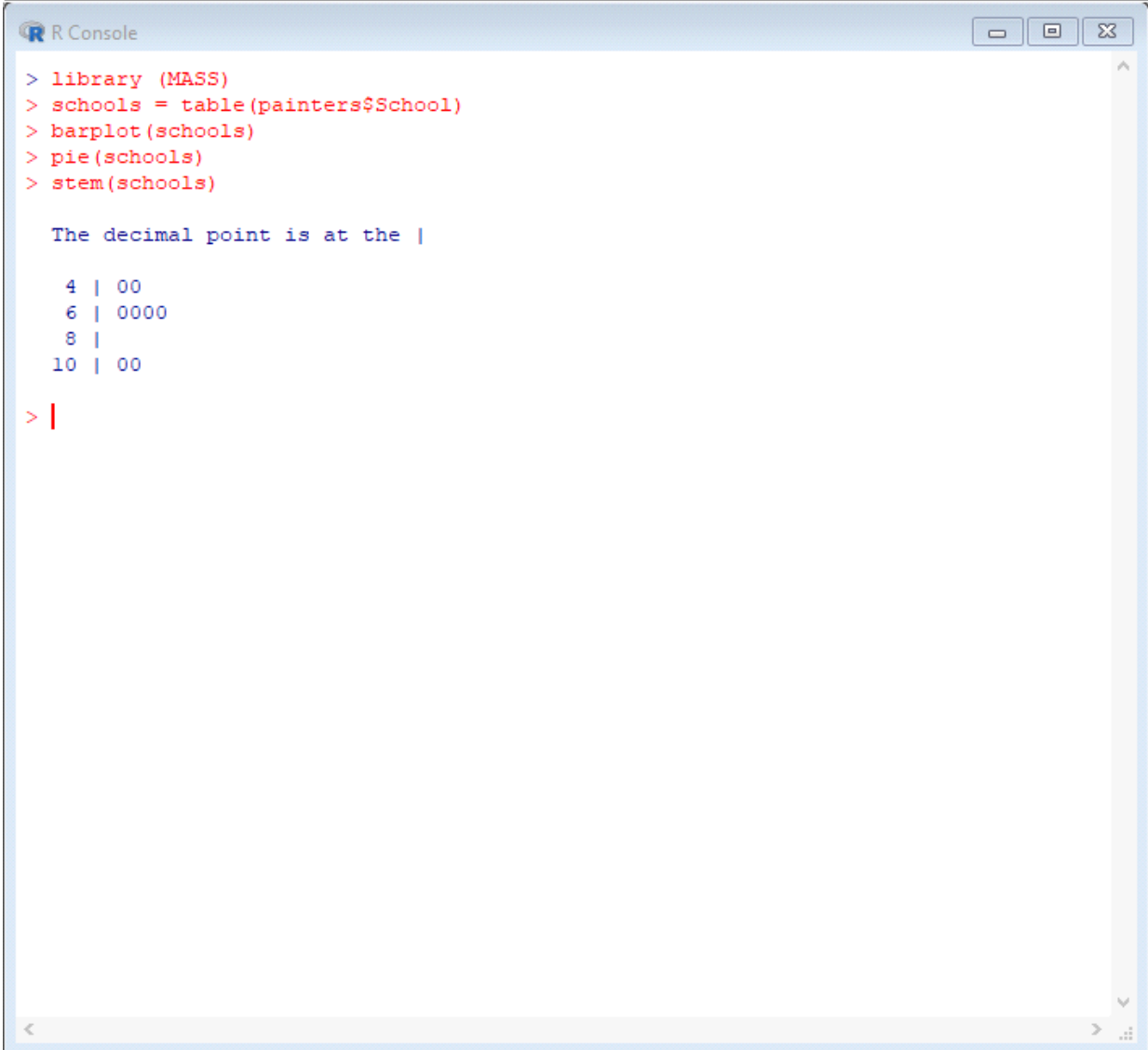


PRACTICAL 1

Aim:- Data presentation.

```
library(MASS)
schools = table(painters$School)
barplot(schools)
pie(schools)
stem(schools)
painters
```

