1**. A car travels 25 miles at 25 miles per hour (mi/h), 25 miles at 50 mph, and 25 miles at 75 mph. Write a program to find the arithmetic mean of the three velocities and the harmonic mean of the** three velocities.

```
>>dist <- c(25, 25, 25)
speed <- c(25, 50, 75)
data <- rep(speed, dist)
data
mean_speed <- mean(data)
mean_speed
library(psych)
harmonic_speed<-harmonic.mean(data)
harmonic_speed
print("Since speed has a fraction unit measure, the harmonic mean is the correct measure.")
```

2. **Import the data in R and find the mean, standard deviation and variance of wage and mode wage of the 65 employees**

```
>>data<-read.csv(file.choose(),sep = ",",header = T)
data3<-data
view(data3)
data3$f0 <- data.table::shift(data3$Frequency,1)
data3$f2 <- data.table::shift(data3$Frequency,-1)
data3$Low <- data3$Low - 0.5
data3$High <- data3$High + 0.5
mode_graph<-data3[which.max(data3$frecuency),]
l1<-mode_group$low
l2<-mode_group$high
f0<-mode_group$f0
f1<-mode_group$frequency
f2<-mode_group$f2
mode_value <- l1+((f1-f0)/(f1-f0+f1-f2)*(l2-l1))
mode_value
```

3. Import the data in R and find the median wage and mode wage of the 65 employees.

```
>>data<-read.csv(file.choose(),sep = ",",header = T)
data2<-data
data2$cumm<-cummsum(data2$frequency)
View(data2)
data2$pcf<-data.table::shift(data2$cumm,1)
data2$low<-data2$low - 0.05
data2$high<-data2$high + 0.05
N<-max(data2$cumm)
median_data<-data2[(data2$pcf <= N/2 & data2$cumm>= N/2), ]
median_data
l1<-median_data$low
l2<-median_data$high
pcf<-median_data$pcf
f<-median_data$frequency
median<-l1+((N/2-pcf)/f*(l2-l1))
median
```

4. Enter the following data sets in Excel:
a) 12, 6, 7, 3, 15, 10, 18, 5 b) 9, 3, 8, 8, 9, 8, 9, 18.
Import the data in R and find standard deviation and variance of the data sets using R

```
>>data<-data.frame(
  X1=c(12, 6, 7, 3, 15, 10, 18, 5),
  X2=c(9, 3, 8, 8, 9, 8, 9, 18)
)
print("Standard Deviaton of X1 and X2 are : ")
sd(input$X1)
sd(input$X2)
print("Variance of X1 and X2 are : ")
var(input$X1)
var(input$X2)
```

5. Import the data in R and write and program to find Pearson's first and second coefficients of skewness.

```
>>data<-data.frame(
x=c(0,1,2,3,4),
f1=c(10,5,2,2,1),
f2=c(1,2,14,2,1),
f3=c(1,2,2,5,10)
)
View(data)
getmode<-function(v){
uniqv<-unique(v)
uniqv[which.max(tabulate(match(v,uniqv)))]
}
attach(data)
mean1<-mean(rep(x,f1))
median1<-median(rep(x,f1))
mode1<-getmode(rep(x,f1))
sd1<-sd(rep(x,f1))
pearsonfirst1<-((mean1-median1)/sd1)
pearsonsecond1<-(3*(mean1-median1)/sd1)
pearsonfirst1
pearsonsecond1
attach(data)
mean2<-mean(rep(x,f2))
median2<-median(rep(x,f2))
mode2<-getmode(rep(x,f2))
sd2<-sd(rep(x,f2))
pearsonfirst2<-((mean2-median2)/sd2)
pearsonsecond2<-(3*(mean2-median2)/sd2)
pearsonfirst2
pearsonsecond2
attach(data)
mean3<-mean(rep(x,f3))
median3<-median(rep(x,f3))
mode3<-getmode(rep(x,f3))
sd3<-sd(rep(x,f3))
pearsonfirst3<-((mean3-median3)/sd3)
pearsonsecond3<-(3*(mean3-median3)/sd3)
pearsonfirst3
pearsonsecond3
```

6. Spades Diamonds Clubs Hearts
Observed 402 358 273 467
Expected 375 375 375 375
Enter the data in Excel. Import the date in R and write a program using chi-square test to determine if the discrepancies are significant. If the discrepancies are significant, then the game would not be fair.

```
>>Me<-data.frame(
  Spades=402, Diamonds=358,Clubs=273, Hearts=467
)
attach(Me)
result<-chisq.test(Me)
print(result)
if(result$p.value>=0.05){
  print("Null Hypothesis is Accepted")
}else{
  print("Null Hypothesis is Rejected")
}
```

