4/22 Quiz 1

Q1

- The mean lifetime of a sample of 100 light tubes produced by a company is fond to be 1580 hours Test the hypothesis at 5% level of significance that the mean lifetime of tubes produced by the company is 1600 hours with standard deviation of 90 hours.
- Is the company claim is correct?

Q1 ANS

```
#H0 : μ = 1600, H1 : μ≠ 1600
xbar<- 1580
pmean<- 1600
psd<- 90
n<- 100
Alpha<-0.05
z<- (xbar-pmean)/(psd/sqrt(n))
z
Pvalue<- 2*pnorm(z,lower.tail = TRUE)
Pvalue
Pvalue <  Alpha
```

```
> #H0 : μ = 1600, H1 : μ≠ 1600
> xbar<- 1580
> pmean<- 1600
> psd<- 90
> n<- 100
> Alpha<-0.05
> z<- (xbar-pmean)/(psd/sqrt(n))
> z
[1] -2.222222
> Pvalue<- 2*pnorm(z,lower.tail = TRUE)
> Pvalue
[1] 0.02626829
> Pvalue <  Alpha
[1] TRUE
```

Q2

- According to the survey, people who have a sleep time of less than 6 hours a day have more obesity, high blood pressure, and diabetes than those who sleep 6 to 8 hours. Now Professor Lin wants to know if the sleep time of college students in Taiwan is less than 6 hours, randomly select 36 students, and investigate the number of sleep hours per day. The result is that the average is 5.8 hours and the standard deviation of population is 1.7 hours. In response to this case, what conclusion does Professor Lin want to make? (α=0.05)

Q2 ANS

```
#H0: μ ≥ 6 H1: μ < 6
xbar<- 5.8
pmean<- 6
psd<- 1.7
n<- 36
Alpha<- 0.05
z<- (xbar-pmean)/(psd/sqrt(n))
z
Pvalue<- pnorm(z)
Pvalue
Pvalue < Alpha
```

```
> #H0: μ ≥ 6 H1: μ < 6
> xbar<- 5.8
> pmean<- 6
> psd<- 1.7
> n<- 36
> Alpha<- 0.05
> z<- (xbar-pmean)/(psd/sqrt(n))
> z
[1] -0.7058824
> Pvalue<- pnorm(z)
> Pvalue
[1] 0.2401307
> Pvalue < Alpha
[1] FALSE
```

Q3

- According to the financial analysis, the convenience store manager believes that if the average customer spends more than \$170 each time, the NFC card will be profitable. Assuming that the amount spent each time is a normal distribution, the standard deviation is \$65. Samples were taken with 400 people and the simple mean is \$178. Can the convenience store manager be able to infer that issuing NFC cards can make a profit? (α=0.1)

Q3 ANS

```
#H0 : μ ≤ 170, H1 : μ > 170
xbar<- 178
pmean<- 170
psd<- 65
n<- 400
Alpha<- 0.1
z<- (xbar-pmean)/(psd/sqrt(n))
z
Pvalue<- pnorm(z,lower.tail = FALSE)
Pvalue
Pvalue < Alpha
```

```
> #H0 : μ ≤ 170, H1 : μ > 170
> xbar<- 178
> pmean<- 170
> psd<- 65
> n<- 400
> Alpha<- 0.1
> z<- (xbar-pmean)/(psd/sqrt(n))
> z
[1] 2.461538
> Pvalue<- pnorm(z,lower.tail = FALSE)
> Pvalue
[1] 0.006917128
> Pvalue < Alpha
[1] TRUE
```

Q4

- According to government statistics, the average life expectancy of Taiwanese in 2011 was 79.15 years old. Compared with Asian countries, life expectancy is higher than that of mainland China, Malaysia, and the Philippines, but lower than Japan, South Korea, and Singapore. Today, there is an almshouse that wants to verify the results of the government's statistical survey. A random sample of 100 people has an average life expectancy of 80 years. According to historical data, the average standard deviation of population of Chinese people is 4 years old. Is the government's information reliable under the significant level = 0.01?

