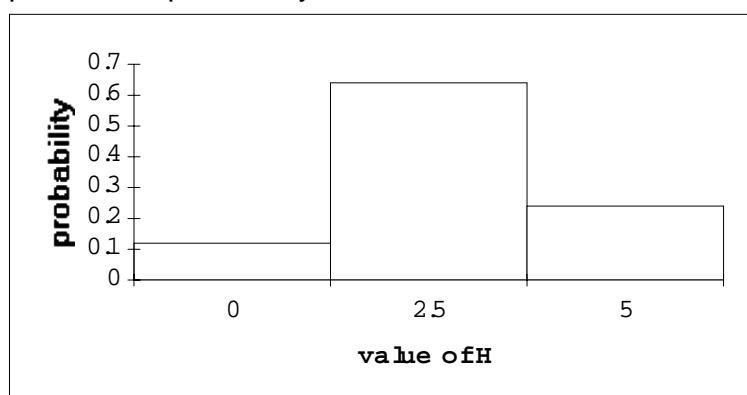
Consider a six-faced die of edge 5 cm. Throw the die. Let H be the height of the one-spot above the floor in centimetres. H is a discrete random variable as it only takes the values 0, 2.5 and 5.



Suppose the experiment was performed 25 times with the following results.

value of H	frequency	relative frequency or experimental probability
0	3	0.12
2.5	16	0.64
5	6	0.24
	25	1

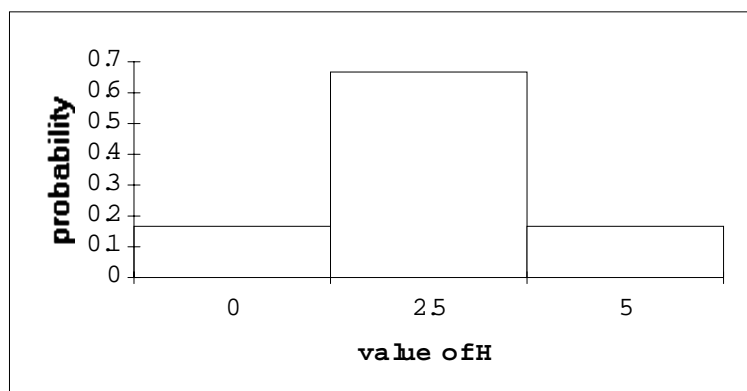
The graph for the experimental probability distribution is:



The theoretical probability distribution for H is:

value of H	probability
0	$\frac{1}{6}$
2.5	$\frac{4}{6}$
5	$\frac{1}{6}$
	1

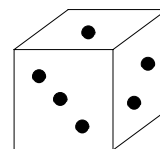
The graph for the theoretical probability distribution H is:



As the number of trials is increased, the graph of the experimental probability distribution would become more like the graph of the theoretical probability distribution.

UNIFORM PROBABILITY DISTRIBUTION

Consider a throw of a six-faced die. Let X be the value shown on the die. The theoretical probability distribution of X is called a rectangular or uniform probability distribution.



This is because of the shape of the graph as shown below.