7. Finance Sales HR Technology
Satisfied 12 38 5 8
Dissatisfied 7 19 3 1
Total 19 57 8 9
Enter the data in Excel. Import the date from Excel to R and write a program suing chi-square test to determine whether the results support or reject the business owner's prediction.

```
>>Me<-data.frame(
  Finance=c(12,7), sales=c(38,19),HR=c(5,3), Technology=c(8,1)
)
attach(Me)
result<-chisq.test(Me)
print(result)
if(result$p.value>=0.05){
  print("Null Hypothesis is Accepted")
}else{
  print("Null Hypothesis is Rejected")
}
```

8. a) What percentage play in fewer than 750 games? (b) What percentage play in more than 2000 games?
(c) Find the 90th percentile for the number of games played during a career.

```
>>print("What percentage play in fewer than 750 games")
pa<-pnorm(750, mean = 1500, sd = 350)
Percenta <- pa*100
print(Percenta)
print("What percentage play in more than 2000 games")
pb<-pnorm(2000, mean = 1500, sd = 350, lower.tail = FALSE)
Percentb <- pb*100
print(Percentb)
print("the 90th percentile for the number of games played during a career")
p05<-round(qnorm(0.05,mean = 1500, sd = 350),0)
p95<-round(qnorm(0.95,mean = 1500, sd = 350),0)
cat("Range for 90 Percentile is : ",p05,"-",p95)
```

9. **H 70 63 72 60 66 70 74 65 62 67 65 68**
W 155 150 180 135 156 168 178 160 132 145 139 152
Import the data in R and write a program to fit a least squares line using a) H as the independent Variable b) H as dependent variable

```
>>data<-data.frame(
  H<-c(70,63,72,60,66,70,74,65,62,67,65,68),
  W<-c(155,150,180,135,166,168,178,160,132,145,139,152)
)
print("H is independent variable")
reg<-lm(W~H)
reg
print("H is hependent variable")
reg<-lm(H~W)
reg
```

10. Year 2000 2001 2002 2003 2004 2005
Total 51246 53659 53115 59364 61383 62958
Import the data in R and perform the following (a) Graph the data and show the least-squares regression line. (b) Find and plot the trend line for the data.(c) Estimate the value of total agricultural exports in the year 2006.

```
>>
input<-data.frame(
  YEAR=c(2000,2001,2002,2003,2004,2005),
  TOTAL=c(51246,53659,53115,59364,61383,62958)
)
reg<-lm(TOTAL ~ YEAR,data = input)
print(reg)
plot(input$YEAR,input$TOTAL,type = "p", col = "blue", pch = 16, cex = 1.3,xlab = "Year",ylab
    = "Total Value",main = "total agricultural exports")
abline(reg,col = "red")
print("Estimate the value of total agricultural exports in the year 2006.")
newdata = data.frame(YEAR=2006)
predict(reg, newdata)
```

11. X 6 5 8 8 7 6 10 4 9 7
Y 8 7 7 10 5 10 8 6 8 6
Import the data in R and write programs for the following: (a) Find the least-squares regression line of Y on X. (b) Find the least-squares regression line of X on Y.

```
>>data<-read.csv(file.choose(),sep=",",header=T)
attach(data)
print("least regression line for y on x is")
lryx<-lm(y~x)
lryx
print("least regression line for y on x is")
lrxy<-lm(x~y)
lrxy
```

14.Write a program in R to create two matrices A and B of order 3 X 3 and perform the following operations:

```
>>Mat_A <- matrix(c(1,2,-1,3,4,5,3,-6,2),nrow = 3,byrow = TRUE)
Mat_A
Mat_B <- matrix(c(2,6,-1,-4,2,3,9,6,5),nrow = 3,byrow = TRUE)
Mat_B
#a.add a matrix A and B
Add_AB <- Mat_A+Mat_B
Add_AB
mul_ab <- Mat_A %*% Mat_B
mul_ab
inv_A <-solve(Mat_A)
inv_A
inv_B <-solve(Mat_B)
```

```
inv_B
tran_A <- t(Mat_A)
tran_A
tran_B <- t(Mat_B)
tran_B
```