- Let p denote the probability of success in a Bernoulli trial, and so $q = 1 - p$ is the probability of failure. A binomial experiment consists of a fixed number of Bernoulli trials.
- A binomial experiment with n trials and probability p of success will be denoted by

$$B(n, p)$$

0.1 The Binomial Distribution

Binomial Probability Function

n general, if the random variable X follows the binomial distribution with parameters n ? ? and p ? [0,1], we write X B(n, p). The probability of getting exactly k successes in n trials is given by the probability mass function:

$$f(k; n, p) = \Pr(X = k) = \binom{n}{k} p^k (1 - p)^{n-k}$$

for k = 0, 1, 2, ..., n, where

$$\binom{n}{k} = \frac{n!}{k!(n-k)!}$$

is the binomial coefficient, hence the name of the distribution.

[Remark ; Provided in exam formulae. Please see pg 142]

where

= the probability of successes in trials

= the number of trials

0.2 Probability Mass Function

(Formally defining something mentioned previously)

- a probability mass function (pmf) is a ***function*** that gives the probability that a discrete random variable is exactly equal to some value.

$$P(X = k)$$

- The probability mass function is often the primary means of defining a discrete probability distribution
- It is conventional to present the probability mass function in the form of a table.

1 Binomial Distribution

Number of independent trials

A coin is tossed eight times.

the number of trials is therefore 8.

A group of people or a batch of items can also be considered as a series of independent trials.

Probability of a success

A "success" is dependent on how the question is framed, or what is being estimated.

1.1 The Binomial Distribution

- The discrete random variable X is the number of successes in the n trials. X is modelled by the binomial distribution $B(n, p)$. You can write $X \sim Bin(n, p)$.
- The binomial distribution can be used to determine the probability of obtaining a designated number of successes in a Bernoulli process. Three values are required: the designated number of successes (X); the number of trials, or observations (n); and the probability of success in each trial (p).
- P(X = k) gives the probability of$k$ successes in n binomial trials.

1.2 Binomial Distribution (1)

- Identify the event that can considered the 'success'.
- (Remark : The success is usually the less likely of two complementary events.)
- Determine the probability of a success in a single trial p.
- Determine the number of independent trials n.