

Project 1

Jacob Hopkins

2/6/2020

Contents

| | |
|--------------------------|---|
| 1.1 Solving 1a | 1 |
| 1.2 Solving 1b | 9 |

I use the built in sample, matrix, and barplot functions to simulate the roll of a 6 sided die, as well as to find the probability of the random selection of two people in a group.

1.1 Solving 1a

Project 1a:

Simulate the rolling of a 6-sided fair die.

Requirements:

Simulation Number of rolls Numeric Summary Graphic Display

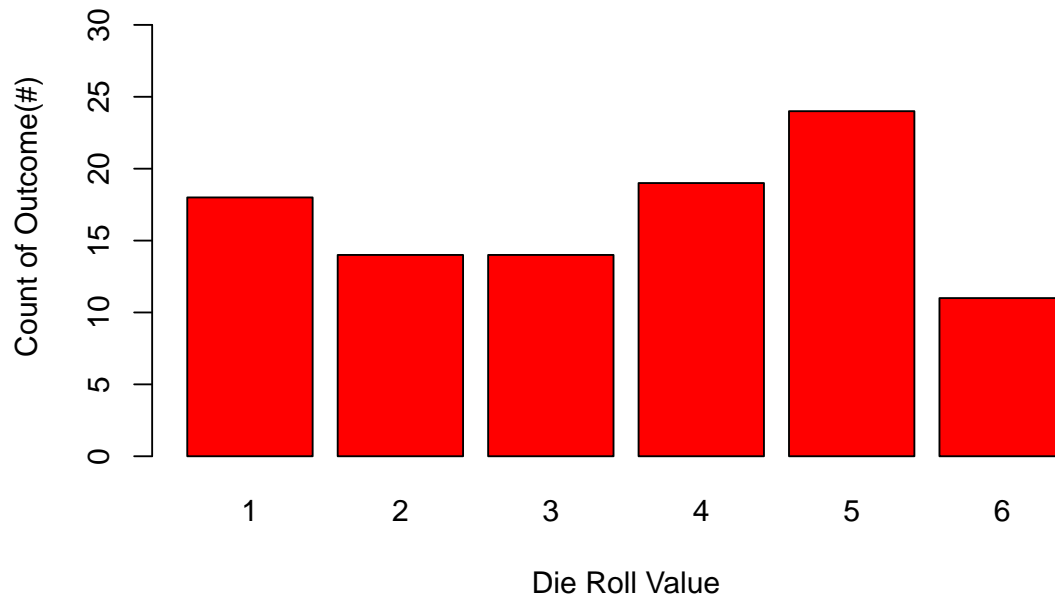
| | | | |
|---|-------|-------|----------|
| 1 | 100 | table | bar plot |
| 2 | 500 | table | bar plot |
| 3 | 1000 | table | bar plot |
| 4 | 10000 | table | bar plot |

So lets get to the data! Ideal probabilities for each die roll should be $1/6$ or 16.6666...%

```
## Simulations: 100
##
## Count Table(##)
```

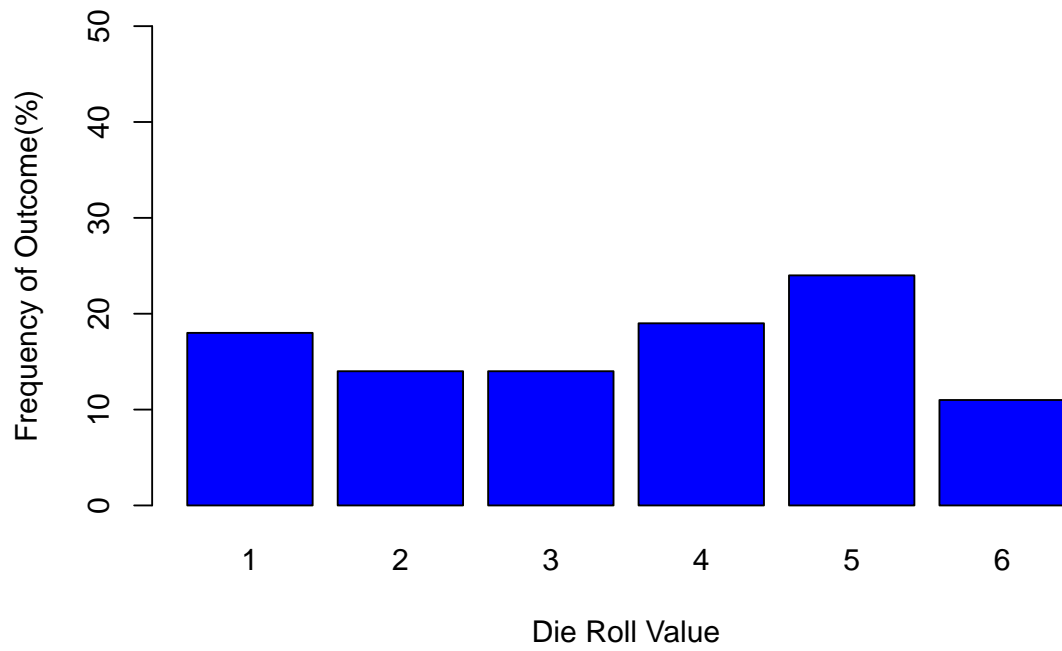
```
##          1  2  3  4  5  6
## Count 18 14 14 19 24 11
```