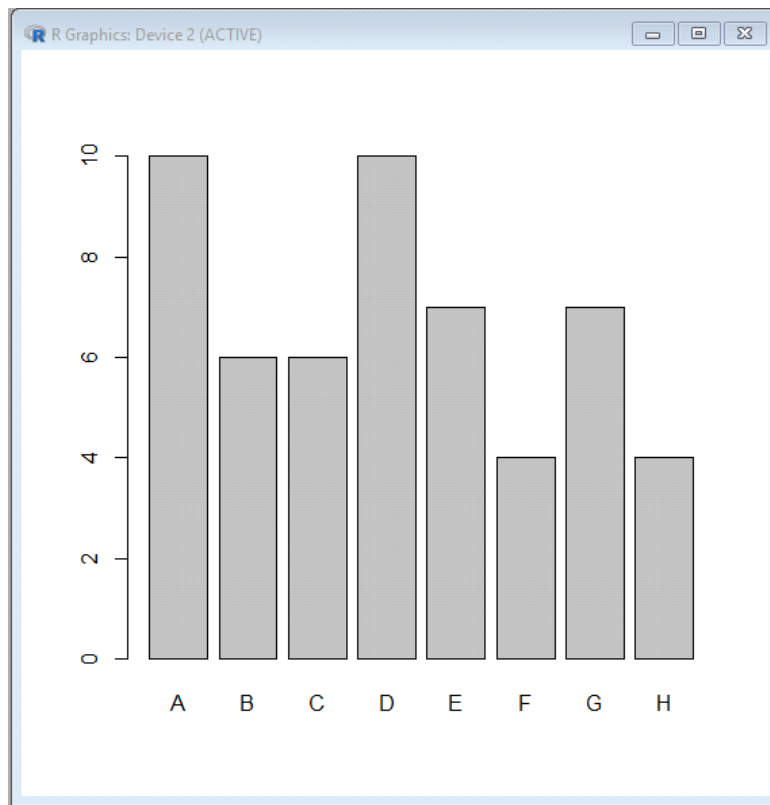
Output:-



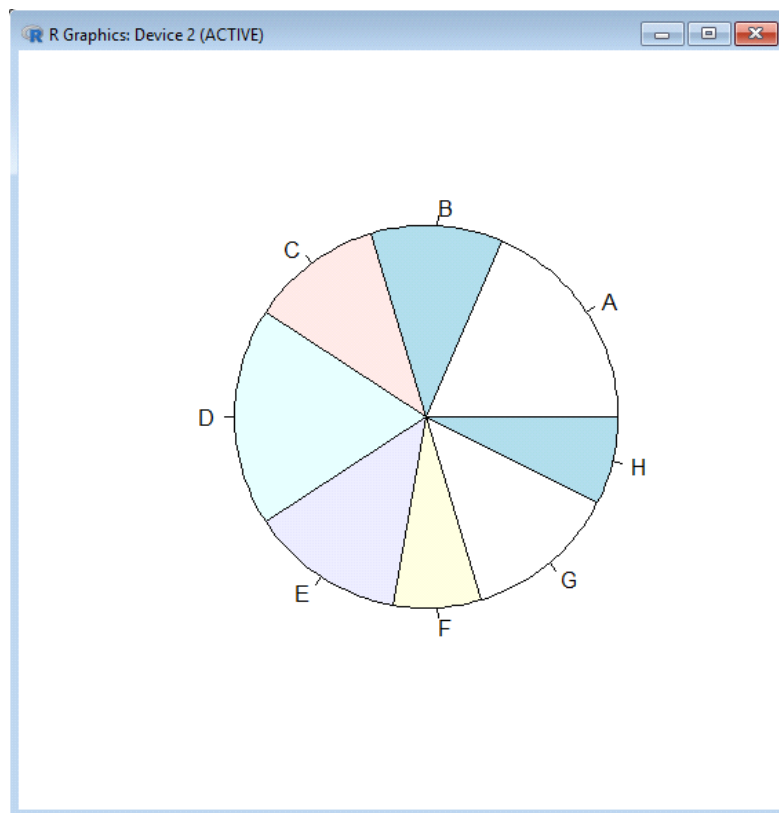
```
R Console
> library(MASS)
> schools = table(painters$School)
> barplot(schools)
> pie(schools)
> stem(schools)

The decimal point is at the |

 4 | 00
 6 | 0000
 8 |
10 | 00
> |
```



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PRACTICAL 2.a

Aim:- Data entry using, functions, c(), scan (), Creating vectors, Mathematical Operations: ** +/~/^ , exp, log, log10, etc, creating vector of text type, useful functions: data, frame, matrix operations, seq(), split() etc.