Q4 ANS

```
#H0 : μ = 79.15, H1 : μ≠ 79.15
xbar<- 80
pmean<- 79.15
psd<- 4
n<- 100
Alpha<-0.01
z<- (xbar-pmean)/(psd/sqrt(n))
z
Pvalue<- 2*pnorm(z,lower.tail = FALSE)
Pvalue
Pvalue <  Alpha
```

```
> #H0 : μ = 79.15, H1 : μ≠ 79.15
> xbar<- 80
> pmean<- 79.15
> psd<- 4
> n<- 100
> Alpha<-0.01
> z<- (xbar-pmean)/(psd/sqrt(n))
> z
[1] 2.125
> Pvalue<- 2*pnorm(z,lower.tail = FALSE)
> Pvalue
[1] 0.03358661
> Pvalue <  Alpha
[1] FALSE
```

Q5

- A company rewards employees and organizes a one-day employee tour. It is estimated to cost 1,700 per person and based on past experience, the standard deviation of population is 450. If you do not participate together, you can participate in other tourism activities and apply for cash assistance from the company (up to 1,700). A staff member surveyed 12 travel agencies for a one-day trip, with an average of 1,298 yuan. Is it cheaper for employees to travel on their own than to participate in company travel?(α=0.05)

Q5 ANS

```
#H0: µ ≥ 1700 H1: µ < 1700
xbar<- 1298
pmean<- 1700
psd<- 450
n<- 12
Alpha<- 0.05
z<- (xbar-pmean)/(psd/sqrt(n))
z
Pvalue<- pnorm(z)
Pvalue
Pvalue < Alpha
```

```
> #H0: µ ≥ 1700 H1: µ < 1700
> xbar<- 1298
> pmean<- 1700
> psd<- 450
> n<- 12
> Alpha<- 0.05
> z<- (xbar-pmean)/(psd/sqrt(n))
> z
[1] -3.094597
> Pvalue<- pnorm(z)
> Pvalue
[1] 0.0009854009
> Pvalue < Alpha
[1] TRUE
```

Q6

- Boys of a certain age are known to have a mean weight of $\mu = 85$ pounds. A complaint is made that the boys living in a municipal children's home are underfed. As one bit of evidence, $n = 25$ boys (of the same age) are weighed and found to have a mean weight is 80.94 pounds. It is known that the population standard deviation σ is 11.6 pounds. Based on the available data, what should be concluded concerning the complaint? ($\alpha=0.1$)

Q6 ANS

```
#H0: μ ≥ 85 H1: μ < 85
xbar<- 80.94
pmean<- 85
psd<- 11.6
n<- 25
Alpha<- 0.1
z<- (xbar-pmean)/(psd/sqrt(n))
z
Pvalue<- pnorm(z)
Pvalue
Pvalue < Alpha
```

```
> #H0: μ ≥ 85 H1: μ < 85
> xbar<- 80.94
> pmean<- 85
> psd<- 11.6
> n<- 25
> Alpha<- 0.1
> z<- (xbar-pmean)/(psd/sqrt(n))
> z
[1] -1.75
> Pvalue<- pnorm(z)
> Pvalue
[1] 0.04005916
> Pvalue < Alpha
[1] TRUE
```

Q7

- When Tom was growing up, His father told him that his last name, Foos, was German for foot because his ancestors had been very fast runners. Tom curious whether there is any evidence for this claim in his family so He has gathered running times for a distance of one mile from 6 family members. The average healthy adult can run one mile in 10 minutes and 13 seconds (standard deviation of 76 seconds). Is his family running speed different from the national average? (α=0.05)

Person	Running Time
Paul	13min 48sec
Phyllis	10min 10sec
Tom	7min 54sec
Aleigha	9min 22sec
Arlo	8min 38sec
David	9min 48sec

Q7 ANS

Person	Running Time	...in seconds
Paul	13min 48sec	828sec
Phyllis	10min 10sec	610sec
Tom	7min 54sec	474sec
Aleigha	9min 22sec	562sec
Arlo	8min 38sec	518sec
David	9min 48sec	588sec

```
#H0 : μ = 613, H1 : μ≠ 613
seconds<-c(828,610,474,562,518,588)
xbar<- mean(seconds)
pmean<- 613
psd<- 76
n<- 6
Alpha<-0.05
z<- (xbar-pmean)/(psd/sqrt(n))
z
Pvalue<- 2*pnorm(z,lower.tail = TRUE)
Pvalue
Pvalue <  Alpha
```

```
> #H0 : μ = 613, H1 : μ≠ 613
> seconds<-c(828,610,474,562,518,588)
> xbar<- mean(seconds)
> pmean<- 613
> psd<- 76
> n<- 6
> Alpha<-0.05
> z<- (xbar-pmean)/(psd/sqrt(n))
> z
[1] -0.5264254
> Pvalue<- 2*pnorm(z,lower.tail = TRUE)
> Pvalue
[1] 0.5985927
> Pvalue <  Alpha
[1] FALSE
```