Count Table (Simulations: 100)



```
## Frequency Table(%)
##          1  2  3  4  5  6
## Frequency 18 14 14 19 24 11
```

Frequency Table (Simulations: 100)



```
## Simulations: 500
##
## Count Table(##)
##      1  2  3  4  5  6
## Count 72 90 86 88 82 82
```

Count Table (Simulations: 500)

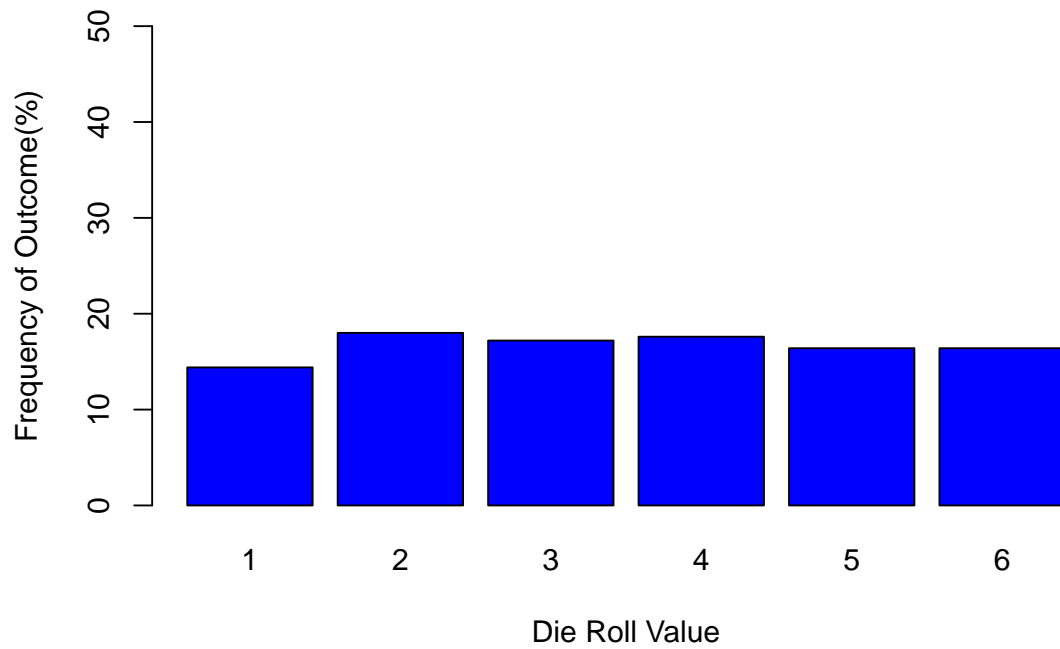


Frequency Table(%)

| | | | | | | | |
|----|--|---|---|---|---|---|---|
| ## | | 1 | 2 | 3 | 4 | 5 | 6 |
|----|--|---|---|---|---|---|---|

| | | | | | | |
|--------------|------|----|------|------|------|------|
| ## Frequency | 14.4 | 18 | 17.2 | 17.6 | 16.4 | 16.4 |
|--------------|------|----|------|------|------|------|

Frequency Table (Simulations: 500)



```
## Simulations: 10000
##
## Count Table(##)
##           1    2    3    4    5    6
## Count 1643 1612 1685 1668 1718 1674
```

Count Table (Simulations: 10000)

