STAT 260 R Assignment 3

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Question 1

```r
repair_time <- c(159, 224, 222, 149, 280, 379, 362, 260, 101, 179, 168, 485, 212, 264, 250, 170)
sample_mean <- mean(repair_time)
sample_sd <- sd(repair_time)
t_score <- qt(0.975, df = length(repair_time) - 1)
margin_of_error <- t_score * (sample_sd / sqrt(length(repair_time)))

lower_bound <- sample_mean - margin_of_error
upper_bound <- sample_mean + margin_of_error

lower_bound
```

```
## [1] 188.8927
```

```r
upper_bound
```

```
## [1] 294.1073
```

```r
t_test_result <- t.test(repair_time, mu = 225, alternative = "greater")
t_test_result
```

```
##
##  One Sample t-test
##
## data:  repair_time
## t = 0.66852, df = 15, p-value = 0.257
## alternative hypothesis: true mean is greater than 225
## 95 percent confidence interval:
##  198.2321      Inf
## sample estimates:
## mean of x
##     241.5
```

c) t = 0.66852

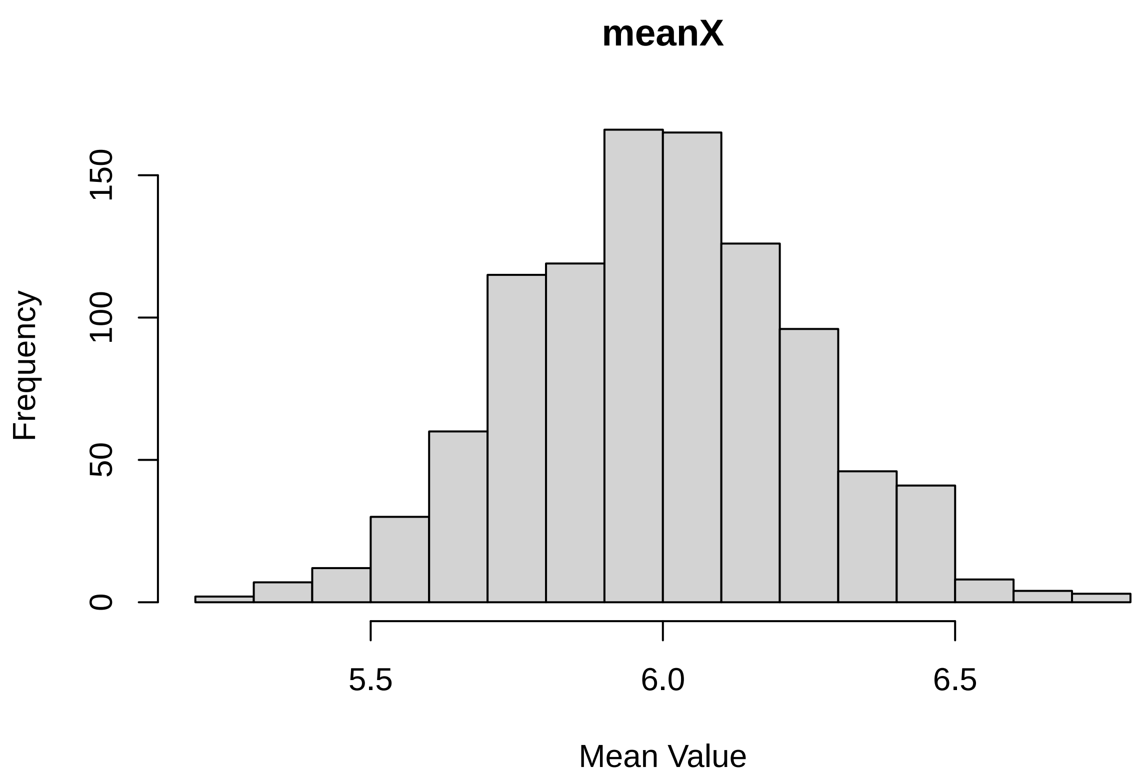
d) p-value = 0.257

e) we fail to reject the null hypothesis since there is not enough evidence.

f) (a) and (e) rely on the assumption that the repair times follow a normal distribution.

