

MAT1011 - LAB REPORT

Taran Mamidala

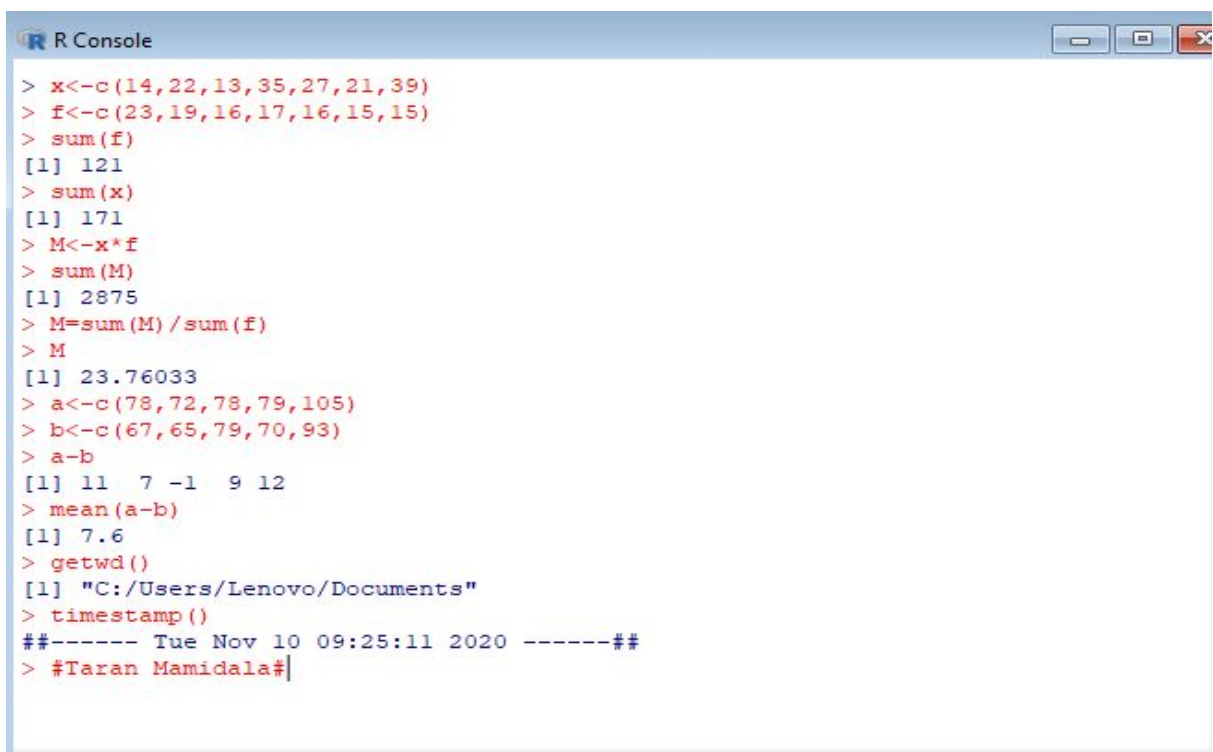
19BCE7346

LAB-1

Code :

```
x<-c(14,22,13,35,27,21,39)
f<-c(23,19,16,17,16,15,15)
sum(f)
sum(x)
M<-x*f
sum(M)
M=sum(M)/sum(f)
M
a<-c(78,72,78,79,105)
b<-c(67,65,79,70,93)
a-b
mean(a-b)
```

Execution :



```
R Console
> x<-c(14,22,13,35,27,21,39)
> f<-c(23,19,16,17,16,15,15)
> sum(f)
[1] 121
> sum(x)
[1] 171
> M<-x*f
> sum(M)
[1] 2875
> M=sum(M)/sum(f)
> M
[1] 23.76033
> a<-c(78,72,78,79,105)
> b<-c(67,65,79,70,93)
> a-b
[1] 11 7 -1 9 12
> mean(a-b)
[1] 7.6
> getwd()
[1] "C:/Users/Lenovo/Documents"
> timestamp()
##----- Tue Nov 10 09:25:11 2020 -----##
> #Taran Mamidala#
```

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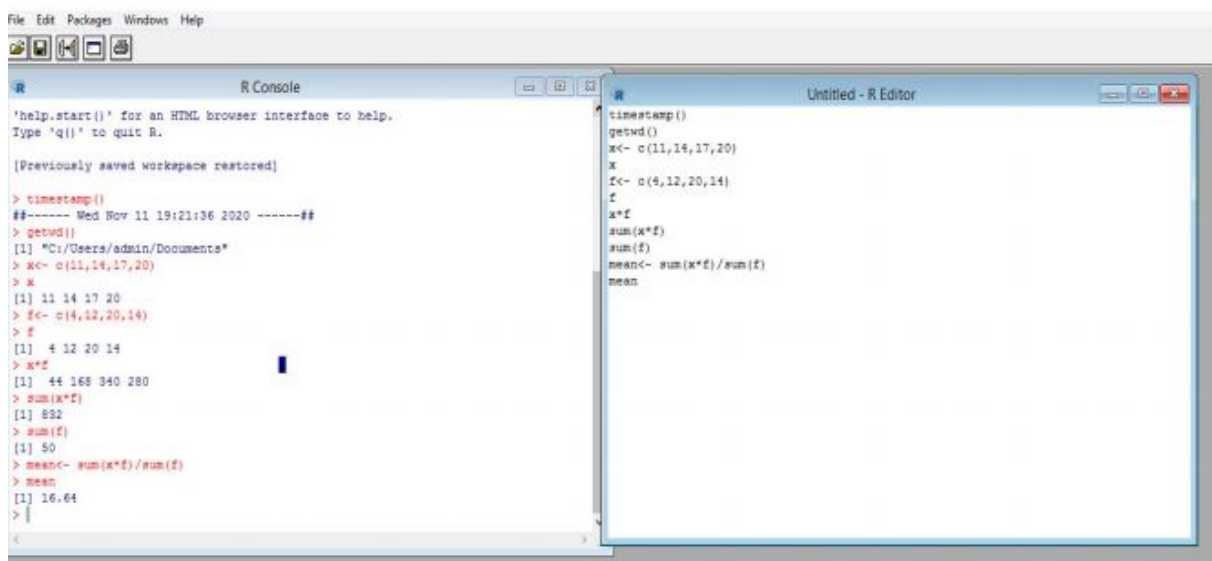
LAB-2 :

Write a code for calculating mean mode, variation for given group data problem using R

Code :

```
#MODE:
x <- c(21,53,52,72,31,34,21,73,71,26,83)
mean.result = mean(x)
print(mean.result)
#MODE:
Mode <- function(x){
  ux <- unique(x)
  ux [which.max(tabulate(match(x, ux)))]}
x <- c(21,53,52,72,31,34,21,73,71,26,83)
mode.result = mode(x)
print(mode.result)
#VARIANCE
Variance.result = var(x)
Print(variance.result)
```

Execution :



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```
> timestamp()
##----- Wed Nov 11 09:44:15 2020 -----##
> #mean
> x <- c(21,53,52,72,31,34,21,73,71,26,83)
> mean.result = mean(x)
> print (mean.result)
[1] 48.81818
> #mode
> mode <- function(x) {
+ ux <- unique(x)
+ ux[which.max(tabulate(match(x, ux)))]
+ }
> x <- c(21,53,52,72,31,34,21,73,71,26,83)
> mode.result = mode(x)
> print (mode.result)
[1] 21
> #variance
> variance.result = var(x)
> print (variance.result)
[1] 541.5636
>
> getwd()
[1] "C:/Users/Lenovo/Documents"
```

LAB-3 :

Reading a data file and working with it.

1. Read the file and store it in 'a'.
2. How many rows and columns are there in this table?
3. How to find the number of rows and number of columns by a single command?
4. What are the variables in the data file?
5. How to see the top or bottom few lines in this file?
6. if the number of columns is too large, again we may face the same problem. So how to see 1st 5 rows and 1st 3 columns
7. How to get 1st,3rd,6th,10th row and 2nd, 4th, 5th column?
8. How to get values in a specific row/column?

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	Price	FloorArea	Age	Height	CentralHeating
1	43.00	1225	30	6.2	no
2	54.75	1230	40	6.5	no
3	546.00	1200	30	5.2	no
4	35.00	1000	20	5.8	no
5	665.50	1420	40	5.2	yes
6	74.60	1450	30	5.7	no
7	53.00	1380	40	5.8	yes
8	727.00	1510	40	6.0	no
9	67.50	1400	50	6.1	no
10	69.75	1550	60	5.9	no
11	70.00	1720	50	5.7	yes

Code :

```
library(readxl)
house_data_2 <- read_excel("house_data_2.xlsx")
View(house_data_2)
library(readxl)
a <- read_excel("house_data_2.xlsx")
library(readxl)
nrow(a)
names(a)
Head(a)
Tail(a)
a[1:5,1:3]
a[c(1,3,6,10), c(2,4,5)]
a[1, ]
a[ ,3]
```

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Execution :