#Practical 2.a

```
x = scan("",what = "int")
```

```
x
```

```
v1 = c(3,8,4,5,0,11)
```

```
v2 = c(4,11,0,8,1,2)
```

```
result.add = v1 + v2
```

```
result.add
```

```
result.sub = v1 - v2
```

```
result.sub
```

```
result.mul = v1 * v2
```

```
result.mul
```

```
result.div = v1 / v2
```

```
result.div
```

```
exp(v1)
```

```
exp(v2)
```

```
log10(v1)
```

```
log10(v2)
```

```
v1 = c(5:13)
```

```
v1
```

```
v2 = c(6.6:12.6)
```

```
v2
```

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#Practical 2.b

```
v3 = c(3.8:11.4)
```

```
v3
```

```
empdata = data.frame(empid = c(1:5),
```

```
empname = c("Ramu","Raju","Sonu","Meenu","Cheenu"),
```

```
empsalary = c(10000,20000,30000,40000,999999),
```

```
startdate=c("2012/021/01","2014/11/15","1999/10/10","1999/09/10","1949/09/10") )
```

```
empdata
```

```
stu.data = data.frame( roll = c(1:3),
```

```
mark = c(85,90,95)
```

```
)
```

```
dent.data = data.frame(roll = c(4:6),
```

```
mark = c(87,60,70)
```

```
)
```

```
student.data = rbind(stu.data,dent.data)
```

```
student.data
```

#Practical 2.c

```
mat1 = matrix(c(3,9,-1,4,2,6),nrow = 2)
```

```
mat2 = matrix(c(5,2,0,9,3,4), nrow = 2)
```

```
res.add = mat1+mat2
```

```
res.add
```

```
res.sub = mat1-mat2
```

```
res.sub
```

```
seq(1,2,by = 0.1)
```

Output:-

```

R Console
> #Practical 3.1
> x = scan("",what = "int")
1: 43
2:
Read 1 item
> x
[1] "43"
> v1 = c(3,8,4,5,0,11)
> v2 = c(4,11,0,8,1,2)
> result.add = v1 + v2
> result.add
[1] 7 19 4 13 1 13
> result.sub = v1 - v2
> result.sub
[1] -1 -3 4 -3 -1 9
> result.mul = v1 * v2
> result.mul
[1] 12 88 0 40 0 22
> result.div = v1 / v2
> result.div
[1] 0.7500000 0.7272727      Inf 0.6250000 0.0000000 5.5000000
> exp(v1)
[1] 20.08554 2980.95799 54.59815 148.41316 1.00000 59874.14172
> exp(v2)
[1] 54.598150 59874.141715 1.000000 2980.957987 2.718282 7.389056
> log10(v1)
[1] 0.4771213 0.9030900 0.6020600 0.6989700      -Inf 1.0413927
> log10(v2)
[1] 0.602060 1.041393      -Inf 0.903090 0.000000 0.301030
> v1 = c(5:13)
> v1
[1] 5 6 7 8 9 10 11 12 13
> v2 = c(6.6:12.6)
> v2
[1] 6.6 7.6 8.6 9.6 10.6 11.6 12.6
>

```

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```

R Console
> #Practical 3.2
> v3 = c(3.8:11.4)
> v3
[1] 3.8 4.8 5.8 6.8 7.8 8.8 9.8 10.8
> empdata = data.frame(empid = c(1:5),
+ empname = c("Ramu", "Raju", "Sonu", "Meenu", "Cheenu"),
+ empsalary = c(10000, 20000, 30000, 40000, 999999),
+ startdate=c("2012/021/01", "2014/11/15", "1999/10/10", "1999/09/10", "1949/09/10")
+ )
> empdata
  empid empname empsalary  startdate
1     1   Ramu    10000 2012/021/01
2     2   Raju    20000 2014/11/15
3     3   Sonu    30000 1999/10/10
4     4  Meenu    40000 1999/09/10
5     5 Cheenu   999999 1949/09/10
> stu.data = data.frame( roll = c(1:3),
+ mark = c(85, 90, 95)
+ )
> dent.data = data.frame(roll = c(4:6),
+ mark = c(87, 60, 70)
+ )
> student.data = rbind(stu.data, dent.data)
> student.data
  roll mark
1     1   85
2     2   90
3     3   95
4     4   87
5     5   60
6     6   70
> |

```

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```
R Console
> #Practical 3.3
> mat1 = matrix(c(3,9,-1,4,2,6),nrow = 2)
> mat2 = matrix(c(5,2,0,9,3,4), nrow = 2)
> res.add = mat1+mat2
> res.add
      [,1] [,2] [,3]
[1,]    8  -1    5
[2,]   11  13   10
> res.sub = mat1-mat2
> res.sub
      [,1] [,2] [,3]
[1,]   -2  -1  -1
[2,]    7  -5    2
> seq(1,2,by = 0.1)
[1] 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0
> |
```

