# R Coding Assignment 1

San Diego State University - STAT550

Aiden Jajo

### R A First Look at Simulation

This section of the text introduces the concept of Monte Carlo simulation, along with some R commands using two examples (which are provided below or as script files). The first code starts with Example 1.32.

```
n <- 100 #set for example

# Generate random binary outcomes (0 or 1) simulating coin flips
sample(0:1, n, replace = TRUE)
```

```
##   [1] 0 0 1 0 1 1 1 1 1 1 0 1 0 0 0 0 1 1 1 0 1 0 0 0 0 0 1 1 0 1 1 0 0 0 1 0 1
##  [38] 1 1 1 0 1 1 1 1 0 1 1 1 0 1 1 1 0 1 1 0 0 1 0 1 0 0 0 0 0 1 0 1 1 0 0 0 0
##  [75] 1 0 1 0 1 0 1 0 0 0 1 0 0 0 0 0 0 0 0 1 1 1 1 1 1 0
```

```
# Calculate mean - theoretical expectation is 0.5 for fair coin
mean(sample(0:1, n, replace = TRUE))
```

```
## [1] 0.36
```

### try creating a sample now

use the code above and make a sample of sampling from the digits 0-9 and find the mean.

```
n <- 100

# Sample from digits 0-9 with replacement
sample_0_to_9 <- sample(0:9, n, replace = TRUE)
sample_0_to_9
```

```
##   [1] 5 6 8 4 8 5 9 9 0 1 4 0 0 5 4 3 6 5 7 2 5 9 5 0 6 1 6 7 6 9 1 3 3 8 6 2 3
##  [38] 6 6 2 7 8 4 8 9 8 8 7 4 7 7 4 6 6 3 4 2 2 0 9 4 2 2 6 7 3 4 6 8 1 0 2 0 6
##  [75] 7 2 3 3 4 5 2 0 2 6 3 2 4 5 1 8 3 6 8 4 4 2 8 8 6 9
```

```
# Calculate mean - expected value is 4.5
mean(sample_0_to_9)
```

```
## [1] 4.64
```

**Here are some of the functions that will be useful as we go through the course.**

choose(n,k) - computes combination of choosing k objects from n. prod(n:m) - computes the product of values from n to m. To do a permutation of r objects out of n, you want to use prod(n:n-r+1). (For whatever reason, this doesn't work if you assign n and r first, just put in the numbers). factorial(x) - computes x!

```
# Combinations: order doesn't matter
choose(n = 10, k = 2)
```

```
## [1] 45
```

```
## [1] 45

# Permutations: order matters
prod(8:6) # permutation of 3 objects out of 8
```

```
## [1] 336
```

```
## [1] 336

# Factorial: total arrangements
factorial(x = 4)
```

```
## [1] 24
```

```
##[1] 24
```

## Try the following

Find how many ways you can select 10 things from a group of 30

Find the total possible ways to arrange 10 people in a line for a photo.

Find 9!

```
# Combination: selecting 10 from 30
choose(30, 10)
```

```
## [1] 30045015
```

```
# Permutation: arranging 10 people in line
factorial(10)
```

```
## [1] 3628800
```

```
# Factorial calculation
factorial(9)
```

```
## [1] 362880
```