Math 490 HW #3

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Question 1.

Consider choosing n = 36 numbers at random from 1, 2, …, 12 with replacement, and let $\overline{Y}_{36}$ be the sample mean.

a. What are the mean and standard deviation of $\overline{Y}_{36}$?

The mean of $\overline{Y}_{36}$ is:

```
x = c(1:12)
mean(x)
```

```
[1] 6.5
```

The standard deviation of $\overline{Y}_{36}$ is:

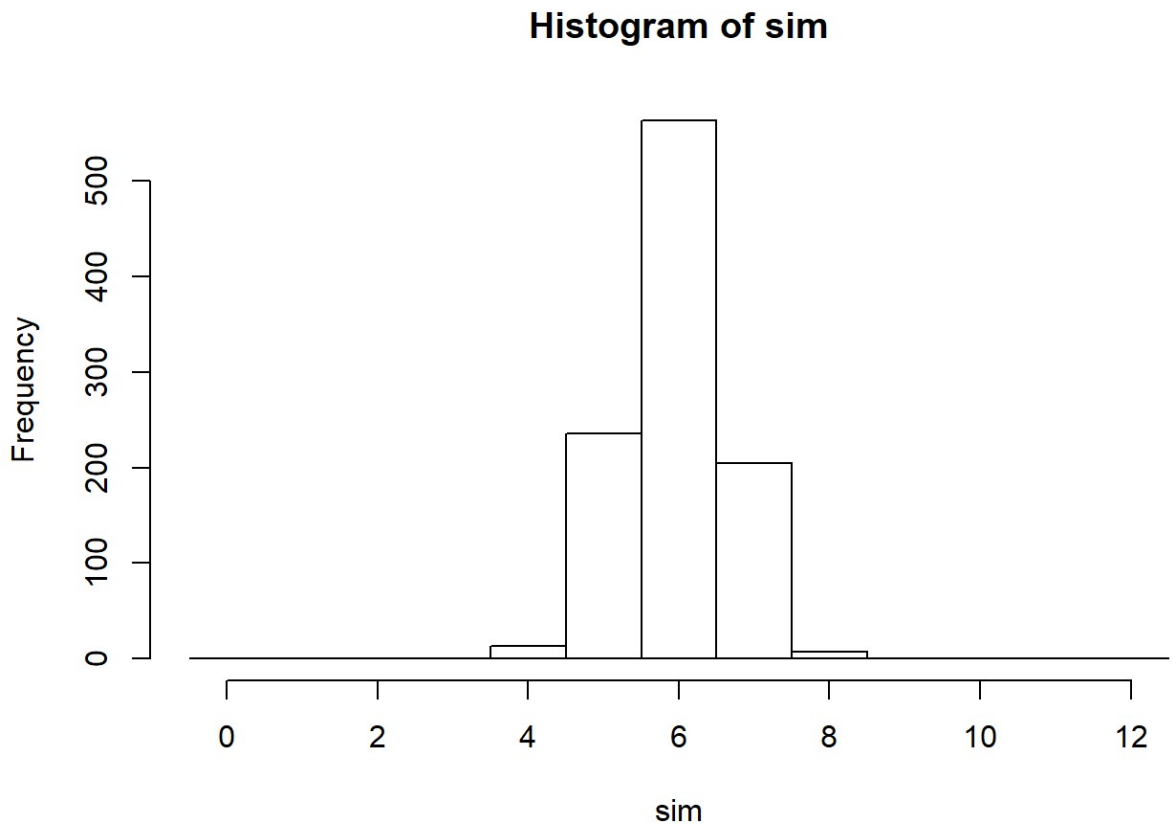
```
x = c(1:12)
var(x)^0.5
```

```
[1] 3.605551
```

b. Use R to generate 1024 sample means $\overline{Y}_{36}$, make a histogram, and report the mean and standard deviation of the simulated sample means.

```
func = function(sam, rep) {
  # sam is the sample size
  # rep is the number of repititions
  obs = NULL
  for (i in 1:rep) {
    ybar = mean(sample(0:12, sam, replace=T))
    obs = c(obs, ybar)
  }
  obs;
}

sim = func(36, 1024)
hist(sim, breaks=seq(-0.5, 12.5, 1), prob=F)
```



The mean of our simulation is:

```
mean(sim)
```

```
[1] 5.961317
```

The standard deviation of our simulation is:

```
var(sim)^0.5
```

```
[1] 0.6501348
```

c. For your simulation in part (b), what is the proportion of simulated sample means falling within one standard deviation from the center?

```
clt = function(data) {
  # data is our vector of means
  CE = mean(sim)
  SD = var(sim)^0.5
  obs = NULL
  for (iota in data) {
    if ( abs(iota - CE) <= SD ) {
      obs = c(obs, iota)
    }
  }
  obs;
}

lenSim = length(clt(sim))

lenSim/1024
```

```
[1] 0.6835938
```