```

> library(readxl)
> house_data_2 <- read_excel("house_data_2.xlsx")
> view(house_data_2)
> library(readxl)
> a<-read_excel("house_data.xlsx")
Error: 'path' does not exist: 'house_data.xlsx'
> a<-read_excel("house_data_2.xlsx")
> library(readxl)
> dim(a)
[1] 20 5
> nrow(a)
[1] 20
> names(a)
> head(a)
# A tibble: 6 x 5
  Price FloorArea Age Height CentralHeating
  <dbl>    <dbl> <dbl>   <dbl> <chr>
1 43      1225    30     6.2 no
2 54.8    1230    40     6.5 no
3 546     1200    30     5.2 no
4 35      1000    20     5.8 no
5 666.    1420    40     5.2 yes
6 74.6    1450    30     5.7 no
> tail(a)
# A tibble: 6 x 5
  Price FloorArea Age Height CentralHeating
  <dbl>    <dbl> <dbl>   <dbl> <chr>
1 81.2    1830    42     6.1 yes
2 82.5    1790    13     5.2 yes
3 86.2    2010    52     5.6 yes
4 87.5    2000    42     5.9 yes
5 88      2100    52     6.2 yes
6 92      2240    12     6.3 yes
> a[1:5,1:3]
# A tibble: 5 x 3
  Price FloorArea Age
  <dbl>    <dbl> <dbl>
1 43      1225    30
2 54.8    1230    40
3 546     1200    30
4 35      1000    20
5 666.    1420    40
> a[c(1,3,6,10),c(2,4,5)]
# A tibble: 4 x 3
  FloorArea Height CentralHeating
  <dbl>    <dbl> <chr>
1 1225     6.2 no
2 1200     5.2 no
3 1450     5.7 no

```

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```

4      1550      5.9 no
> a[1,]
# A tibble: 1 x 5
  Price FloorArea Age Height CentralHeating
  <dbl>      <dbl> <dbl>   <dbl>   <chr>
1    43      1225   30     6.2    no
> a[,3]
# A tibble: 20 x 1
  Age
  <dbl>
1    30
2    40
3    30
4    20
5    40
6    30
7    40
8    40
9    50
10   60
11   50
12   20
13   32
14   25
15   42
16   13
17   52
18   42
19   52
20   12

> timestamp()
##----- Fri Nov 13 12:53:15 2020 -----##
> getwd()
[1] "C:/Users/Lenovo/Documents"

```

LAB-4 :

PLOT(X,Y) – Eg : 1

```

x <- seq(-10, 10, length = 100)
y <- x^4
plot(x,y)

```

Execution :

```

> timestamp()
##----- Tue Nov 17 09:38:14 2020 -----##
> x <- seq(-10, 10, length = 100)
> y <- x^4
> plot(x,y)

> getwd()
[1] "C:/Users/Lenovo/Documents"

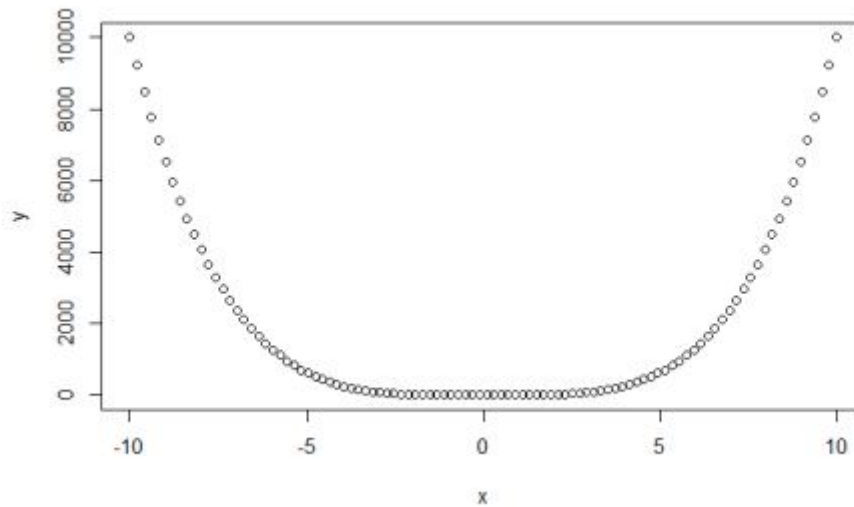
```

Graph :

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**PLOT(X,Y) – Eg : 2****Code :**

```
x <- seq(-20, 20, length = 200)
y <- cos(x)
plot(x,y)
```

Execution :

```
> timestamp()
##----- Tue Nov 17 09:42:53 2020 -----##
> x <- seq(-20, 20, length = 200)
> y <- cos(x)
> plot(x,y)

> getwd()
[1] "C:/Users/Lenovo/Documents"
> #taran mamidala

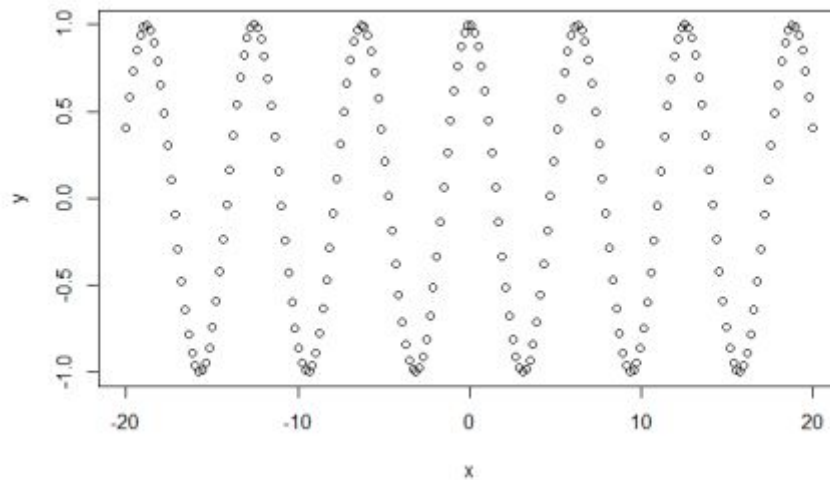
> getwd()
[1] "C:/Users/Lenovo/Documents"
> #taran mamidala
```

OUTPUT :

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Persp(x,y,z) : x^3+y^3

Code :

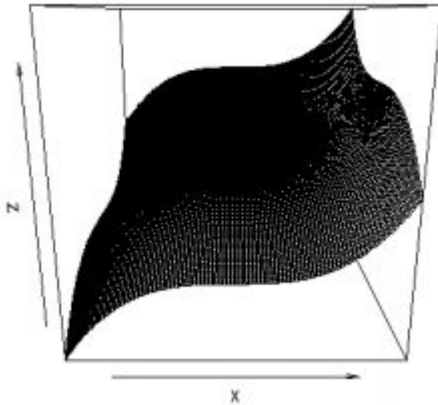
```
N <- function(x,y) x^(3)+y^(3)
x <- y <- seq(-7,7,length=200)
z <- Outer(x,y,N)
Persp(x,y,z)
```

Execution :

```
> timestamp()
##----- Tue Nov 17 09:46:30 2020 -----##
> N <- function(x,y) x^(3)+y^(3)
> x <- y <- seq(-7,7,length=200)
> z <- outer(x,y,N)
> persp(x,y,z)

> getwd()
[1] "C:/Users/Lenovo/Documents"
> #taran mamidala
```

OUTPUT :



$\text{Persp}(x,y,z) : \exp(x^2+y^2)$

Code :

```
N <- function(x,y) exp(x^{3}+y^{3})
x <- y <- seq(-7,7,length=200)
z <- Outer(x,y,N)
Persp(x,y,z)
Library(ployly)
Plot_ly(x=x,y=y,z=z)%>% add_surface()
```

Execution :

```
> timestamp()
##----- Tue Nov 17 11:07:03 2020 -----##
> N <- function(x,y) exp(x^{3}+y^3)
> x <- y <- seq(-3,3,length=100)
> z <- outer(x,y,N)
> persp(x,y,z)
> library(plotly)
> plot_ly(x=x,y=y,z=z)%>% add_surface()
>

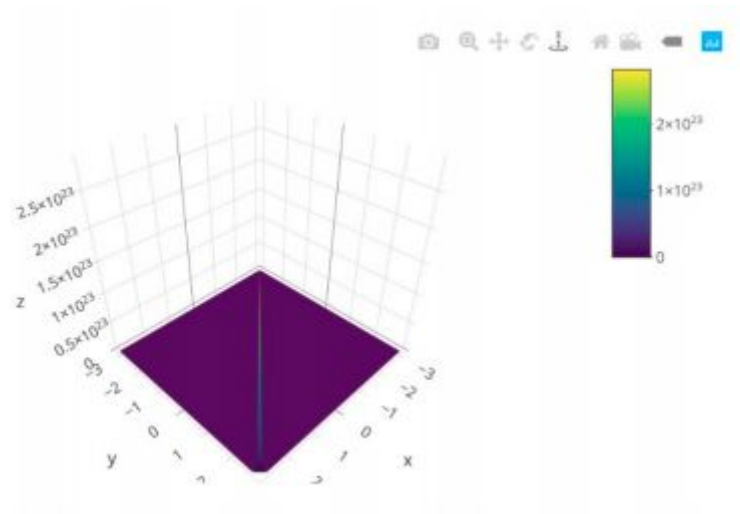
> getwd()
[1] "C:/Users/Lenovo/Documents"
> #taran mamidala
```

Graph :

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Bar Plot:

Code :

```
Age <- c(21, 19, 20, 20, 18, 19, 20, 20, 17, 18)
Table(age)
Barplot(table(age))
Main="Age count of 10 students"
Xlab="Age",
Ylab="count",
Border="black",
Col="blue",
Density=15
)
```

Execution :