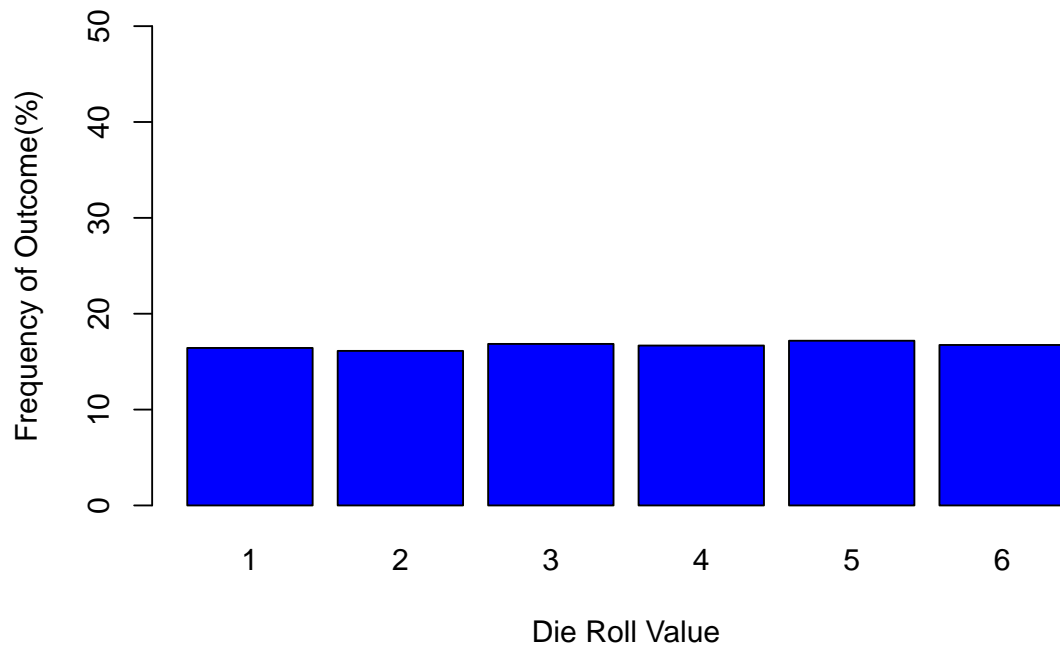


Frequency Table(%)

| | | | | | | |
|----|---|---|---|---|---|---|
| ## | 1 | 2 | 3 | 4 | 5 | 6 |
|----|---|---|---|---|---|---|

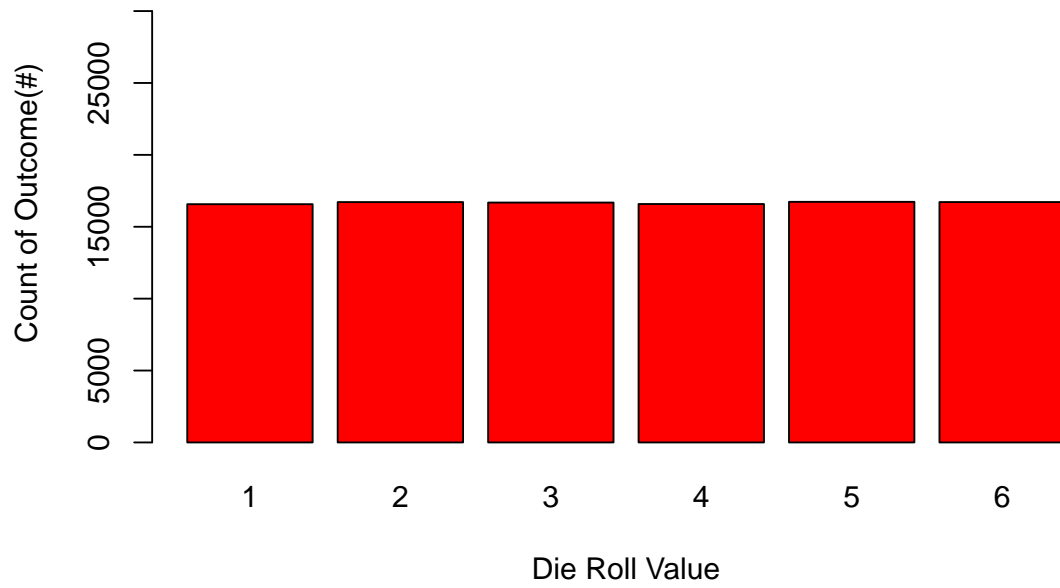
| | | | | | | |
|--------------|-------|-------|-------|-------|-------|-------|
| ## Frequency | 16.43 | 16.12 | 16.85 | 16.68 | 17.18 | 16.74 |
|--------------|-------|-------|-------|-------|-------|-------|

Frequency Table (Simulations: 10000)



```
## Simulations: 1e+05
##
## Count Table(##)
##           1      2      3      4      5      6
## Count 16569 16716 16683 16582 16732 16718
```

