DATA 605 - Discussion 5

Omer Ozeren

Table of Contents

Chapter 1 Exercise 3 :

In the early 1600s, Galileo was asked to explain the fact that, although the number of triples of integers from 1 to 6 with sum 9 is the same as the number of such triples with sum 10, when three dice are rolled, a 9 seemed to come up less often than a 10—supposedly in the experience of gamblers.

(a) Write a program to simulate the roll of three dice a large number of times and keep track of the proportion of times that the sum is 9 and the proportion of times it is 10.

(b) Can you conclude from your simulations that the gamblers were correct?

Solutions :

(a)

```r
# number of times to run this simulation of 10000 trials/runs
n_sim <- 100 # 100 times simulate 10000 trials
total_times <- rep(FALSE, n_sim) # vector to store all simulation results
for (i in 1:n_sim){

  sum_9 <- 0 # counter for # of times sum == 9
  sum_10 <- 0 # counter for # of times sum == 10
  n <- 10000 # number of times to roll 3 dice
  # for loop to simulate
  for (j in 1:n){
    dice <- sample(1:6, 3, replace = TRUE) # pick a number from 1 to 6 3
times with equal likelihood
    if (sum(dice) == 9){ # if the sum of the rolled 3 dice is 9
      sum_9 <- sum_9 + 1 # increment the counter
    }
    if (sum(dice) == 10){ # if the sum of the rolled 3 dice is 10
      sum_10 <- sum_10 + 1
```

```
    }
  }

  # check if the # of sum == 9 is less than # of sum == 10
  if (sum_9 < sum_10){
    total_times[i] <- TRUE # mark as true
  }
}
```

Running this simulation 100 times of rolling 3 dice 10000 times:

```
print(sum(total_times == TRUE))

## [1] 97
```

(b)

The gamblers were right. The sum of 9 comes up less frequently than sum of 10 for rolling 3 dice usually around 90% or more of the time.