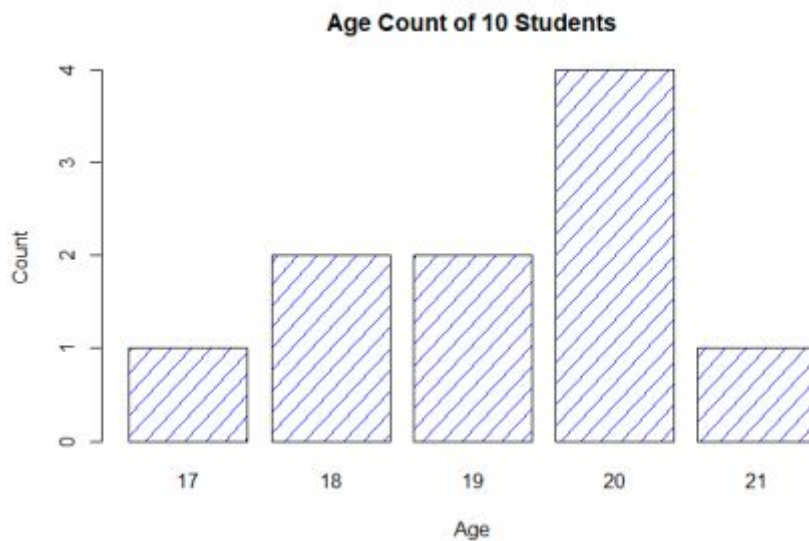
```
> timestamp()
##----- Tue Nov 17 11:16:36 2020 -----##
> age <- c(21,19,20,20,18,19,20,20,17,18)
> table(age)
age
17 18 19 20 21
 1  2  2  4  1
> barplot(table(age),
+ main="Age Count of 10 Students",
+ xlab="Age",
+ ylab="Count",
+ border="black",
+ col="blue",
+ density=15
+ )
> getwd()
[1] "C:/Users/Lenovo/Documents"
> #taran mamidala
```

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OUTPUT :



Box Plot :

Code :

```
Set.seed(8642)
X <- rnorm(1000)
Y <- runif(1000)
Z <- rpois(1000, 3)
Data <- data.frame(values = c(x,y,z),
  Group = c(rep("x", 1000),
    rep("y", 1000),
    rep("z", 1000)))
boxplot(values ~ group.data,
  main = "My Boxplots",
  xlab = "My Boxplot Groups",
  ylab = "The vales of my Boxplots")
```

Execution :

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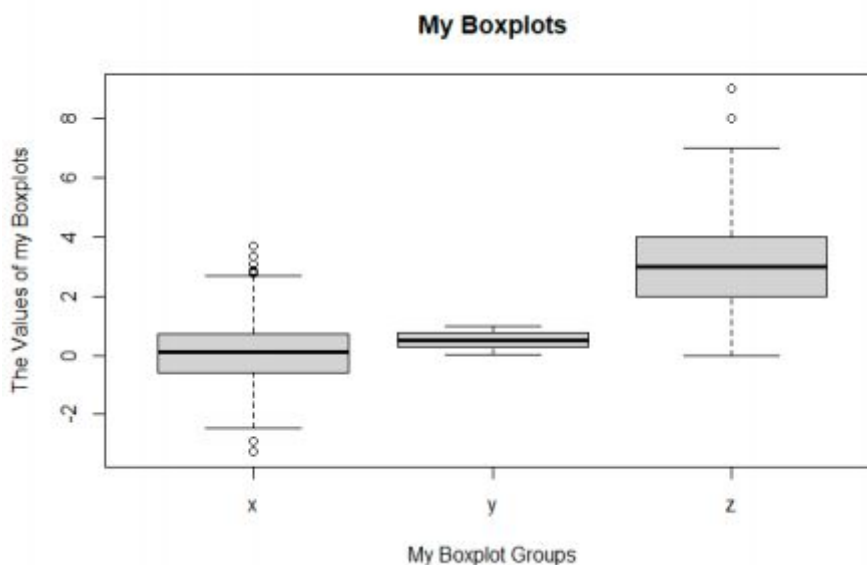
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```

Console Terminal Jobs
~/
> set.seed(8642)
> x <- rnorm(1000)
> y <- runif(1000)
> z <- rpois(1000, 3)
> data <- data.frame(values = c(x,y,z),
+ group = c(rep("x", 1000),
+ rep("y", 1000),
+ rep("z", 1000)))
> head(data)
  values group
1 -0.8035458   x
2  0.6384819   x
3 -0.1417869   x
4  2.1542073   x
5 -0.1220888   x
6 -0.7332229   x
> boxplot(values ~ group,data,
+ main = "My Boxplots",
+ xlab = "My Boxplot Groups",
+ ylab = "The Values of my Boxplots")
>
> getwd()
[1] "C:/Users/Lenovo/Documents"
> #taran mamidala

```

Output :



Pie Chart:

Code :

```

x <- c(10, 12, 14, 16, 6)
lbls <- c("cat", "Dog", "fish", "rabbit", "horse")
pie3D(x, labels = lbls, explode = 0.1, main = "pie chart of Animals")

```

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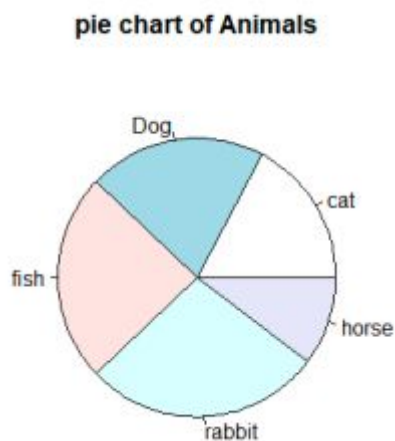
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```
library(plotrix)
```

Execution :

```
Console Terminal x Jobs x  
~/  
> x <- c(10, 12, 14, 16, 6)  
> lbls <- c("cat", "Dog", "fish", "rabbit", "horse")  
> pie(x, labels = lbls, main = "pie chart of Animals")  
> library(plotrix)  
> |
```

OUTPUT :



3D Pie Chart :

Code :

```
x <- c(10, 12, 14, 16, 6)  
lbls <- c("cat", "Dog", "fish", "rabbit", "horse")  
pie3D(x, labels = lbls, explode = 0.1, main = "pie chart of Animals")
```

Execution :

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```
Console Terminal x Jobs x  
~/  
> x <- c(10, 12, 14, 16, 6)  
> lbls <- c("cat", "Dog", "fish", "rabbit", "horse")  
> pie3D(x, labels = lbls, explode=0.1, main = "pie chart of Animals")  
> |
```

OUTPUT :



Curve :

Code :

```
Curve(expr = cos, from = 0, to = 6*pi)
```

Execution :

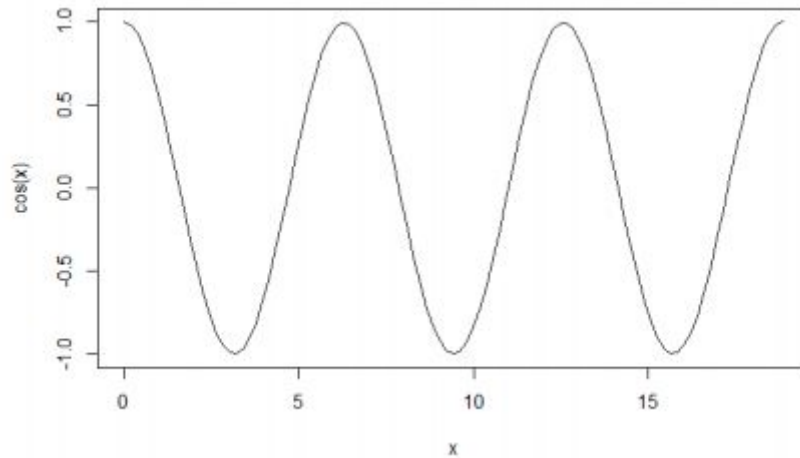
```
Console Terminal x Jobs x  
~/  
> curve(expr = cos, from = 0, to = 6*pi)  
> |
```

OUTPUT :

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Probability Distribution :

Code :

```
Probability <- rep(1/6, 6)
Plot(probability,
Xlab = "outcomes",
Main = "Probability Distribution")
```

Execution :

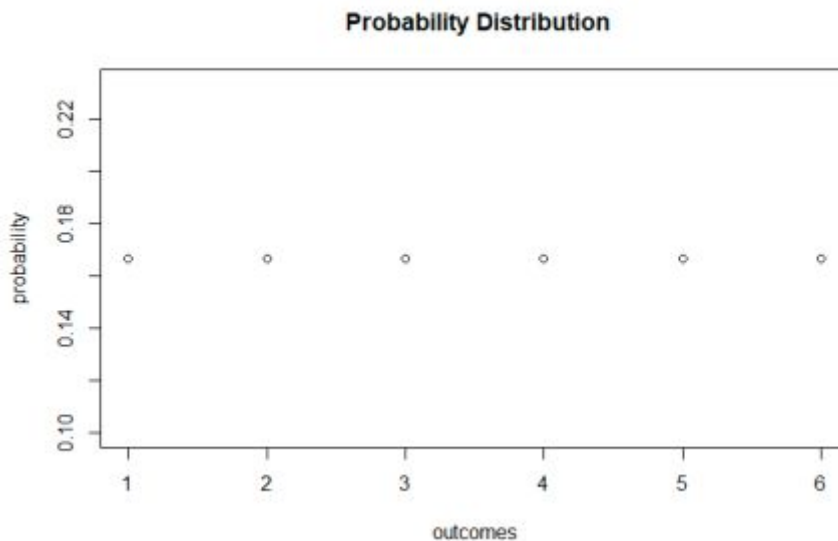
```
Console  Terminal x  Jobs x
~/
> probability <- rep(1/6, 6)
> plot(probability,
+ xlab = "outcomes",
+ main = " Probability Distribution")
> |
```

OUTPUT :

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Cumulative Distribution:

Code :