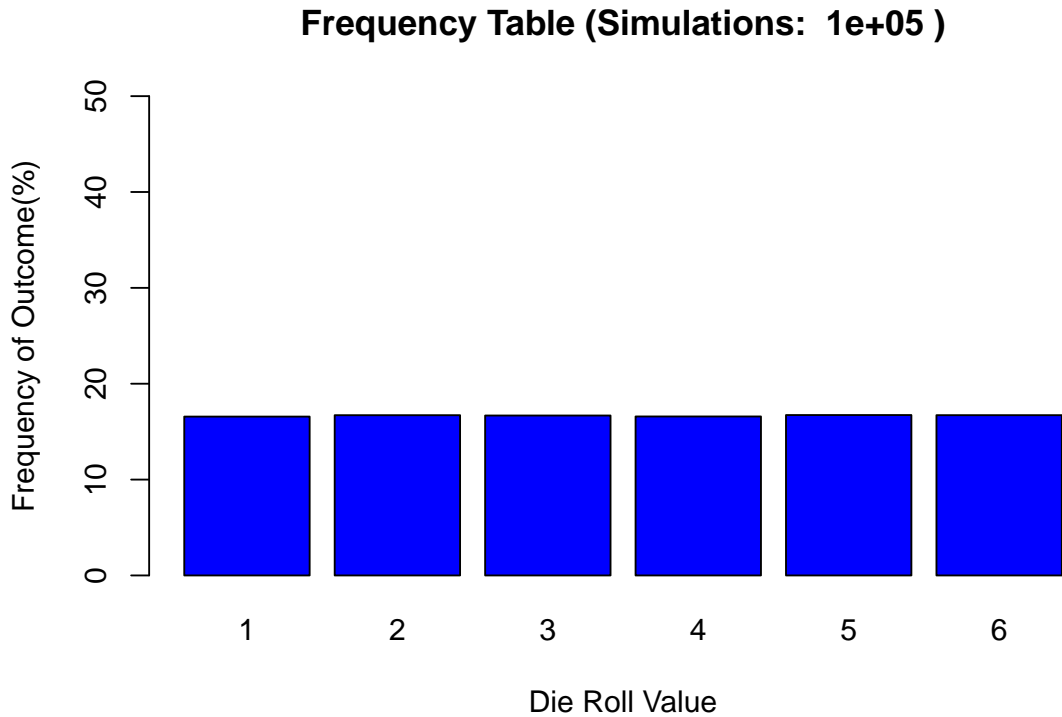
Count Table (Simulations: 1e+05)



Frequency Table(%)

1 2 3 4 5 6

Frequency 16.569 16.716 16.683 16.582 16.732 16.718



In conclusion this simulation approaches acceptable accuracy as the trials approach 10000.

1.2 Solving 1b

Project 1b: A club has 5 members, including Tom and Jerry. Randomly select two members. Use simulation to estimate the probability that Tom and Jerry are selected.

Again I will do four simulations with 100, 500, 1000, 10000 trials each. Each with a table and graph.

So lets get to the data!

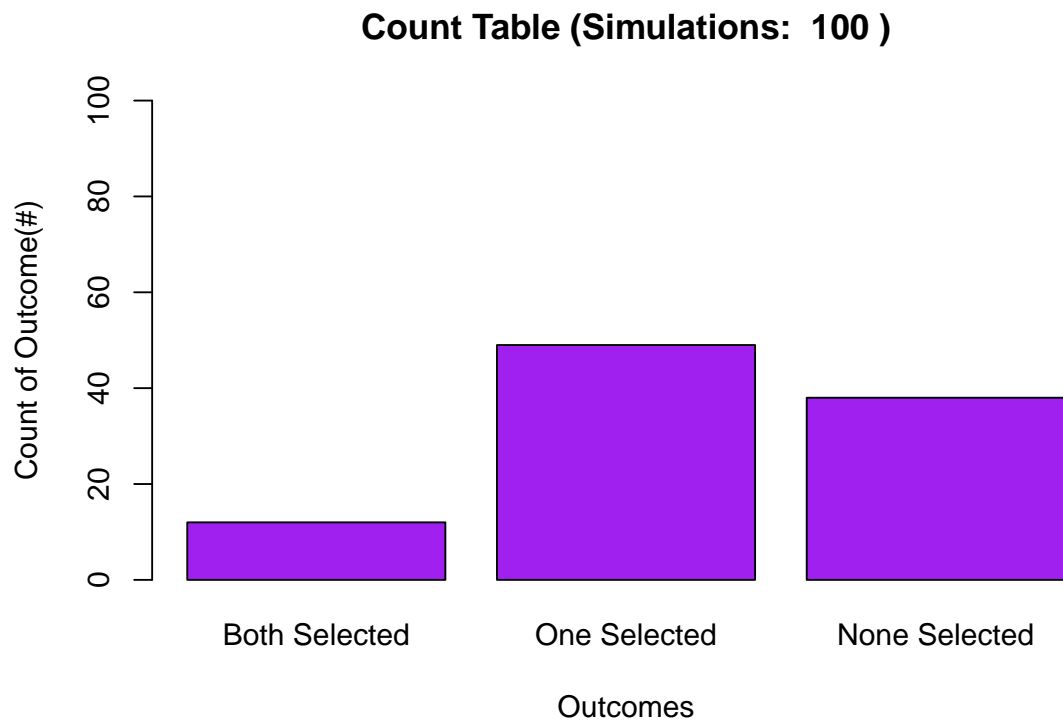
Probability of Tom getting picked: $1/5$ 0.20 20%

