HM4

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Coding Howework (submmite the pdf file to Canvas)

Here we are going to test a couple of hypotheses about the Old Faithful data in R. Remember, this is the `faithful` data frame that is built in to R. You can use `data(faithful)` to load data set. First split faithful into two separate data frames: (1) those entries with eruption times less than 3 minutes (`eruptions < 3`) and (2) those entries with eruption times greater than or equal to 3 minutes (`eruptions >= 3`). Answer the following about the entry wait time (`waiting`):

(a). For the entries with short eruption times, you want to test the hypothesis that the associated waiting last on average less than 60 minutes. What is the null hypothesis? What is the alternative hypothesis? (Write your own code)

(b). Give `R` commands to compute the statistic that you used in (a) and the resulting p-value. What values did you get? Would you reject the null hypothesis at the $\alpha = 0.05$ level?

(c). For the entries with long eruption times, you want to test the hypothesis that the associated waiting time last on average shorter than 80 minutes. What is the null hypothesis? What is the alternative hypothesis? (Write your own code)

(d). Give `R` commands to compute the statistic you used in (c) and the resulting p-value to test the hypothesis you came up with in part (c).What values did you get? Would you reject the null hypothesis at the $\alpha = 0.05$ level?

(a)

```
# input your r code here
data(faithful)
short_waiting <- subset(faithful, eruptions < 3)$waiting

print("Null Hypothesis H0: The short eruption wait time last on average for 60 minutes")
```

```
## [1] "Null Hypothesis H0: The short eruption wait time last on average for 60 minutes"
```

```
print("Alternate Hypothesis H1: The short eruption wait time last on average less than 60 minutes")
```

```
## [1] "Alternate Hypothesis H1: The short eruption wait time last on average less than 60 minutes"
```

(b)

```
# input your r code here
alpha <- 0.05

t <- (60 - mean(short_waiting))/(sd(short_waiting)/sqrt(length(short_waiting)))
cat("The statistic is", t)
```

```
## The statistic is 9.284003
```

```
pvalue <- pt(t,length(short_waiting)-1,lower.tail = F)
cat("The p-value is: ", pvalue)
```

```
## The p-value is:  2.569802e-15
```

```
if (pvalue > alpha){
  print("We fail to reject H0 because p-value > alpha")
}else{
  print("We reject H0 because p-value < alpha")
}
```

```
## [1] "We reject H0 because p-value < alpha"
```

(c)

```
# input your r code here
long_waiting <- subset(faithful, eruptions >= 3)$waiting
print("Null Hypothesis H0: The long eruption wait time last on average for 80 minutes")
```

```
## [1] "Null Hypothesis H0: The long eruption wait time last on average for 80 minutes"
```

```
print("Alternate Hypothesis H1: The long eruption wait time last on average less than 80 minutes")
```

```
## [1] "Alternate Hypothesis H1: The long eruption wait time last on average less than 80 minutes"
```

(d)

```
# input your r code here
alpha <- 0.05

t <- (80 - mean(long_waiting))/(sd(long_waiting)/sqrt(length(long_waiting)))
cat("The statistic is", t)
```

```
## The statistic is 0.02522185
```

```
pvalue <- pt(t,length(long_waiting)-1,lower.tail = F)
cat("The p-value is: ", pvalue)
```

```
## The p-value is:  0.4899535
```

```
if (pvalue > alpha){
  print("We fail to reject H0 because p-value > alpha")
}else {
  print("We reject H0 because p-value < alpha")
}
```

```
## [1] "We fail to reject H0 because p-value > alpha"
```