```
cum_probability <- cumsum(probability)
plot(Cum_probability,
     xlab = "outcomes",
     main = "Cumulative Probability Distribution")aa
```

Execution :

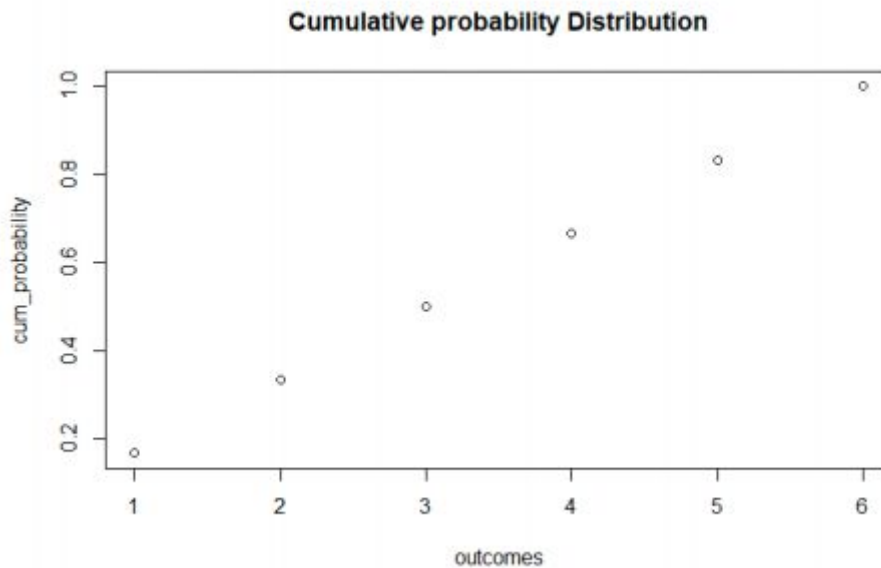
```
> timestamp()
##----- Wed Nov 18 18:02:39 2020 -----##
> probability <- rep(1/6, 6)
> plot(probability,
+ xlab = "outcomes",
+ main = "probability Distribution")
> cum_probability <- cumsum(probability)
> plot(cum_probability,
+ xlab = "outcomes",
+ main = "Cumulative probability Distribution")
> |
```

OUTPUT :

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LAB-5 :

Suppose there are 12 multiple choice questions in an English class quiz. Each question has five possible answers, and only one of them is correct. Now if a student attempts to every question at random:

1. Find the probability of having four or less correct answers $P(x \leq 4)$
2. Find $p(x=3)$
3. Find $P(2 \leq x \leq 4)$

Code :

```
#P(x<=4)
pbinom(4,size=12,prob=0.2,lower.tail=TRUE)
#P(X=3)
pbinom(3,size=12,prob=0.2)
#P(2<x<4)
(1-pbinom(3,12,0.2,lower.tail=FALSE))-(pbinom
(2,12,0.2,lower.tail=TRUE))
#3 Random Numbers
rbinom(3,size=12,prob=0.2)
#p(x>=4)
1-pbinom(4,size=12,prob=0.2,lower.tail=TRUE)
```

Execution :

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```

> timestamp()
##----- Wed Nov 18 16:18:57 2020 -----##
> #P(x<=4)
>
> pbinom(4,size=12,prob=0.2,lower.tail=TRUE)
[1] 0.9274445
> #P(X=3)
> pbinom(3,size=12,prob=0.2)
[1] 0.7945689
> #P(2<x<4)
> (1-pbinom(3,12,0.2,lower.tail=FALSE))-(pbinom (2,12,0.2,lower.tail=TRUE))
[1] 0.2362232
> #3 Random Numbers
> rbinom(3,size=12,prob=0.2)
[1] 1 3 1
> #p(x>=4)
> 1-pbinom(4,size=12,prob=0.2,lower.tail=TRUE)
[1] 0.0725555
> |

> getwd()
[1] "C:/Users/Lenovo/Documents"
> #taran mamidala

```

LAB-5 :

1. In a certain industrial facility, accidents occur infrequently. It is known that the probability of an accident on any given day is 0.005 and accidents are independent of each other.

(a) What is the probability that in any given period of 400 days there will be an accident on one day?

(b) What is the probability that there are at most three days with an accident?

Code :

```

x=seq(20,80,length=200)
y=dnorm(x,mean=50,sd=10)
plot(x,y,type="l")
x=seq(-3,3,length=200)
y=dnorm(x,mean=0,sd=1)
plot(x,y,type="l")
x=seq(-3,0,length=100)
y=dnorm(x,mean=0,sd=1)
polygon(c(-3,x,0),c(0,y,0),col="red")
pnorm(0,mean=0,sd=1)

```

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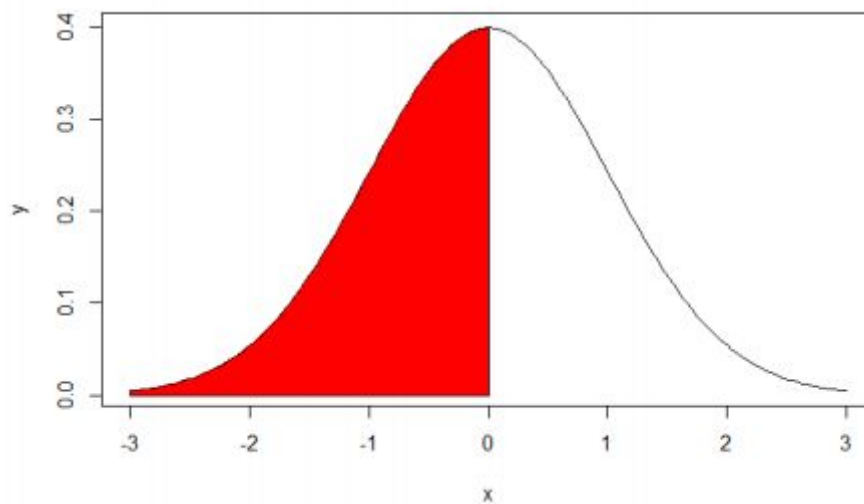
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Execution :

```
Console Terminal x Jobs x
~/
> x=seq(20,80,length=200)
> y=dnorm(x,mean=50,sd=10)
> plot(x,y,type="l")
> x=seq(-3,3,length=200)
> y=dnorm(x,mean=0,sd=1)
> plot(x,y,type="l")
> x=seq(-3,0,length=100)
> y=dnorm(x,mean=0,sd=1)
> polygon(c(-3,x,0),c(0,y,0),col="red")
> pnorm(0,mean=0,sd=1)
[1] 0.5
> getwd()
[1] "C:/Users/Lenovo/Documents"
> #taran mamidala
```

OUTPUT :



2. Plot the PDF and CDF for poisson distribution.

Code :

```
Occurrence <- 0:20
plot(Occurrence , dpois(Occurrence, lamda=5),
type='h',
main='poison Distribution (lamda = 5)',
ylab = 'probability',
```

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```
xlab = '# Occurence',lwd=3)
```

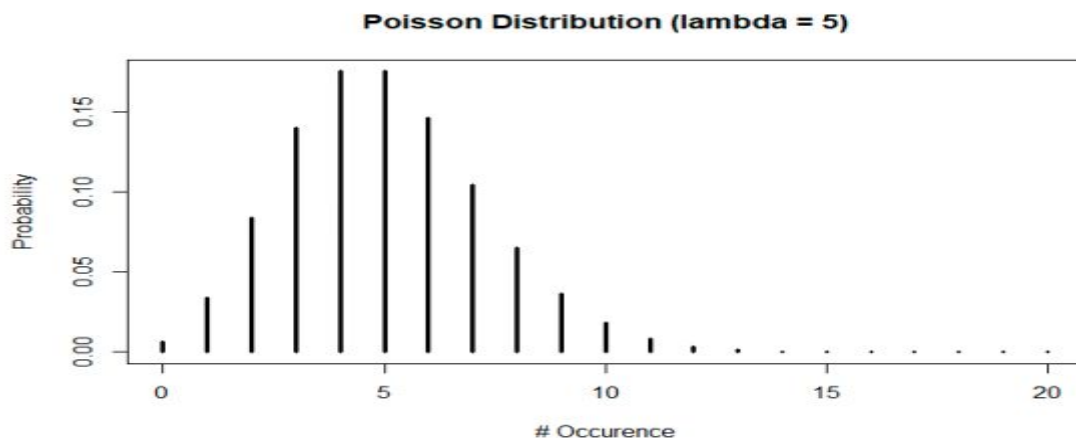
Execution :

```

Console Terminal x Jobs x
~ / 
> Occurence <- 0:20
> plot(Occurence, dpois(Occurence, lambda=5),
+ type='h',
+ main='Poisson Distribution (lambda = 5)',
+ ylab='Probability',
+ xlab='# Occurence',
+ lwd=3)
> |

```

OUTPUT :



LAB-7 :

1. (solve the problem using R software) The serum cholesterol level X in 14-year old boys has approximately a normal distribution with mean 170 and standard deviation 30.

(a) Find the probability that the serum cholesterol level of a randomly chosen 14-Year old boy exceeds 230.

Code :