Probability of then Jerry getting picked $1/4$ 0.25 25%

Probability of Tom and Jerry getting picked: $0.20 \times 0.25 = 0.05$ 5%

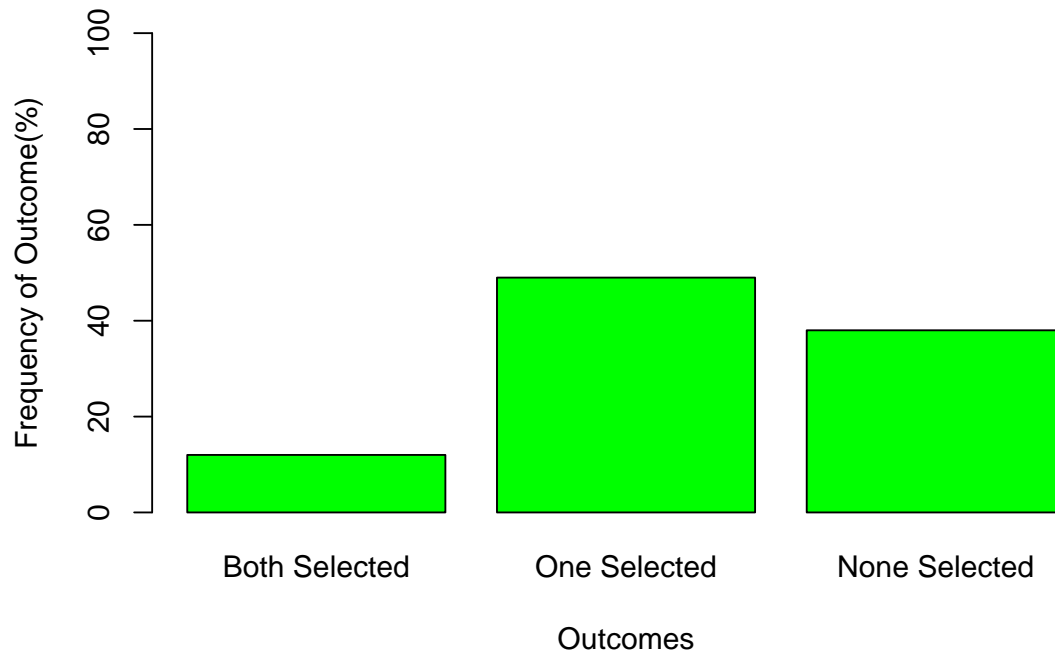
Simulations: 100

```
##
## Count Table(##)
##           Both Selected One Selected None Selected
## Outcome Count           12           49           38
```

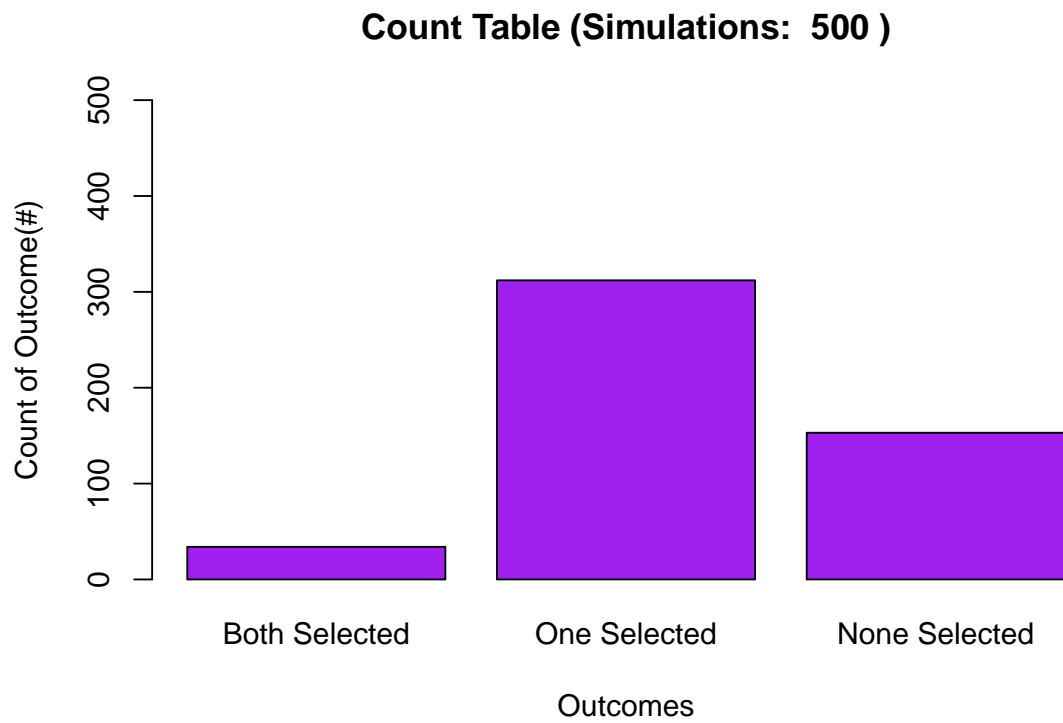


```
## Frequency Table(%)
##           Both Selected One Selected None Selected
## Outcome Frequency           12           49           38
```

