AIM:- Employ R to use Random number generation that and Simulation to verify theoritical probability.

Materials:-

1. RStudio or R environment installed.
2. Basic Knowledge of Probability theory.

WorkSheet-2.R | WorkSheet-2B.R | WorkSheet-1.R | WorkSheet-3.R*

Source on Save | Run | Source

```r
theoretical_probabilities <- rep(1/6, 6)
simulated_rolls <- sample(1:6, size = 1000, replace = TRUE)
empirical_probabilities <- table(simulated_rolls) / length(simulated_rolls)

# Create a matrix of probabilities and provide column names
prob_matrix <- cbind(Theoretical = theoretical_probabilities, Empirical = empirical_probabilities)

# Plot the barplot
barplot(prob_matrix, beside = TRUE,
        ylim = c(0, 1), col = c("[redacted]", "[redacted]"),
        legend.text = c("Theoretical", "Empirical"),
        main = "Theoretical vs Empirical Probability")
```

13:1 (Top Level) | R Script

Date

Expt. No. 3 Page No. 07

AIM :- Employ R to use random number generation and submission to verify theoritical probabilities.

Objective :-

The main objectives of this practical are :-

1. Understand theoritical probabilites for simple events.
2. Utilize R to generate random number and simulate events.
3. Compare simulated probabilities with theoritical probabilities to validate results.

Software Requirements :-

- R environment installed
- RStudio installed

Description :-

Probability theory plays a crucial role in understanding and predicting uncertain events. In this practical we will leverage the power of R to explore theoritical probability through random generation and simulations.

By Comparing the result obtained through simulation with the expected theoritical probabilities, we aim to gain insights into the practical application of probability theory.

Procedure :-

Step-1 :- Theoretical Probability

Define the theoretical probability for a set of simple event For eg. Consider a fair six-side die and calculate the probability of rolling each number (1 through 6)

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Environment History Connections Git Tutorial

Import Dataset 238 MiB List

R Global Environment

```
Data
  prob_matrix                num [1:6, 1:2] 0.167 0.167 0.167 0.167 0.167 ...
values
  empirical_probabilities    'table' num [1:6(1d)] 0.151 0.172 0.183 0.17 0.171 0.153
  simulated_rolls            int [1:1000] 5 2 2 4 4 3 5 4 1 1 ...
  theoretical_probabilities  num [1:6] 0.167 0.167 0.167 0.167 0.167 ...
```

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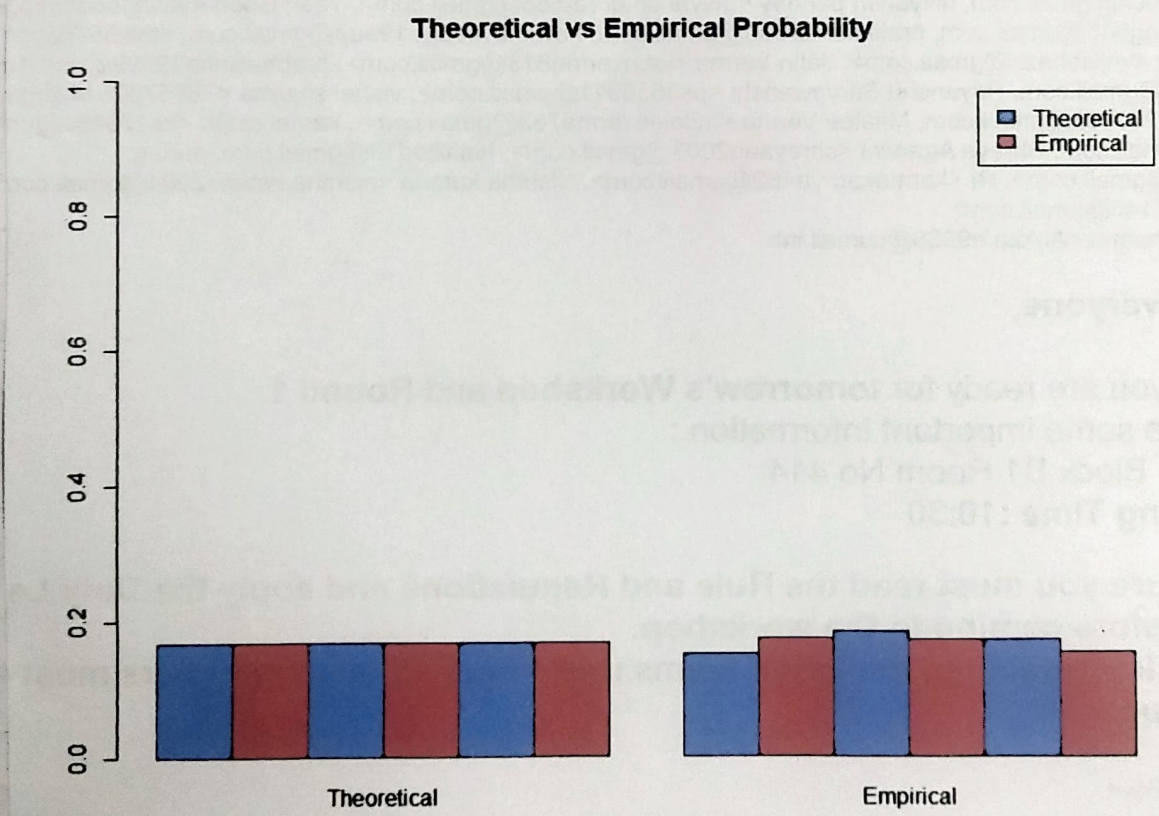

Step-2 :- Random number generation

Use R to generate random number that mimic the outcomes of the theoritical event. for eg use the sample function in R to simulate die rolls.

```
Simulate_roll <- sample(1:6, size=1000, replace=TRUE)
```

Step-3 :- Simulations :-

Perform simulation using the generated random number, calculate the empirical probability by counting the occurrent of each event in the simulated data.

```
emp_probability <- table(Simulated_roll)/length(Simulated_roll)
```

Step-4 :- Visualization

Create visualization to compare theoretical and empirical probabilities plot bar charts or histograms for a clear representation

```
barplot(theoritical_probability, names.arg = 1:6, ylim=c(0,1),
        col="blue", main="Theoritical Probability")

barplot(empirical_probability, names.arg=1:6, ylim=c(0,1),
        col="red", main="Empiricat probability")
```

Step-5 :- Analysis.

Compare both probability. Discuss any discrepancies and analyze the impact of sample size on the accuracy of simulation result.

This practical provides a hands-on experiance and understanding of probability using R.

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