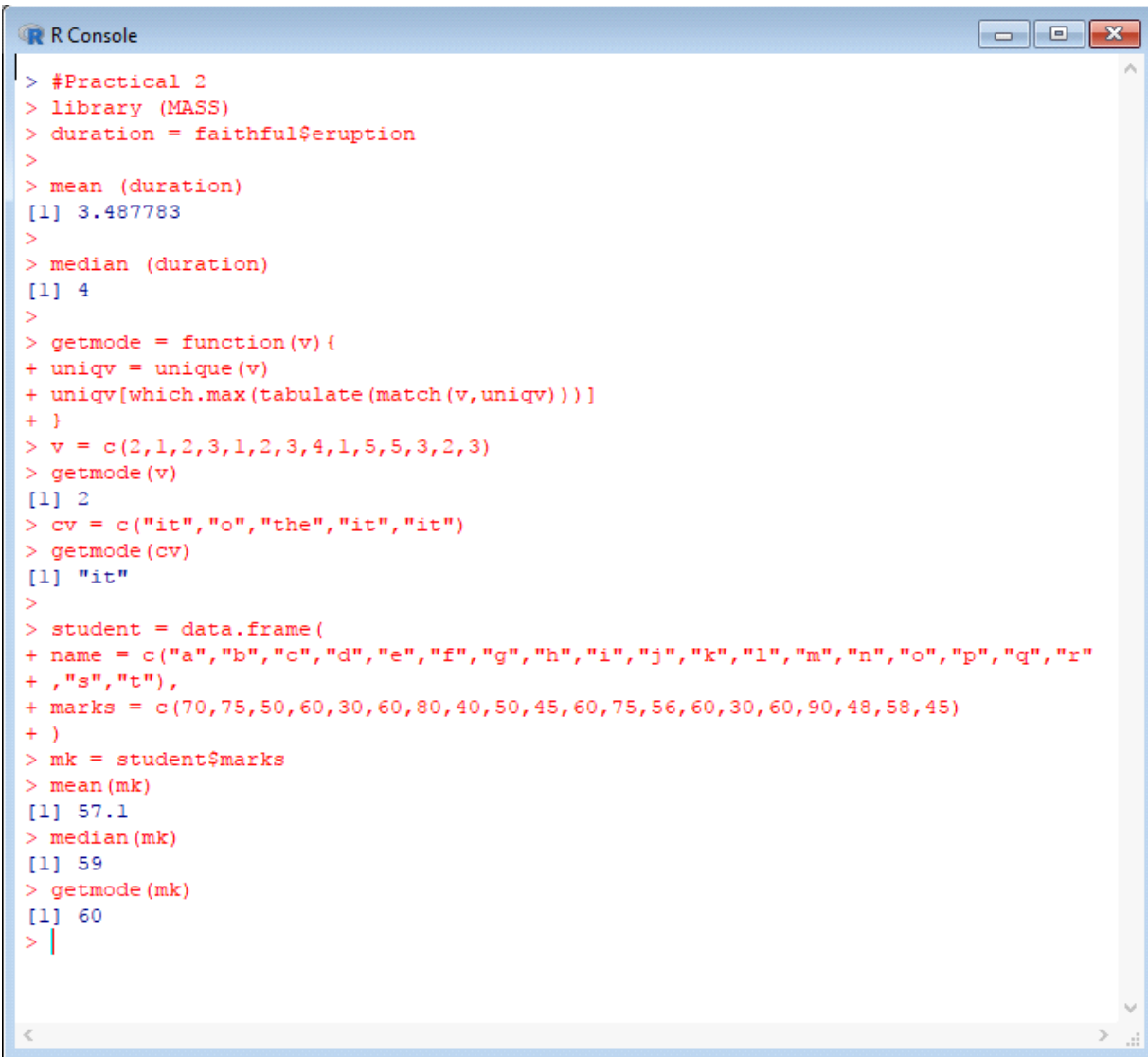
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PRACTICAL 3

Aim:- Measures of central tendency

```
library (MASS)
duration = faithful$eruption
mean (duration)
median (duration)
getmode = function(v) {
  uniqv = unique(v)
  uniqv[which.max(tabulate(match(v,uniqv)))]
}
v = c(2,1,2,3,1,2,3,4,1,5,5,3,2,3)
getmode(v)
cv = c("it","o","the","it","it")
getmode(cv)

student = data.frame(
name = c("a","b","c","d","e","f","g","h","i","j","k","l","m","n","o","p","q","r",
"s","t"),
marks = c(70,75,50,60,30,60,80,40,50,45,60,75,56,60,30,60,90,48,58,45)
)
mk = student$marks
mean(mk)
median(mk)
getmode(mk)
```