Frequency Table (Simulations: 100)



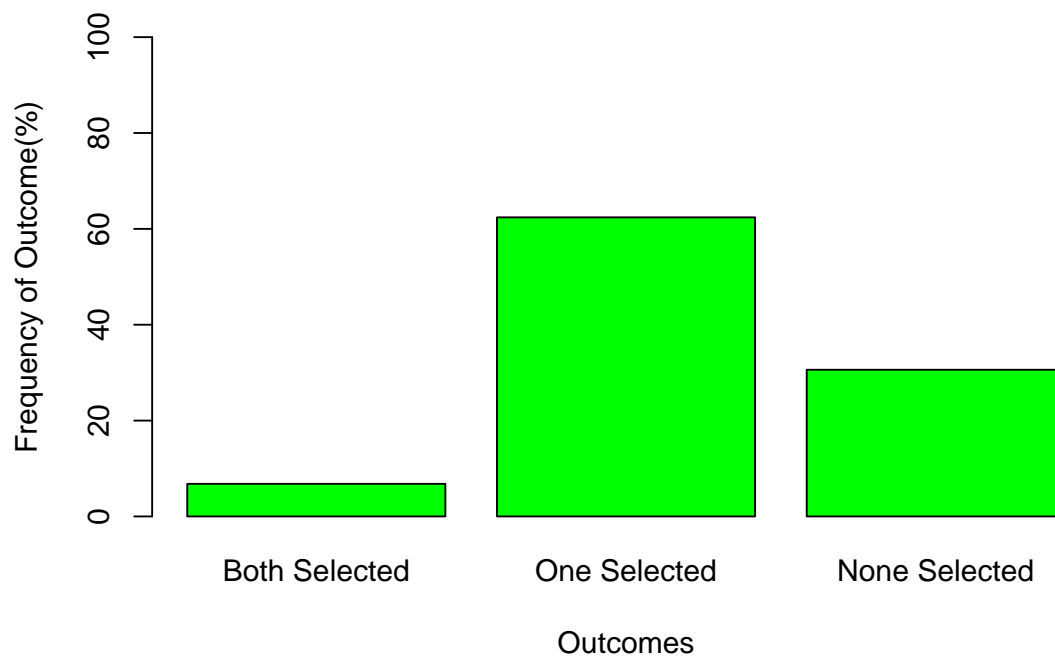
```
## Simulations: 500
##
## Count Table(##)
##           Both Selected One Selected None Selected
## Outcome Count           34           312           153
```