```

x=seq(90,250,length=200)
y=dnorm(x,mean=170,sd=30)
plot(x,y,type="l")
x=seq(230,250,length=100)
y=dnorm(x,mean=170,sd=30)

```

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```

polygon(c(230,x,250),c(0,y,0),col="red")
1-pnorm(230,mean=170,sd=30)

```

Execution :

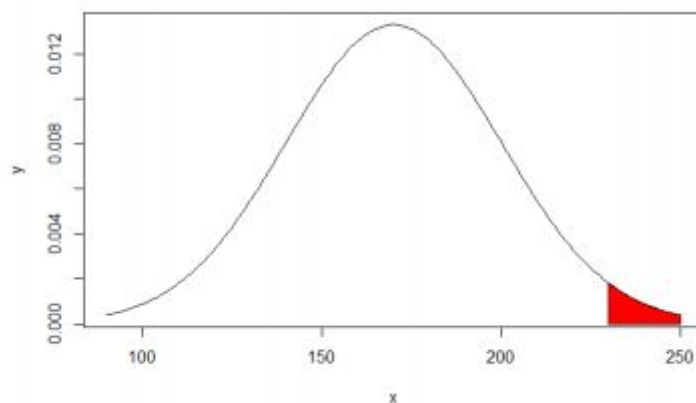
```

~/
> x=seq(90,250,length=200)
> y=dnorm(x,mean=170,sd=30)
> plot(x,y,type="l")
> x=seq(230,250,length=100)
> y=dnorm(x,mean=170,sd=30)
> polygon(c(230,x,250),c(0,y,0),col="red")
> 1-pnorm(230,mean=170,sd=30)
[1] 0.02275013

> getwd()
[1] "C:/Users/Lenovo/Documents"
> #taran mamidala
> timestamp()
##----- Wed Nov 25 15:51:45 2020 -----##

```

OUTPUT :



(b) In a middle school there are 300, 14-year-old boys. Find the probability that at Least 8 boys have serum cholesterol level that exceeds 230.

Code :

```

x=seq(90,250,length=100)
y=dnorm(x,mean=6.84,sd=2.58)
plot(x,y,type="l")
x=seq(230,250,length=100)
y=dnorm(x,mean=6.84,sd=2.58)
polygon(c(230,x,250),c(0,y,0),col="yellow")

```

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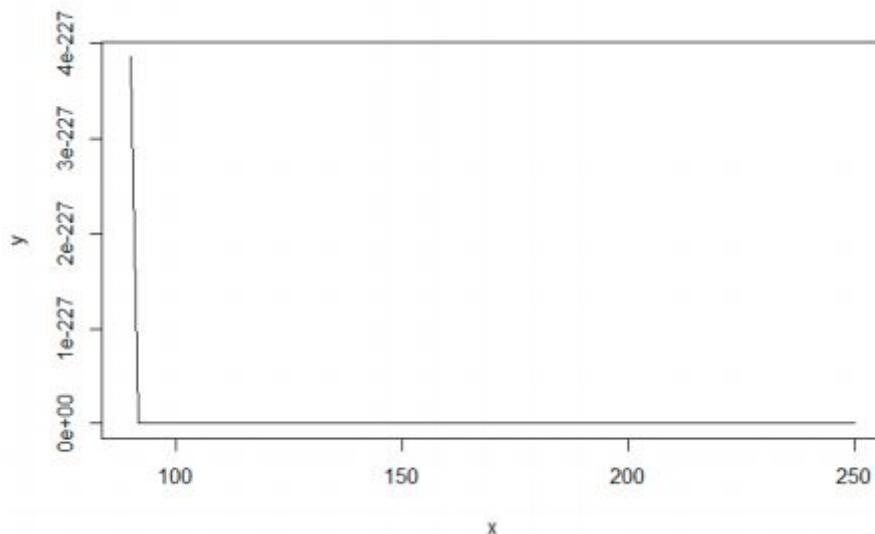
19BCE7346

```
1-pnorm(7.5,mean=6.84,sd=2.58)
```

Execution :

```
> x=seq(90,250,length=100)
> y=dnorm(x,mean=6.84,sd=2.58)
> plot(x,y,type="l")
> x=seq(230,250,length=100)
> y=dnorm(x,mean=6.84,sd=2.58)
> polygon(c(230,x,250),c(0,y,0),col="yellow")
> 1-pnorm(7.5,mean=6.84,sd=2.58)
[1] 0.3990472
>
```

OUTPUT :



2. Lifetimes of batteries in a certain application are normally distributed with mean 50 hours and standard deviation 5 hours. Find the probability that a randomly chosen battery lasts between 42 and 52 hours.

Code :

```
x=seq(40,60,length=200)
y=dnorm(x,mean=50,sd=5)
plot(x,y,type="l")
x=seq(42,52,length=100)
y=dnorm(x,mean=50,sd=5)
polygon(c(42,x,52),c(0,y,0),col="red")
```

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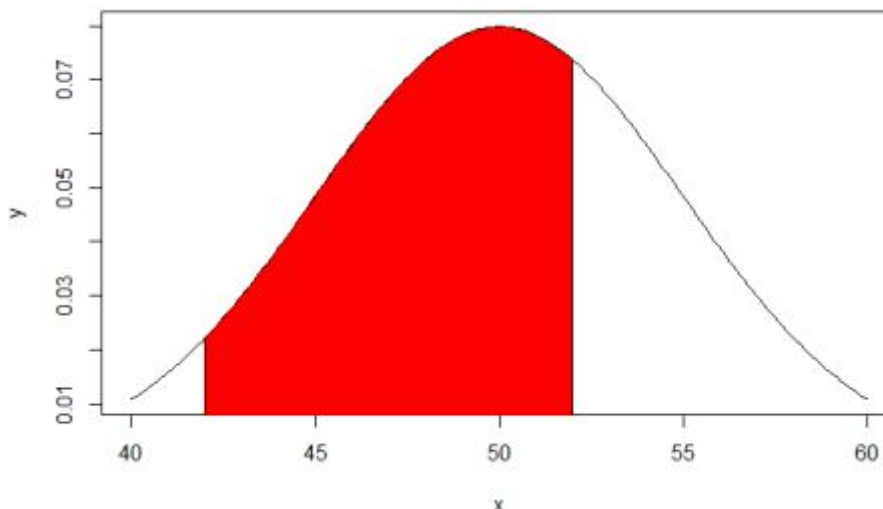
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```
pnorm(52,mean=50,sd=5)-pnorm(42,mean=50,sd=5)
```

Execution :

```
Console Terminal x Jobs x
~/
> x=seq(40,60,length=200)
> y=dnorm(x,mean=50,sd=5)
> plot(x,y,type="l")
> x=seq(42,52,length=100)
> y=dnorm(x,mean=50,sd=5)
> polygon(c(42,x,52),c(0,y,0),col="red")
> pnorm(52,mean=50,sd=5)-pnorm(42,mean=50,sd=5)
[1] 0.6006224
>
```

OUTPUT :



3. The speed of a file transfer from a server on campus to a personal computer at a students home on a weekday evening is normally distributed with a mean of 60 kilobits per second and a standard deviation of four kilobits per second.

(a) What is the probability that the file will transfer at a speed of 68 kilobits per second or more?

Code :

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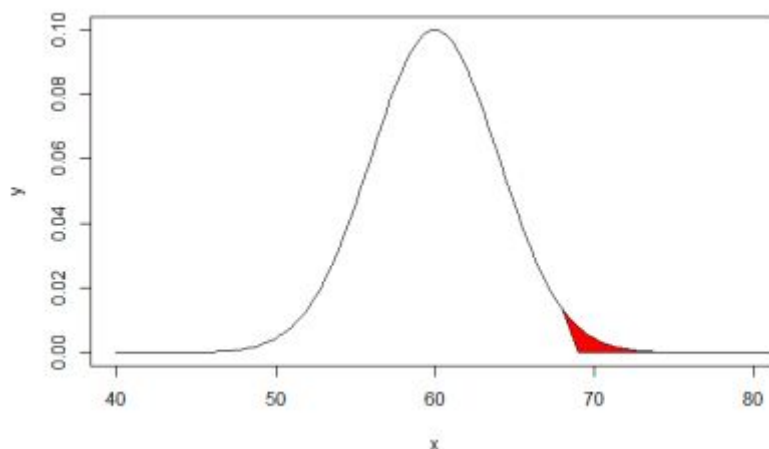
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```
x=seq(40,80,length=150)
y=dnorm(x,mean=60,sd=4)
plot(x,y,type="l")
x=seq(68,100,length=150)
y=dnorm(x,mean=60,sd=4)
polygon(c(69,x,100),c(0,y,0),col="red")
pnorm(68,mean=60,sd=4,lower.tail=TRUE)
```

Execution :

```
> timestamp()
##----- Wed Nov 25 16:25:23 2020 -----##
> x=seq(40,80,length=150)
>
> y=dnorm(x,mean=60,sd=4)
> plot(x,y,type="l")
> x=seq(68,100,length=150)
> y=dnorm(x,mean=60,sd=4)
> polygon(c(69,x,100),c(0,y,0),col="red")
> pnorm(68,mean=60,sd=4,lower.tail=TRUE)
[1] 0.9772499
> |
```

OUTPUT :



(b) What is the probability that the file will transfer at a speed of less than 55 kilobits per second?

