

Binomial Experiments

Finite Mathematics
Section 9.5

Conditions for a Binomial Experiment

- The same experiment is repeated many (n) times under the same conditions. Each repetition is called a trial or a Bernoulli trial.
- Only the same two outcomes (success and failure) are possible each time the experiment is performed.
- Each time the experiment is performed, the probabilities for the two outcomes remain the same. We use p for the probability of success and $q = 1 - p$ for the probability of failure.
- The trials are independent. The outcome of one trial has no influence on the outcome of another trial.
- We are interested in the total number of successes, not the order in which they occur. There may be 0, 1, 2, 3, ..., or n successes in n trials.

Binomial Experiment Formula

Given a binomial experiment with n independent repeated trials, p is the probability of success in a single trial, $q = 1 - p$ is the probability of failure in a single trial, r is the number of successes. Then the probability of r successes in n trials is given by the formula:

$$P(r \text{ successes in } n \text{ trials}) = C(n, r) \cdot p^r q^{n-r}$$

Probability Distribution and Expected Value for a Binomial Experiment

- The probability distribution for a binomial experiment is called a binomial probability distribution or a binomial distribution. The expected value of a binomial experiment can be found using the formula:

$$E(X) = np.$$