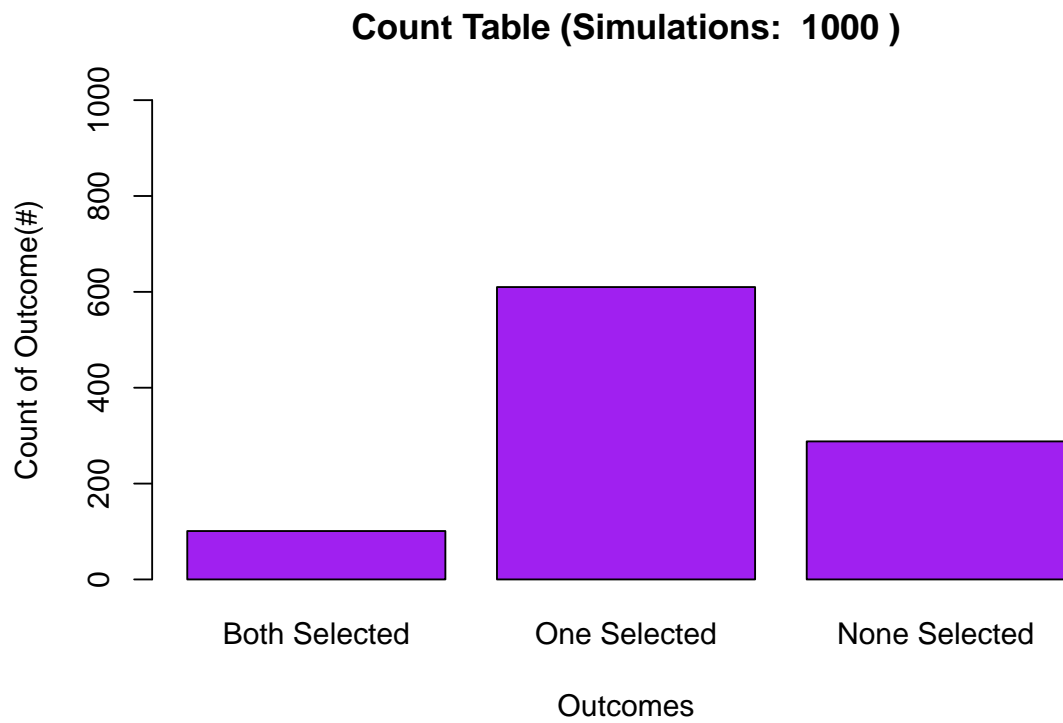
Frequency Table(%)

| | | | |
|----------------------|---------------|--------------|---------------|
| ## | Both Selected | One Selected | None Selected |
| ## Outcome Frequency | 6.8 | 62.4 | 30.6 |

Frequency Table (Simulations: 500)



```
## Simulations: 1000
##
## Count Table(##)
##           Both Selected One Selected None Selected
## Outcome Count          101          610          288
```

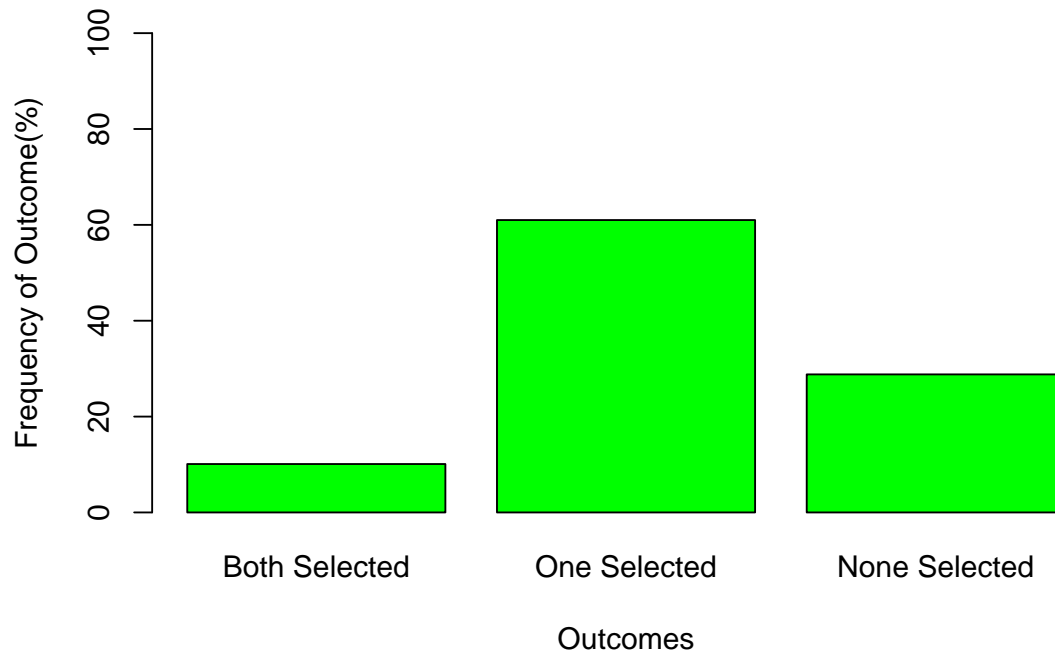


Frequency Table(%)

