STA 3100 Programming With Data in R: Probability

Probability

Probability is the measure of the likelihood that an event will occur. It is a numerical value between 0 and 1, where 0 indicates impossibility and 1 indicates certainty. In probability theory, the probability of an event is expressed as a number between 0 and 1, where 0 indicates impossibility and 1 indicates certainty. Probability can be used to make predictions about the future, to analyze data, and to make decisions.

Key Concepts

- **Random Variable**: A random variable is a variable whose value is determined by chance. It can take on any value within a given range.

- **Probability Distribution**: A probability distribution is a function that describes the probability of a random variable taking on a particular value.

- **Expected Value**: The expected value of a random variable is the average value that it is expected to take on over many trials.

- **Law of Large Numbers**: The law of large numbers states that the average of a large number of independent trials will approach the expected value as the number of trials increases.

Definitions

- **Probability**: The measure of the likelihood that an event will occur. It is a numerical value between 0 and 1, where 0 indicates impossibility and 1 indicates certainty.

- **Random Variable**: A variable whose value is determined by chance. It can take on any value within a given range.

- **Probability Distribution**: A function that describes the probability of a random variable taking on a particular value.

- **Expected Value**: The average value that a random variable is expected to take on over many trials.

- **Law of Large Numbers**: The law that states that the average of a large number of independent trials will approach the expected value as the number of trials increases.

Coding Examples

Example 1: Calculating Probability

Start of Code

```R
# Generate a random sample of size 10 from a normal distribution
x <- rnorm(10)
# Calculate the probability of x being greater than 0
prob <- mean(x > 0)
# Print the probability
print(prob)
```

End of Code

Example 2: Calculating Expected Value

Start of Code

```R
# Generate a random sample of size 10 from a normal distribution
x <- rnorm(10)
# Calculate the expected value of x
exp_val <- mean(x)
# Print the expected value
print(exp_val)
```

End of Code

Practice Multiple Choice Questions

Q: What is the probability of an event occurring if its probability is 0.5?

A: The probability of an event occurring if its probability is 0.5 is 50%.

Q: What is the expected value of a random variable?

A: The expected value of a random variable is the average value that it is expected to take on over many trials.