Code :

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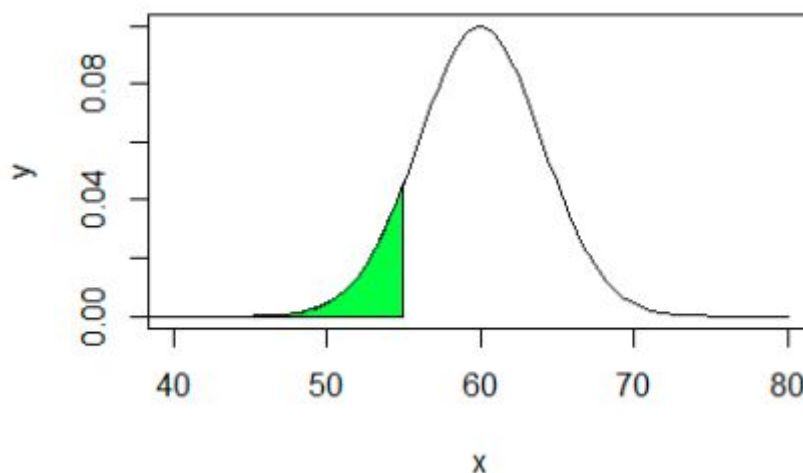
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```
x=seq(40,80,length=150)
y=dnorm(x,mean=60,sd=4)
plot(x,y,type="l")
x=seq(10,55,length=150)
y=dnorm(x,mean=60,sd=4)
polygon(c(10,x,55),c(0,y,0),col="green")
pnorm(55,mean=60,sd=4,lower.tail=TRUE)
```

Execution :

```
> timestamp()
##----- Wed Nov 25 16:28:39 2020 -----##
> x=seq(40,80,length=150)
>
> y=dnorm(x,mean=60,sd=4)
> plot(x,y,type="l")
> x=seq(10,55,length=150)
> y=dnorm(x,mean=60,sd=4)
> polygon(c(10,x,55),c(0,y,0),col="green")
> pnorm(55,mean=60,sd=4,lower.tail=TRUE)
[1] 0.1056498
> |
```

OUTPUT :



4. Using R software draw normal curve, use a mean=50 and a standard deviation=10.

Code ::

```
x <- seq(-20, 20, by = .1)
```

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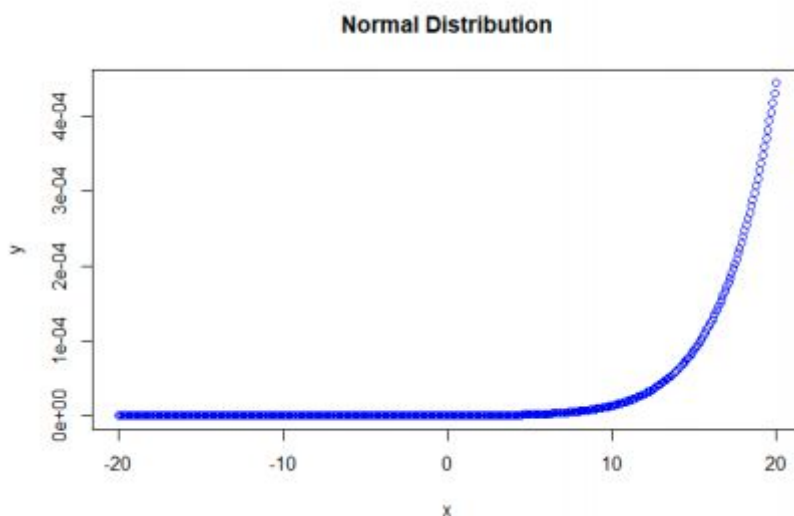
19BCE7346

```
y <- dnorm(x, mean = 50, sd = 10)
plot(x,y, main = "Normal Distribution", col = "blue")
```

Execution :

```
Console Terminal x Jobs x
~/
> x <- seq(-20, 20, by = .1)
>
> y <- dnorm(x, mean = 50, sd = 10)
> plot(x,y, main = "Normal Distribution", col = "blue")
>
```

OUTPUT :



5. Plot chi square distribution PDF and CDF using R software.

Chi Square Distribution PDF :

Code :

```
curve(dchisq(x, df = 10), from = 0, to = 40,
main = 'Chi-Square Distribution (df = 10)',
ylab = 'Density',
lwd = 2, #increase
col = 'steelblue')
```

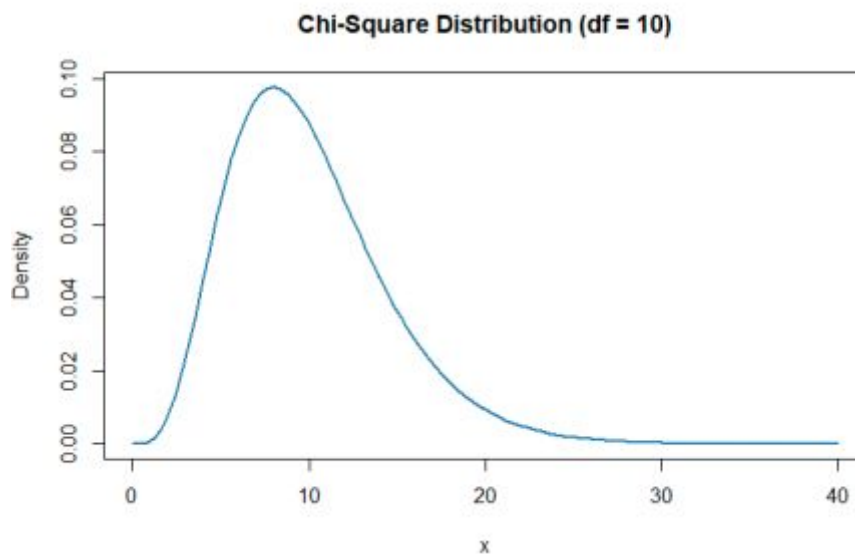
Execution :

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```
> timestamp()
##----- Thu Nov 26 18:20:20 2020 -----##
> curve(dchisq(x, df = 10), from = 0, to = 40,
+
+ main = 'Chi-Square Distribution (df = 10)',
+ ylab = 'Density',
+ lwd = 2, #increase
+ col = 'steelblue')
> |
```

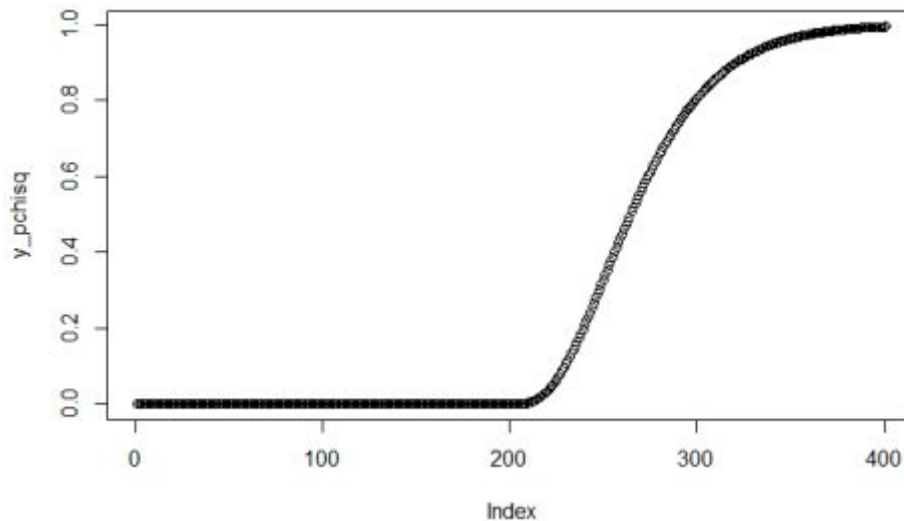
OUTPUT :**Chi Square Distribution CDF :****Code :**

```
x_pchisq <- seq(-20, 20, by = 0.1)
y_pchisq <- pchisq(x_pchisq, df = 7)
plot(y_pchisq)
```

Execution :

```
Console Terminal x Jobs x
~/
> x_pchisq <- seq(-20, 20, by = 0.1)
>
> y_pchisq <- pchisq(x_pchisq, df = 7)
> plot(y_pchisq)
```

OUTPUT :



6. Plot F-distribution PDF and CDF using R software.

CODE :

```
x=seq(-3,3,length=200)
y=dnorm(x,mean=0,sd=1)
plot(x,y,type="l")
x=seq(2,3,length=100)
y=dnorm(x,mean=0,sd=1)
polygon(c(2,x,3),c(0,y,0),col="red")
1-pnorm(2,mean=0,sd=1)
```

Execution :

