The Binomial Distribution

The binomial distribution is a special case of a discrete random variable. The conditions that we must know are:

- There are exactly two outcomes to each trial: "success" and "failure".
- The trials are independent of each other
- The number of trials in the experiment is fixed 'n'
- The probability of success in a trial is constant 'p'

Notation

$$X \sim B(n, p)$$

- Where n is the number of set trials
- Where p is the probability of success

Be Aware of the Binomial Formula

$$P(X = x) = nCx\ p^x (1 - p)^{n-x}$$

- Where n is the number of set trials
- Where x is the number of successful trials
- Where p is the probability of success

We can use the Binomial tables from the formula booklet which calculate cumulative probabilities for set values of n and p [$P(X \leq x)$]

We can use the calculators to find $P(X = x)$ and $P((X \leq x)$ probabilities

For other inequalities we need to use the rules for discrete random variables

****REMEMBER****

$P(X < x) = P(X \leq x-1)$

$P(X > x) = 1 - P(X \leq x)$

$P(X \geq x) = 1 - P(X \leq x-1)$

$P(a < X < b) = P(X \leq b-1) - P(X \leq a)$

$P(a \leq X < b) = P(X \leq b-1) - P(X \leq a-1)$

$P(a < X \leq b) = P(X \leq b) - P(X \leq a)$

$P(a \leq X \leq b) = P(X \leq b) - P(X \leq a-1)$

Mean and Variance of the Binomial Distribution

Mean: np Variance: $np(1 - p)$ $\therefore$ sd = $\sqrt{np(1 - p)}$