Output:-


```

R Console
> #Practical 2
> library (MASS)
> duration = faithful$eruption
>
> mean (duration)
[1] 3.487783
>
> median (duration)
[1] 4
>
> getmode = function(v){
+ uniqv = unique(v)
+ uniqv[which.max(tabulate(match(v,uniqv)))]
+ }
> v = c(2,1,2,3,1,2,3,4,1,5,5,3,2,3)
> getmode(v)
[1] 2
> cv = c("it","o","the","it","it")
> getmode(cv)
[1] "it"
>
> student = data.frame(
+ name = c("a","b","c","d","e","f","g","h","i","j","k","l","m","n","o","p","q","r"
+ ,"s","t"),
+ marks = c(70,75,50,60,30,60,80,40,50,45,60,75,56,60,30,60,90,48,58,45)
+ )
> mk = student$marks
> mean(mk)
[1] 57.1
> median(mk)
[1] 59
> getmode(mk)
[1] 60
> |

```

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PRACTICAL 4

Aim:- Frequency distribution and data presentation

```
library (MASS)
```

```
s = painters$School
```

```
s.freq = table(s)
```

```
cbind (s.freq)
```

```
blooddonation = data.frame(
```

```
name = c("abc","xy","lm","ab","cd","ef","gh","hi","jk","no"),
```

```
age = c(18,18,21,32,33,22,45,41,28,29),
```

```
weight = c(60,50,61,70,80,70,60,61,62,52),
```

```
bloodgroup = c("A+","A-","B+","B+","B-","AB+","A+","0+","A+","A+"),
```

```
quantity = c(0.1, 0.5, 0.4, 0.3, 0.5, 0.5, 0.3, 0.2, 0.1, 0.5)
```

```
)
```

```
#Exercise
```

```
n = blooddonation$name
```

```
n.freq = table(n)
```

```
a = blooddonation$age
```

```
a.freq = table(a)
```

```
w = blooddonation$weight
```

```
w.freq = table(w)
```

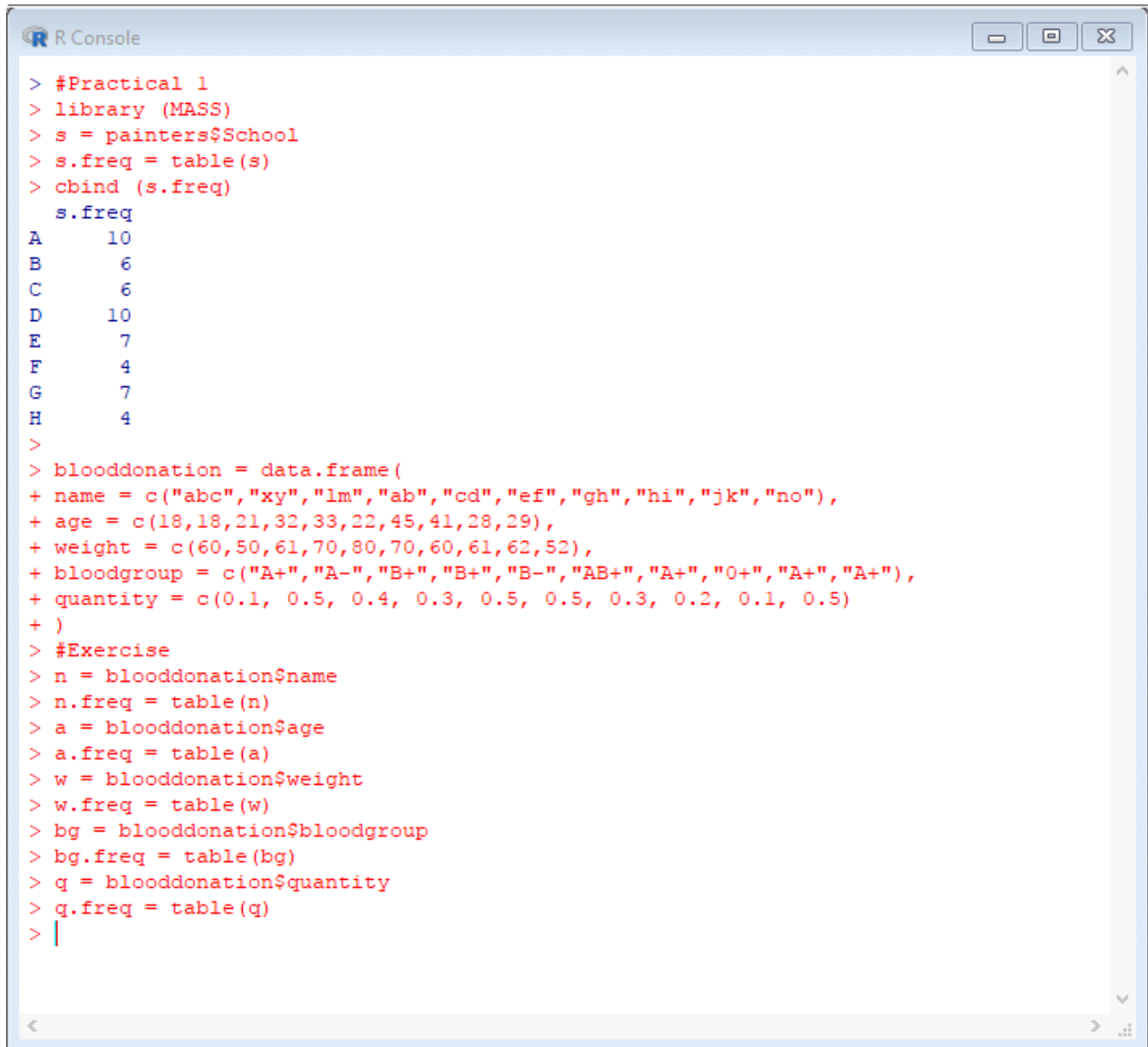
```
bg = blooddonation$bloodgroup
```

```
bg.freq = table(bg)
```

```
q = blooddonation$quantity
```

```
q.freq = table(q)
```

