Task2

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TASK2

Problem

Second task Solve this task in R - There are 2 boxes - one contains 2$, the other one is empty. You have to pick one of them. If you pick non empty one, you get the value of that box. If you pick an empty one, boxes are randomly re-organized and the value of non-empty box is doubled. This goes on until you pick non empty box.

a. Simulate this game as a function in R.

```
play_game <- function() {
  # Initialize boxes with one containing 2$, the other one is empty
  boxes <- c(2, 0)

  # Pick a box at random
  #pick <- sample(boxes, 1)
  pick = c(0)
  # Initialize round count
  round <- 1

  # Keep playing until non-empty box is picked
  while (pick == 0) {
    round <- round+1
    # Re-arrange boxes randomly
    boxes <- sample(boxes)
    # Double the value of the non-empty box
    boxes[boxes != 0] <- boxes[boxes != 0] * 2
    # Pick a box at random
    pick <- sample(boxes, 1)
  }

  # Return the number of rounds played and the value of the box picked in a dataframe
  return(data.frame(round = round, value = pick))
}
```

Plots

```
game_simulation <- function(n) {
  # Run the game n times
  results <- replicate(n, play_game(), simplify = FALSE)
```

```
  # convert the results to dataframe
  results_df <- data.frame(round = unlist(lapply(results, "[[", "round")),
                           value = unlist(lapply(results, "[[", "value")),
                           stringsAsFactors = FALSE,
                           col.names = c("rounds", "value"))
  return(results_df)
}
```

b. Run simulation multiple times (ex. 100K) and calculate summary statistics like median, average, etc.

```
set.seed(1234)
results_df <- game_simulation(100000)
```

summary statistics

```
# Calculate the median and average of of the values
median_values <- median(results_df$value, na.rm = TRUE)
average_values <- mean(results_df$value,na.rm = TRUE)

# Print the median of the values
print(paste("Median of values:", median_values))
```

```
## [1] "Median of values: 4"
```

```
#rounds
median_rounds <- median(results_df$round, na.rm = TRUE)
average_rounds <- mean(results_df$round,na.rm = TRUE)
# Print the median and average of the rounds
print(paste("Median of rounds:", median_rounds))
```

```
## [1] "Median of rounds: 2"
```

```
print(paste("Average of rounds:", average_rounds))
```

```
## [1] "Average of rounds: 2.99585"
```

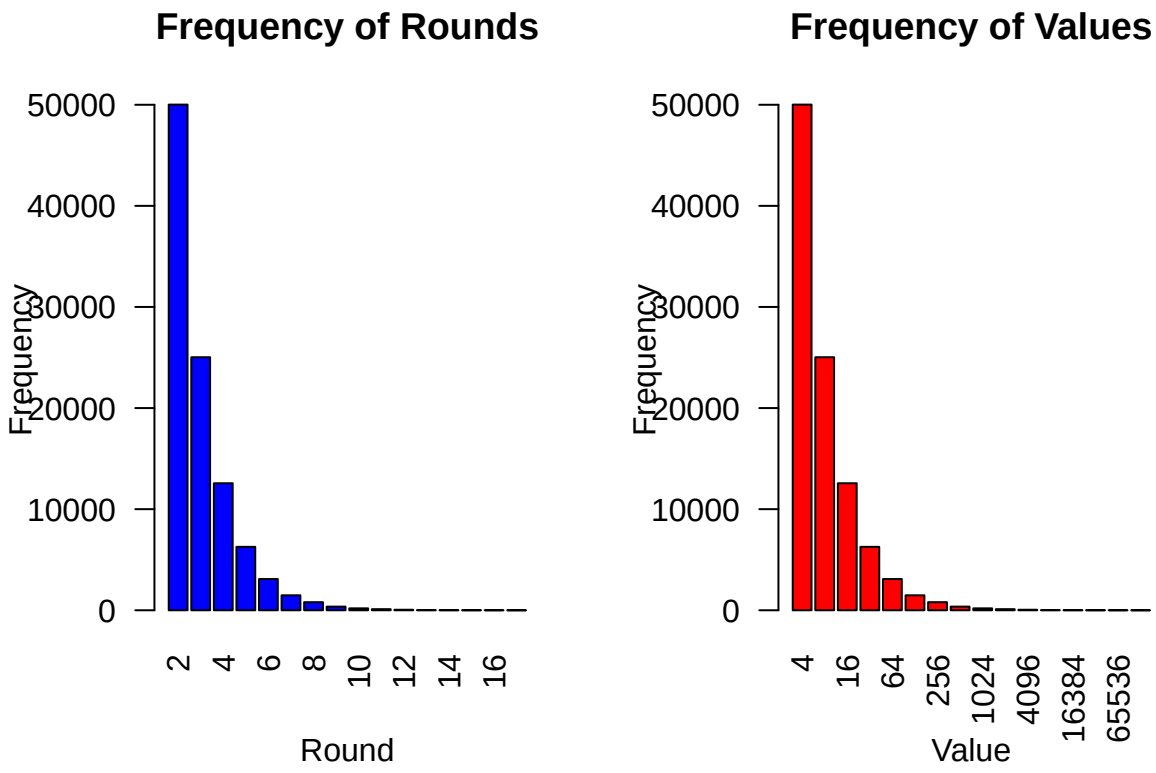
```
#barplot

# Set the layout of the plots on the page
par(mfrow = c(1, 2))

# Create the first bar plot
barplot(table(sort(results_df$round)),
        main = "Frequency of Rounds",
        xlab = "Round",
        ylab = "Frequency",
        col = "blue",
        las = 2)

# Create the second bar plot
barplot(sort(table(results_df$value),decreasing = TRUE),
        main = "Frequency of Values",
        xlab = "Value",
        ylab = "Frequency",
```

```
        col = "red",
        las = 2)
```



Quantile Results:

```
# Calculate summary statistics for the rounds column
rounds_summary <- summary(results_df$round)

# Print the summary statistics for the rounds column
print(rounds_summary)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   2.000   2.000   2.000   2.996   3.000  18.000
```

```
# Calculate summary statistics for the value column
value_summary <- summary(results_df$value)

# Print the summary statistics for the value column
print(value_summary)
```

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
##      4.00      4.00      4.00     35.92      8.00 262144.00
```

```
quantile(results_df$round)
```

```
##   0%  25%  50%  75% 100%
##    2    2    2    3   18
```

```
quantile(results_df$value)
```

```
##     0%    25%    50%    75%   100%
##      4      4      4      8 262144
```