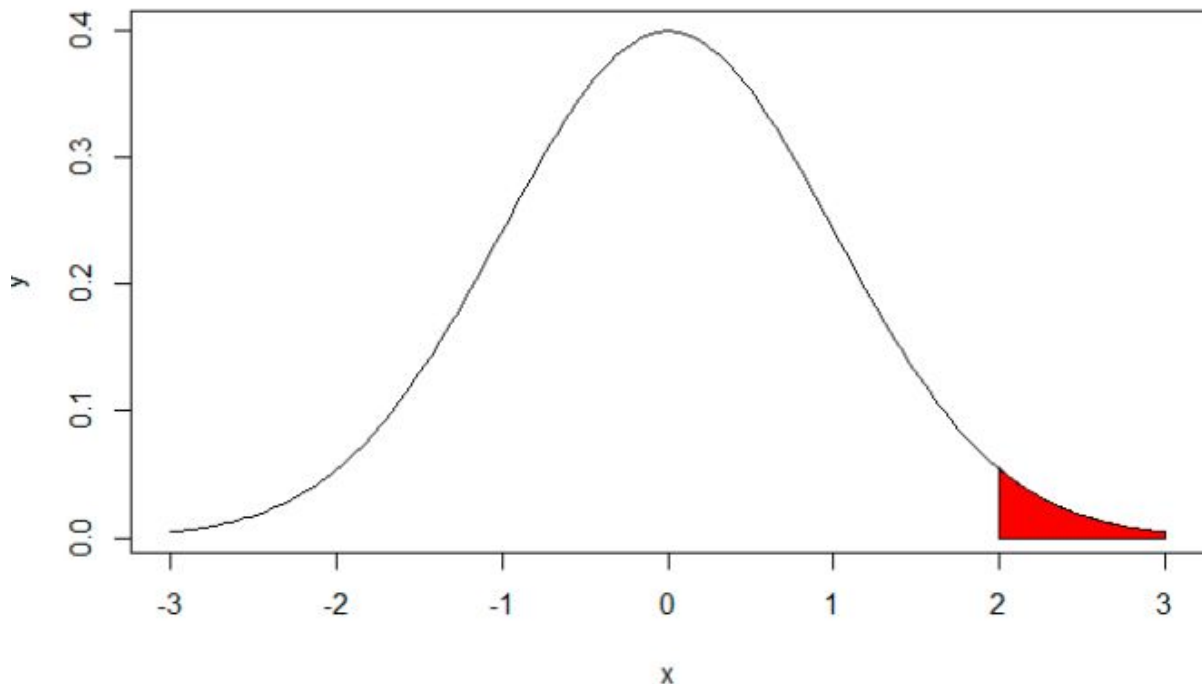
```
Console Terminal x Jobs x
~/
> x=seq(-3,3,length=200)
> y=dnorm(x,mean=0,sd=1)
> plot(x,y,type="l")
> x=seq(2,3,length=100)
> y=dnorm(x,mean=0,sd=1)
> polygon(c(2,x,3),c(0,y,0),col="red")
> 1-pnorm(2,mean=0,sd=1)
[1] 0.02275013
> |
```

OUTPUT :

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LAB-8 :

Find , 1. Scatter Plot

2. Finding True regression line

3. Plot regression line and predict the value of y for given x=90 for following problem

The cetane number is a critical property in specifying the ignition quality of a fuel used in a diesel engine. Determination of this number for a biodiesel fuel is expensive and time-consuming. The article Relating the Cetane Number of Biodiesel Fuels to Their Fatty Acid Composition: A Critical Study (J. of Automobile Engr.,2009: 565583) included the following data on x = iodine value (g) and y = cetane number for a sample of 14 biofuels. The iodine value is the amount of iodine necessary to saturate a sample of 100 g of oil. The data are shown in the table below:

x	132	129	120	113.2	105	92	84	83.2	88.4	59	80
y	46	48	51	52.1	54	52	59	58.7	61.6	64	61.4

Code :

```
x<-c(132.0,129.0,120.0,113.2,105.0,92.0,84.0,83.2,88.4,59.0,80.0,81.5,
71.0,69.2)
x
y<-c(46.0,48.0,51.0,52.1,54.0,52.0,59.0,58.7,61.6,64.0,61.4,54.6,58.8,
58.0)
y
plot(x,y,main="19BCE7346 Scatter
```

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```

plot",xlab="x",ylab="y",pch=19,frame=FALSE)
Sxx=sum(x*2)-(((sum(x))^2)/14)
Sxx
Sxy=sum(x*y)-((sum(x))/14)
Sxy
Sxy=sum(x*y)-((sum(x)*sum(y))/14)
Sxy
b1=Sxy/Sxx
b1
b0=mean(y)-(b1)*mean(x)
b0
plot(x,y,main="19BCE7346",col = "cyan",
abline(lm(y~x)),cex=1.3,pch=19)
plot(x,y,main="19BCE7346
Scatterplot",xlab="x",ylab="y",pch=19,frame=FALSE)

```

Execution :

```

> x<-c(132.0,129.0,120.0,113.2,105.0,92.0,84.0,83.2,88.4,59.0,80.0,81.5,71.0,69.2)
> x
[1] 132.0 129.0 120.0 113.2 105.0 92.0 84.0 83.2 88.4 59.0 80.0 81.5
[13] 71.0 69.2
> y<-c(46.0,48.0,51.0,52.1,54.0,52.0,59.0,58.7,61.6,64.0,61.4,54.6,58.8,58.0)
> y
[1] 46.0 48.0 51.0 52.1 54.0 52.0 59.0 58.7 61.6 64.0 61.4 54.6 58.8 58.0
> plot(x,y,main="19BCE7346 Scatter
+ plot",xlab="x",ylab="y",pch=19,frame=FALSE)
> Sxx=sum(x*2)-((sum(x))^2)/14)
> Sxx
[1] -119496.2
> Sxy=sum(x*y)-((sum(x))/14)
> Sxy
[1] 71253.91
> Sxy=sum(x*y)-((sum(x)*sum(y))/14)
> Sxy
[1] -1424.414
> b1=Sxy/Sxx
> b1
[1] 0.01192017
> b0=mean(y)-(b1)*mean(x)
> b0
[1] 54.54388
> plot(x,y,main="19BCE7346",col = "cyan",
+ abline(lm(y~x)),cex=1.3,pch=19)
> plot(x,y,main="19BCE7346 Scatterplot",xlab="x",ylab="y",pch=19,frame=FALSE)|

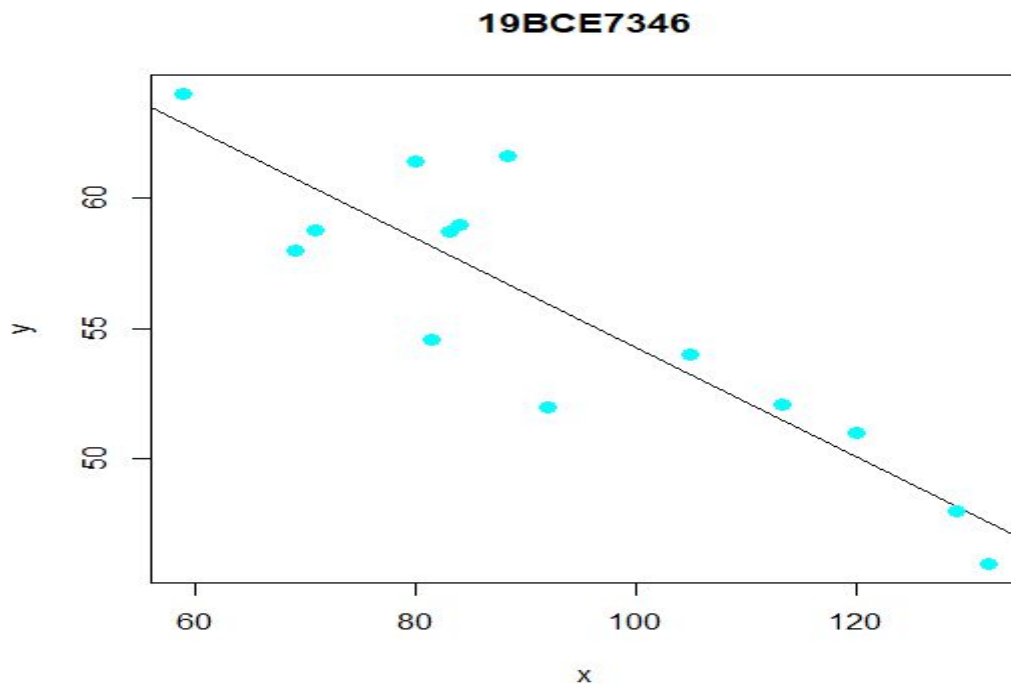
```

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OUTPUT : OUTPUT :



Code :

```
x<-c(132.0,129.0,120.0,113.2,105.0,92.0,84.0,83.2,88.4,59.0,80.0,81.5,
71.0,69.2)
x
y<-c(46.0,48.0,51.0,52.1,54.0,52.0,59.0,58.7,61.6,64.0,61.4,54.6,58.8,
58.0)
y
plot(x,y,main="19BCE7346 scatter plot", xlab="x", ylab="y",
pch=19,frame=FALSE)
sxx=sum(x*2)-(((sum(x))^2)/14)
sxx
sxy=sum(x*y)-((sum(x))/14)
sxy
sxy=sum(x*y)-((sum(x)*sum(y))/14)
sxy
b1=sxy/sxx
b1
b0=mean(y)-(b1)*mean(x)
b0
plot(x,y,main="19BCE7346",col="cyan",abline(lm(y~x)),cex=1.3,pch=19)
plot(x,y,main="19BCE7346
scatterplot",xlab="x",ylab="y",pch=19,frame=FALSE)
```

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```
plot(x,y,main="19BCE7346",col="cyan",abline(lm(y~x)),cex=1.3,pch=19)
```

Execution :