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Output:-


```

> #Practical 1
> library (MASS)
> s = painters$School
> s.freq = table(s)
> cbind (s.freq)
  s.freq
A      10
B       6
C       6
D      10
E       7
F       4
G       7
H       4
>
> blooddonation = data.frame(
+ name = c("abc","xy","lm","ab","cd","ef","gh","hi","jk","no"),
+ age = c(18,18,21,32,33,22,45,41,28,29),
+ weight = c(60,50,61,70,80,70,60,61,62,52),
+ bloodgroup = c("A+","A-","B+","B+","B-","AB+","A+","O+","A+","A+"),
+ quantity = c(0.1, 0.5, 0.4, 0.3, 0.5, 0.5, 0.3, 0.2, 0.1, 0.5)
+ )
> #Exercise
> n = blooddonation$name
> n.freq = table(n)
> a = blooddonation$age
> a.freq = table(a)
> w = blooddonation$weight
> w.freq = table(w)
> bg = blooddonation$bloodgroup
> bg.freq = table(bg)
> q = blooddonation$quantity
> q.freq = table(q)
> |

```

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PRACTICAL 5.a

Aim:- Frequency distribution using cut(), table()

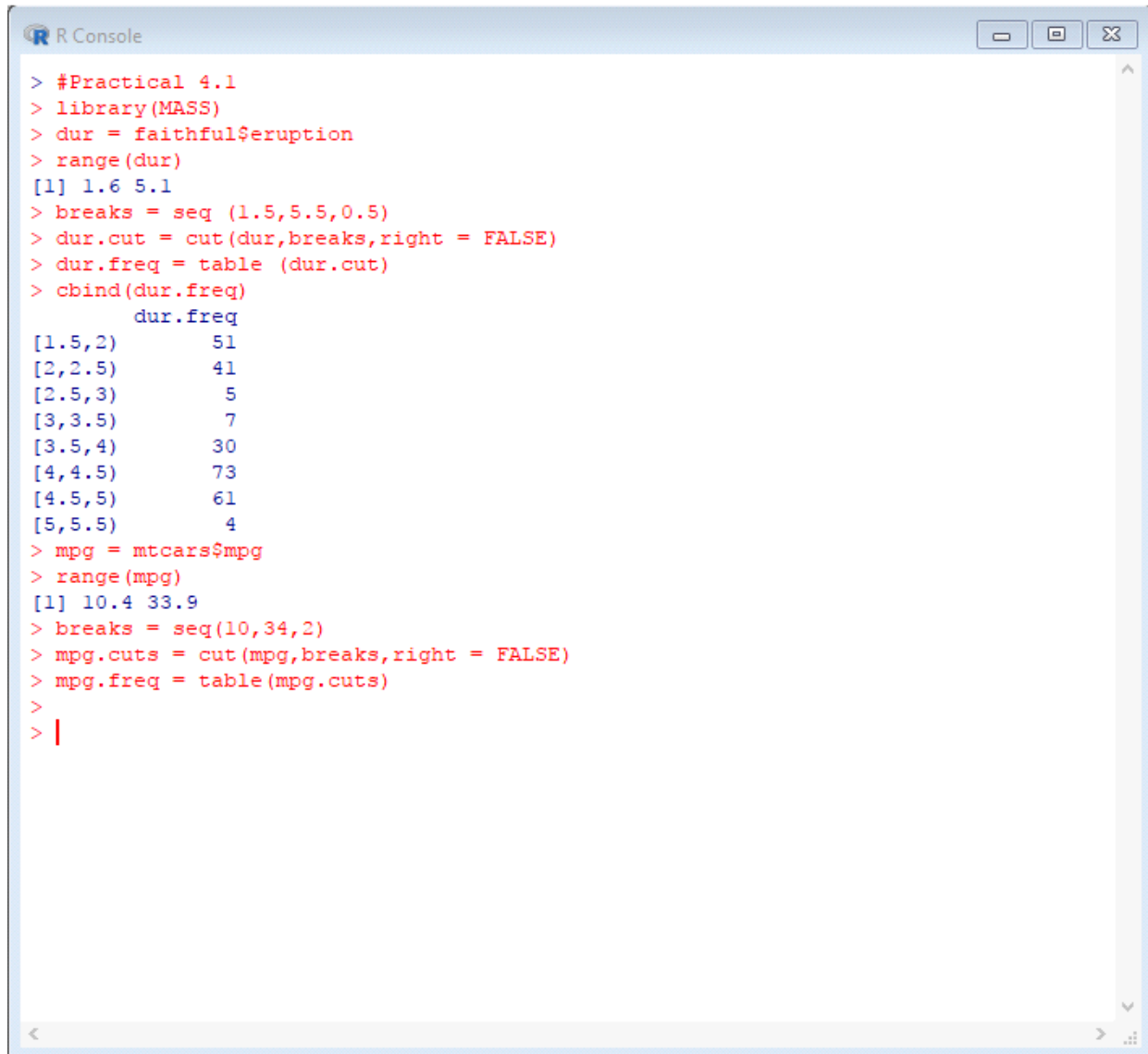
#Practical 5.a

```
library(MASS)
dur = faithful$eruption
range(dur)
breaks = seq(1.5,5.5,0.5)
dur.cut = cut(dur,breaks,right = FALSE)
dur.freq = table(dur.cut)
cbind(dur.freq)
mpg = mtcars$mpg
range(mpg)
breaks = seq(10,34,2)
mpg.cuts = cut(mpg,breaks,right = FALSE)
mpg.freq = table(mpg.cuts)
```