Q8

- Trying to encourage people to stop driving to campus, the university claim that on average it takes at least 30 minutes to find a parking space on campus. Jack don't think it takes so long to find a spot. In fact he has a sample of the last five times he drove to campus, and the mean is 20. Assuming that the time it takes to find a parking spot is normal and σ= 6 minutes, then perform a hypothesis test with level α= 0.01 to see if his claim is correct?

Q8 ANS

```
#H0: μ ≥ 30 H1: μ < 30
xbar<- 20
pmean<- 30
psd<- 6
n<- 5
Alpha<- 0.01
z<- (xbar-pmean)/(psd/sqrt(n))
z
Pvalue<- pnorm(z)
Pvalue
Pvalue < Alpha
```

```
> #H0: μ ≥ 30 H1: μ < 30
> xbar<- 20
> pmean<- 30
> psd<- 6
> n<- 5
> Alpha<- 0.01
> z<- (xbar-pmean)/(psd/sqrt(n))
> z
[1] -3.72678
> Pvalue<- pnorm(z)
> Pvalue
[1] 9.697081e-05
> Pvalue < Alpha
[1] TRUE
```

Q9

- An insurance company is reviewing its current policy rates. When originally setting the rates they believed that the average claim amount will be maximum \$180. They are concerned that the true mean is actually higher than this, because they could potentially lose a lot of money. They randomly select 40 claims, and calculate a sample mean of \$195. Assuming that the standard deviation of claims is \$50 and set α=0.1, test to see if the insurance company should be concerned or not.

Q9 Ans

```
#H0 : μ ≤ 180, H1 : μ > 180
xbar<- 195
pmean<- 180
psd<- 50
n<- 40
Alpha<- 0.1
z<- (xbar-pmean)/(psd/sqrt(n))
z
Pvalue<- pnorm(z,lower.tail = FALSE)
Pvalue
Pvalue < Alpha
```

```
> #H0 : μ ≤ 180, H1 : μ > 180
> xbar<- 195
> pmean<- 180
> psd<- 50
> n<- 40
> Alpha<- 0.1
> z<- (xbar-pmean)/(psd/sqrt(n))
> z
[1] 1.897367
> Pvalue<- pnorm(z,lower.tail = FALSE)
> Pvalue
[1] 0.02888979
> Pvalue < Alpha
[1] TRUE
```

Q10

- The convenience store's lunch is based on the central kitchen and the perfect distribution system. It must be prepared in advance. If there are too many purchases, it will cause waste. If the purchase is too small, the customer will complain. Therefore, how to accurately estimate the demand becomes an important issue. Assuming three weeks after launch, a convenience store has counted an average of 33.4 lunches for 15 noon periods over the past three weeks, and according to history, convenience stores can estimate a standard deviation of population is 8.2. However, the manager of a convenience store believes that the three-week period belongs to the advertising period, and the future sales situation should be reduced after the advertisement, so the daily purchase amount is set to 30. Under the significant level = 0.05, can the store manager's purchase volume meet the needs of consumers?

Q10 ANS

```
#H0 : μ ≤ 30, H1 : μ > 30
xbar<- 33.4
pmean<- 30
psd<- 8.2
n<- 15
Alpha<- 0.05
z<- (xbar-pmean)/(psd/sqrt(n))
z
Pvalue<- pnorm(z,lower.tail = FALSE)
Pvalue
Pvalue < Alpha
```

```
> #H0 : μ ≤ 30, H1 : μ > 30
> xbar<- 33.4
> pmean<- 30
> psd<- 8.2
> n<- 15
> Alpha<- 0.05
> z<- (xbar-pmean)/(psd/sqrt(n))
> z
[1] 1.605871
> Pvalue<- pnorm(z,lower.tail = FALSE)
> Pvalue
[1] 0.05415111
> Pvalue < Alpha
[1] FALSE
```