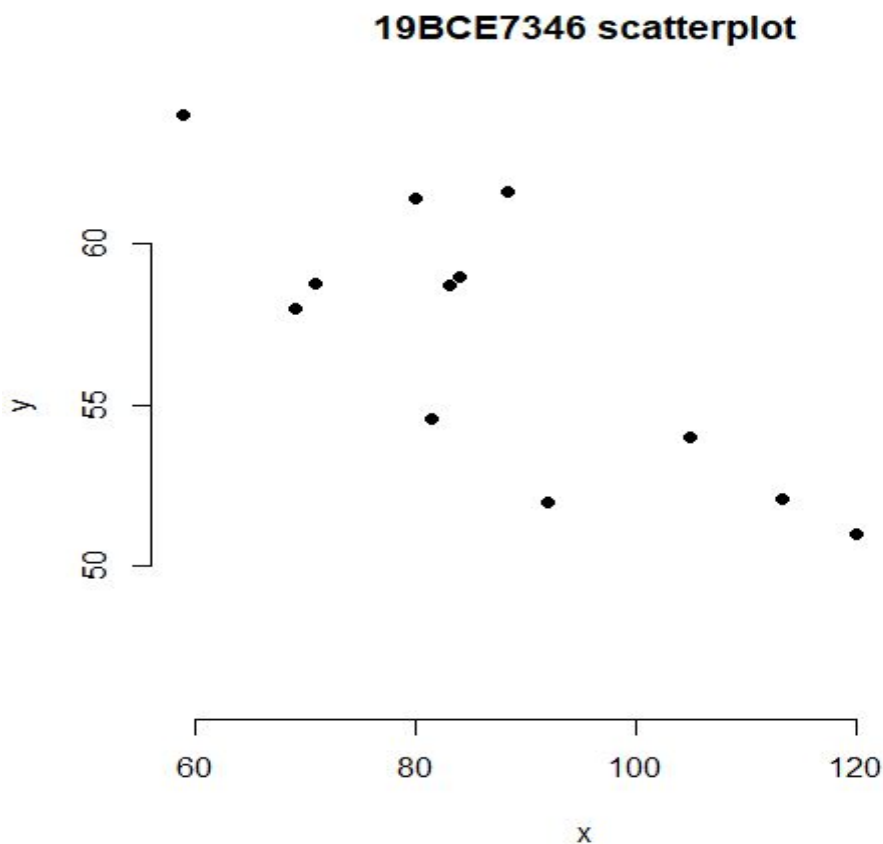
```
> x<-c(132.0,129.0,120.0,113.2,105.0,92.0,84.0,83.2,88.4,59.0,80.0,81.5,71.0,69.2)
> x
[1] 132.0 129.0 120.0 113.2 105.0 92.0 84.0 83.2 88.4 59.0 80.0 81.5
[13] 71.0 69.2
> y<-c(46.0,48.0,51.0,52.1,54.0,52.0,59.0,58.7,61.6,64.0,61.4,54.6,58.8,58.0)
> y
[1] 46.0 48.0 51.0 52.1 54.0 52.0 59.0 58.7 61.6 64.0 61.4 54.6 58.8 58.0
> plot(x,y,main="19BCE7346 scatter plot", xlab="x", ylab="y", pch=19,frame=FALSE)
> sxx=sum(x^2)-((sum(x))^2)/14)
> sxx
[1] -119496.2
> sxy=sum(x*y)-((sum(x))/14)
> sxy
[1] 71253.91
> sxy=sum(x*y)-((sum(x)*sum(y))/14)
> sxy
[1] -1424.414
> b1=sxy/sxx
> b1
[1] 0.01192017
> b0=mean(y)-(b1)*mean(x)
> b0
[1] 54.54388
> plot(x,y,main="19BCE7346",col="cyan",abline(lm(y~x)),cex=1.3,pch=19)
> plot(x,y,main="19BCE7346 scatterplot",xlab="x",ylab="y",pch=19,frame=FALSE)
> plot(x,y,main="19BCE7346",col="cyan",abline(lm(y~x)),cex=1.3,pch=19)|
```

OUTPUT :

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LAB-9

A popular cold-remedy was tested for its efficacy. In a sample of 150 people who took the remedy upon getting a cold, 117(78%) had no symptoms one week later. In a sample of 125 people who took the placebo upon getting a cold, 90(75%) had no symptoms one week later. The table summarizes this information.

Group	#Who is symptom free after one week	#total in group(n)	Proportion $P=x/n$
Remedy	117	150	0.78
Placebo	90	120	0.75

The test: Test is the claim that the proportion of all remedy users who are symptom free after one week is greater than the proportion of placebo users. Test this claim at 0.05 Significance Level

Code :

```
X <- c(117, 90)
N <- c(150,120)
Prop.test(x, n, alternative = "greater", correct = False)
```

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Execution :

```
> timestamp()
##----- Wed Dec 02 17:53:30 2020 -----##
> x <- c(117,90)
> n <- c(150,120)
> prop.test(x, n, alternative = "greater", correct= FALSE)

      2-sample test for equality of proportions
      without continuity correction

data:  x out of n
X-squared = 0.3354, df = 1, p-value = 0.2812
alternative hypothesis: greater
95 percent confidence interval:
 -0.05557192  1.00000000
sample estimates:
prop 1 prop 2
  0.78   0.75

> |
```

LAB-10 :

1. An outbreak of salmonella related illness was attributed to ice produced at a certain factory. Scientists measured the level of Salmonella in 9 randomly sampled batches ice

crean. The levels (in MPN/g) were:

0.593 0.142 0.329 0.691 0.231 0.793 0.519 0.392 0.418

Is there evidence that the mean level pf Salmonella in ice cream greater than 0.3MPN/g?

CODE :

```
X <- c(0.593, 0.142, 0.329, 0.691, 0.231, 0.793, 0.519, 0.392, 0.418)
t.test(X, alternative = "greater", mu=0.3)
```

Execution :

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```
> timestamp()
##----- Fri Dec 04 12:42:43 2020 -----##
> X <- c(0.593,0.142,0.329,0.601,0.231,0.793,0.519,0.392,0.418)
> t.test(X,alternative="greater",mu=0.3)
```

One sample t-test

```
data: X
t = 2.1717, df = 8, p-value = 0.03083
alternative hypothesis: true mean is greater than 0.3
95 percent confidence interval:
 0.3210493      Inf
sample estimates:
mean of x
0.4464444
```

```
> |
```

2. Suppose that 10 volunteers have taken an intelligence test; here are the results obtained.

The average score of the entire population is 75 in the same test. Is there any significant difference (with a significance level of 95%) between the sample and population means, assuming that the variance of the population is not known. Scores: 65, 78, 88, 55, 48, 95, 66, 57, 79, 81

Code :

```
R <- c(65, 78, 88, 55, 48, 95, 66, 57, 79, 81)
t.test(R, mu=0.3)
```

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```
> timestamp()
##----- Fri Dec 04 12:46:33 2020 -----##
> X = c(65, 78, 88, 55, 48, 95, 66, 57, 79, 81)
> t.test(X, mu=75, conf.level=0.05)
```

One Sample t-test

```
data: X
t = -0.78303, df = 9, p-value = 0.4537
alternative hypothesis: true mean is not equal to 75
5 percent confidence interval:
 70.8871 71.5129
sample estimates:
mean of x
 71.2
```

```
> R <- c(65, 78, 88, 55, 48, 95, 66, 57, 79, 81)
> t.test(R, mu=0.3)
```

One Sample t-test

```
data: R
t = 14.61, df = 9, p-value = 1.418e-07
alternative hypothesis: true mean is not equal to 0.3
95 percent confidence interval:
 60.22187 82.17813
sample estimates:
mean of x
 71.2
```

```
> |
```

3. Comparing two independent sample means, taken from two populations with unknown variance. The following data shows the heights of individuals of two different countries with unknown population variances. Is there any significant difference b/n the average heights of two groups.

A 175 168 168 190 156 181 182 175 174 179

B 185 169 173 173 188 186 175 174 179 180

Code :

```
K <- c(175, 168, 168, 190, 156, 181, 182, 175, 174, 179)
L <- c(185, 169, 173, 173, 188, 186, 175, 174, 179, 180)
t.test(K, L)
```

Execution :

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```
> timestamp()
##----- Fri Dec 04 12:50:41 2020 -----##
> K<-c(175,168,168,190,156,181,182,175,174,179)
> L<-c(185,169,173,173,188,186,175,174,179,180)
> t.test(K,L)

Welch Two Sample t-test

data: K and L
t = -0.94737, df = 15.981, p-value = 0.3576
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -11.008795  4.208795
sample estimates:
mean of x mean of y
  174.8    178.2

> |
```

LAB-12 :

A manufacturer of sports equipment has developed a new synthetic fishing line that the company claims has a mean breaking strength of 8 kilograms with a standard deviation of 0.5 kilograms. Test the hypothesis that $\mu = 8$ kilograms against the alternative that μ is not equal to 8 kilograms if a random sample of 50 lines is tested and found to have a mean breaking strength 7.8 kilograms. Use a 0.01 level of significance.

Code :

```
#H0:Mean=8 H1:Mean!=8(two tailed) here alpha=0.01
> Mean=8 #Mean
> n=50 #Random sample length
> stdv=0.5 #Standard deviation in kilograms
> X=7.8 #Mean breaking strength in kilograms
> alpha=0.01 #Significance value
> Z=sqrt(n)*(X-Mean)/stdv
> Z
> pValue=2*(1-pnorm(abs(Z)))#twotailed
> pValue
> if(pValue<=alpha)
```

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```
> {  
> print("H0 is rejected and H1 is accepted")  
> }else{  
> print("H0 is accepted and H1 is rejected")  
> }
```

Execution :

```
> #H0:Mean=8 H1:Mean!=8 (two tailed) here alpha=0.01  
> Mean=8  
> n=50  
> stdv=0.5  
> X=7.8  
> alpha=0.01  
> Z=sqrt(n)*(X-Mean)/stdv  
> Z  
[1] -2.828427  
> pValue=2*(1-pnorm(abs(Z)))#twotailed  
> pValue  
[1] 0.004677735
```