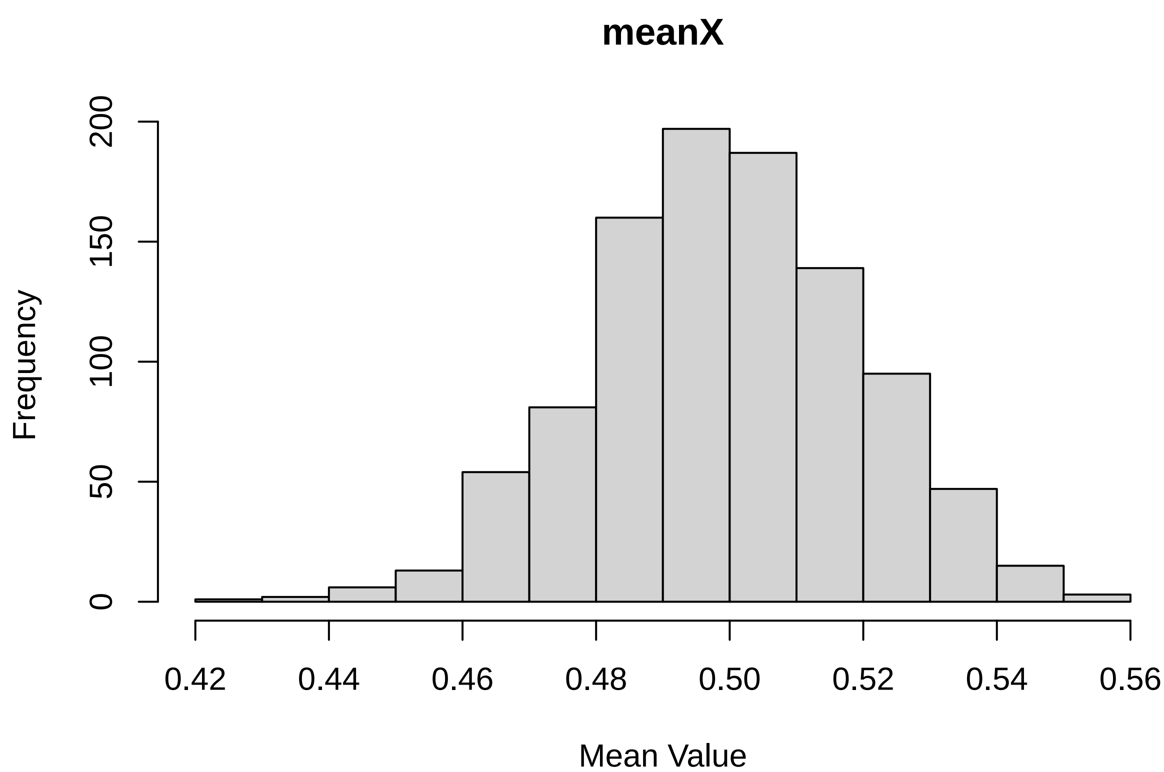
Question 2

```r
meanX=NULL
for (i in 1:1000){
  X<-rgamma(n=200,shape=3, scale=2)
  meanX[i]=mean(X)
}

hist(meanX, main = "meanX", xlab = "Mean Value", ylab = "Frequency")
```



a) The plot looks approximately normally distributed with a small left tail and a slightly bigger right tail.

```r
  meanX <- NULL


for (i in 1:1000) {
  X <- runif(n = 200, min = 0, max = 1)
  meanX[i] <- mean(X)
}
hist(meanX, main = "meanX", xlab = "Mean Value", ylab = "Frequency")
```



c) The plot looks approximately normally distributed with a small left tail and a slightly bigger right tail.

Question 3

```r
F1 = c(177, 176, 198, 197, 185, 188, 206)
F2 = c(206, 193, 192, 188, 207, 210, 197)

sd_F1 <- sd(F1)
sd_F2 <- sd(F2)

threshold <- 0.1 * max(sd_F1, sd_F2)
is_ratio_close <- (abs(sd_F1 - sd_F2) <= threshold)
is_ratio_close
```

```
## [1] FALSE
```

```r
sd_F1
```

```
## [1] 11.26731
```

```r
sd_F2
```

```
## [1] 8.602325
```

a) Since the standard deviations are not close to each other it is more appropriate to use unpooled procedures.

```
t_test_result <- t.test(F1, F2, alternative = "less", var.equal = FALSE)
t_test_result
```

```
##
##  Welch Two Sample t-test
##
## data:  F1 and F2
## t = -1.7597, df = 11.221, p-value = 0.05283
## alternative hypothesis: true difference in means is less than 0
## 95 percent confidence interval:
##       -Inf 0.1763627
## sample estimates:
## mean of x mean of y
##  189.5714  199.0000
```

c) p-value = 0.05283

d) There is not enough evidence to reject the null hypothesis.