#Practical 5.b

```
cbind(mpg.freq)
wait = faithful$
waiting range(wait)
breaks = seq(40,100,5)
wait.cut = cut(wait,breaks,right = FALSE)
wait.freq = table(wait.cut)
cbind(wait.freq)
```

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Output:-The image shows an R Console window with a light blue title bar and standard window controls. The console contains R code for Practical 4.1, which includes loading the MASS library, extracting eruption data from the faithful dataset, calculating its range, creating breaks, and generating frequency tables. The output for the faithful dataset is displayed as a table. The console also shows the start of code for the mtcars dataset.

```
> #Practical 4.1
> library(MASS)
> dur = faithful$eruption
> range(dur)
[1] 1.6 5.1
> breaks = seq(1.5,5.5,0.5)
> dur.cut = cut(dur,breaks,right = FALSE)
> dur.freq = table(dur.cut)
> cbind(dur.freq)
      dur.freq
[1.5,2)      51
[2,2.5)      41
[2.5,3)       5
[3,3.5)       7
[3.5,4)      30
[4,4.5)      73
[4.5,5)      61
[5,5.5)       4
> mpg = mtcars$mpg
> range(mpg)
[1] 10.4 33.9
> breaks = seq(10,34,2)
> mpg.cuts = cut(mpg,breaks,right = FALSE)
> mpg.freq = table(mpg.cuts)
>
> |
```