Both Selected One Selected None Selected

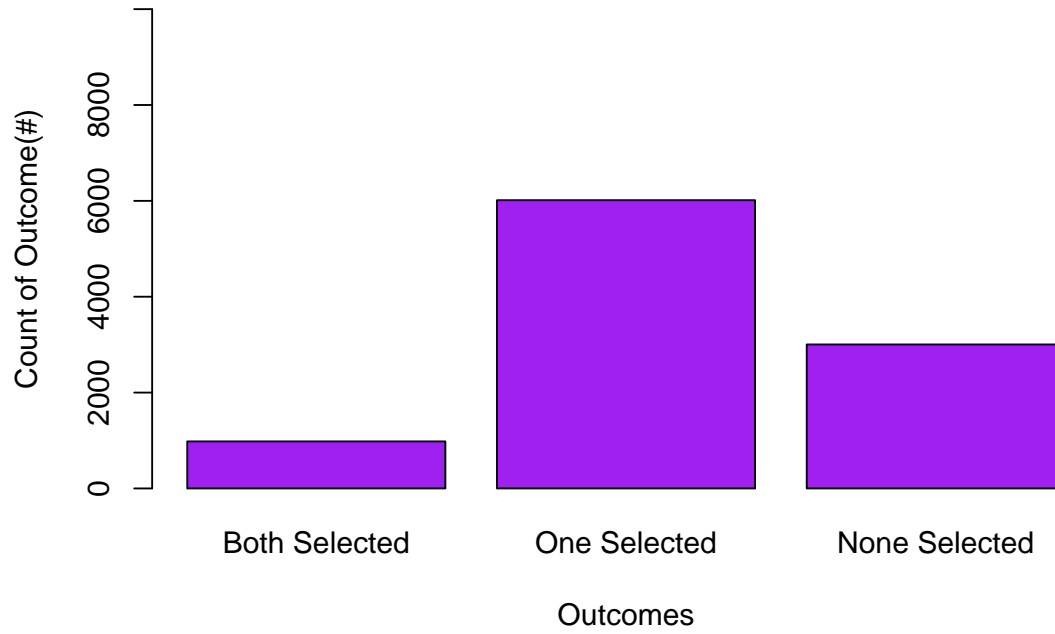
Outcome Frequency 10.1 61 28.8

Frequency Table (Simulations: 1000)



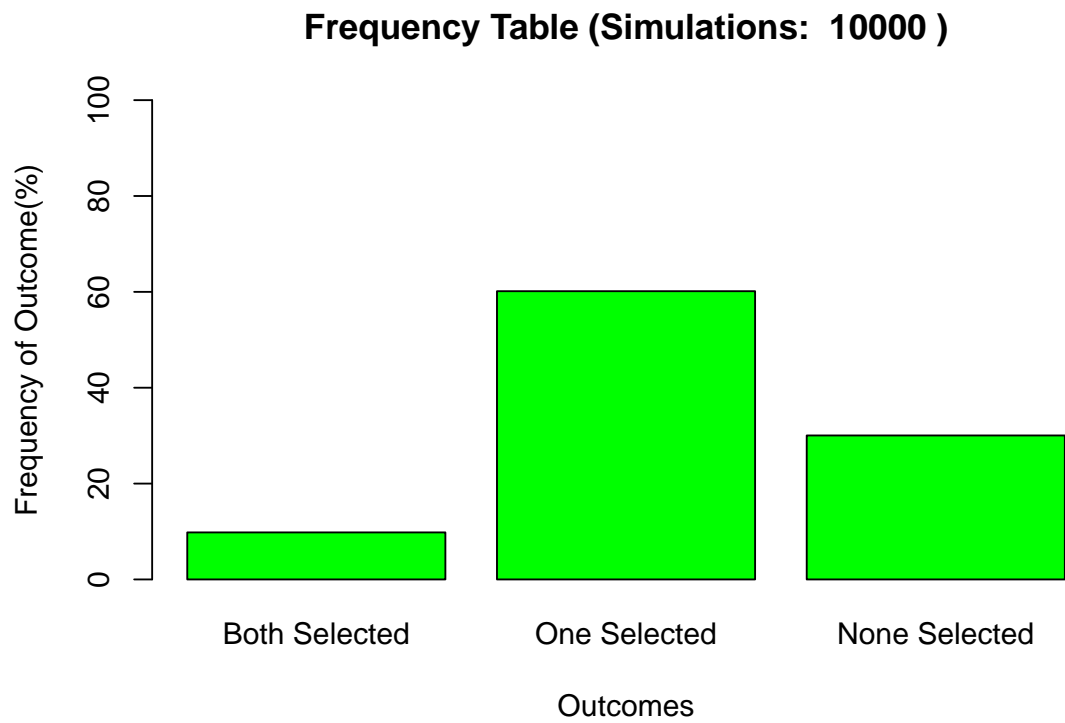
```
## Simulations: 10000
##
## Count Table(##)
##           Both Selected One Selected None Selected
## Outcome Count           981           6014           3004
```

Count Table (Simulations: 10000)



Frequency Table(%)

| | | | |
|----------------------|---------------|--------------|---------------|
| ## | Both Selected | One Selected | None Selected |
| ## Outcome Frequency | 9.81 | 60.14 | 30.04 |



In conclusion this simulation does not seem to become very accurate.