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```
R Console
> #Practical 4.2
> cbind(mpg.freq)
      mpg.freq
[10,12)      2
[12,14)      1
[14,16)      7
[16,18)      3
[18,20)      5
[20,22)      5
[22,24)      2
[24,26)      1
[26,28)      2
[28,30)      0
[30,32)      2
[32,34)      2
> wait = faithful$waiting
> range(wait)
[1] 43 96
> breaks = seq(40,100,5)
> wait.cut = cut(wait,breaks,right = FALSE)
> wait.freq = table(wait.cut)
> cbind(wait.freq)
      wait.freq
[40,45)        1
[45,50)       20
[50,55)       32
[55,60)       24
[60,65)       17
[65,70)        9
[70,75)       23
[75,80)       54
[80,85)       57
[85,90)       23
[90,95)       11
[95,100)        1
> |
```

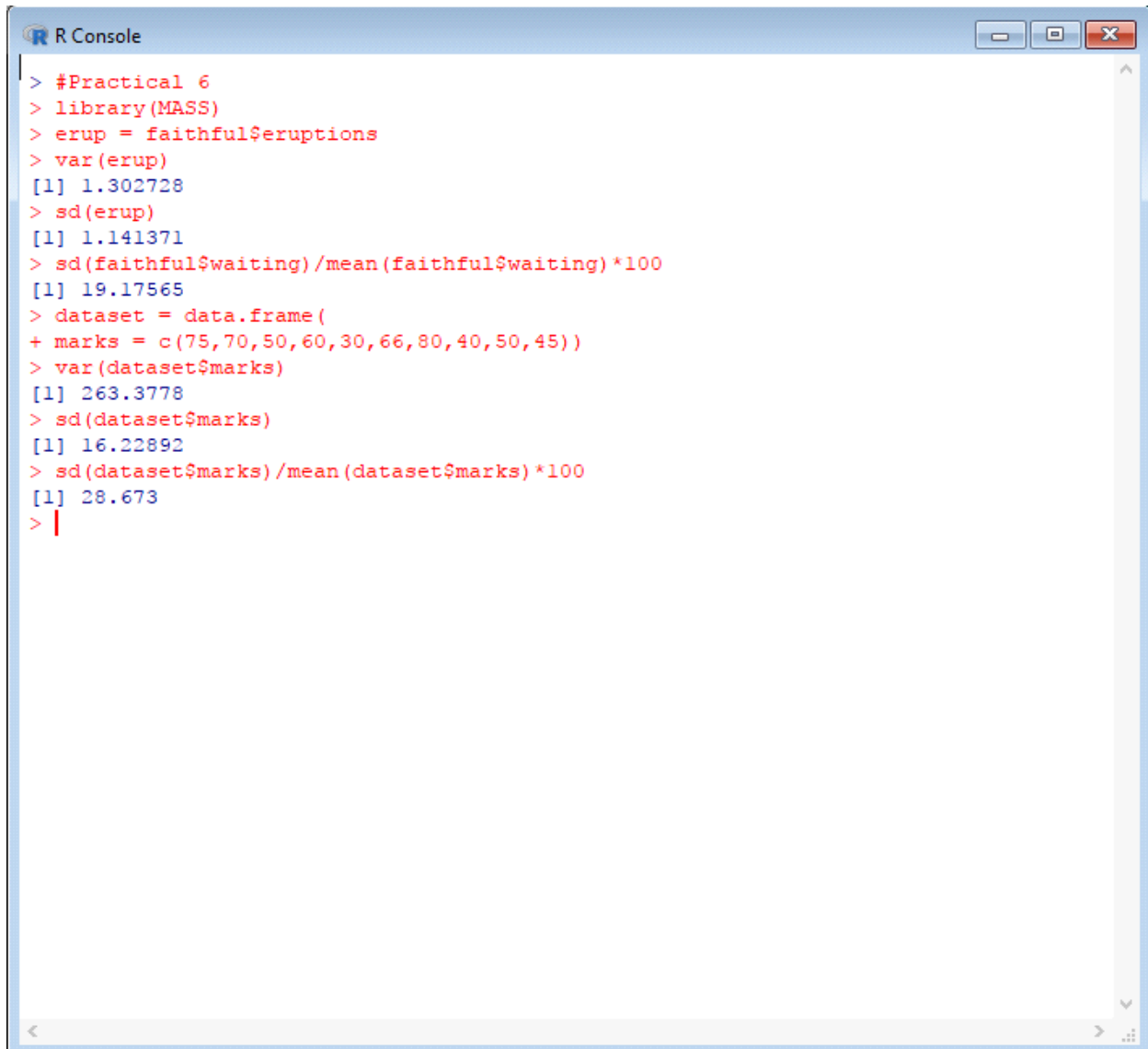
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PRACTICAL 6

Aim:- Summary Statistics (measures of central tendency, dispersion)

```
library(MASS)
erup = faithful$eruptions
var(erup)
sd(erup)
sd(faithful$waiting)/mean(faithful$waiting)*100
dataset = data.frame(
marks = c(75,70,50,60,30,66,80,40,50,45))
var(dataset$marks)
sd(dataset$marks)
sd(dataset$marks)/mean(dataset$marks)*100
```

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Output:-

```
R Console
> #Practical 6
> library(MASS)
> erup = faithful$eruptions
> var(erup)
[1] 1.302728
> sd(erup)
[1] 1.141371
> sd(faithful$waiting)/mean(faithful$waiting)*100
[1] 19.17565
> dataset = data.frame(
+ marks = c(75,70,50,60,30,66,80,40,50,45))
> var(dataset$marks)
[1] 263.3778
> sd(dataset$marks)
[1] 16.22892
> sd(dataset$marks)/mean(dataset$marks)*100
[1] 28.673
> |
```

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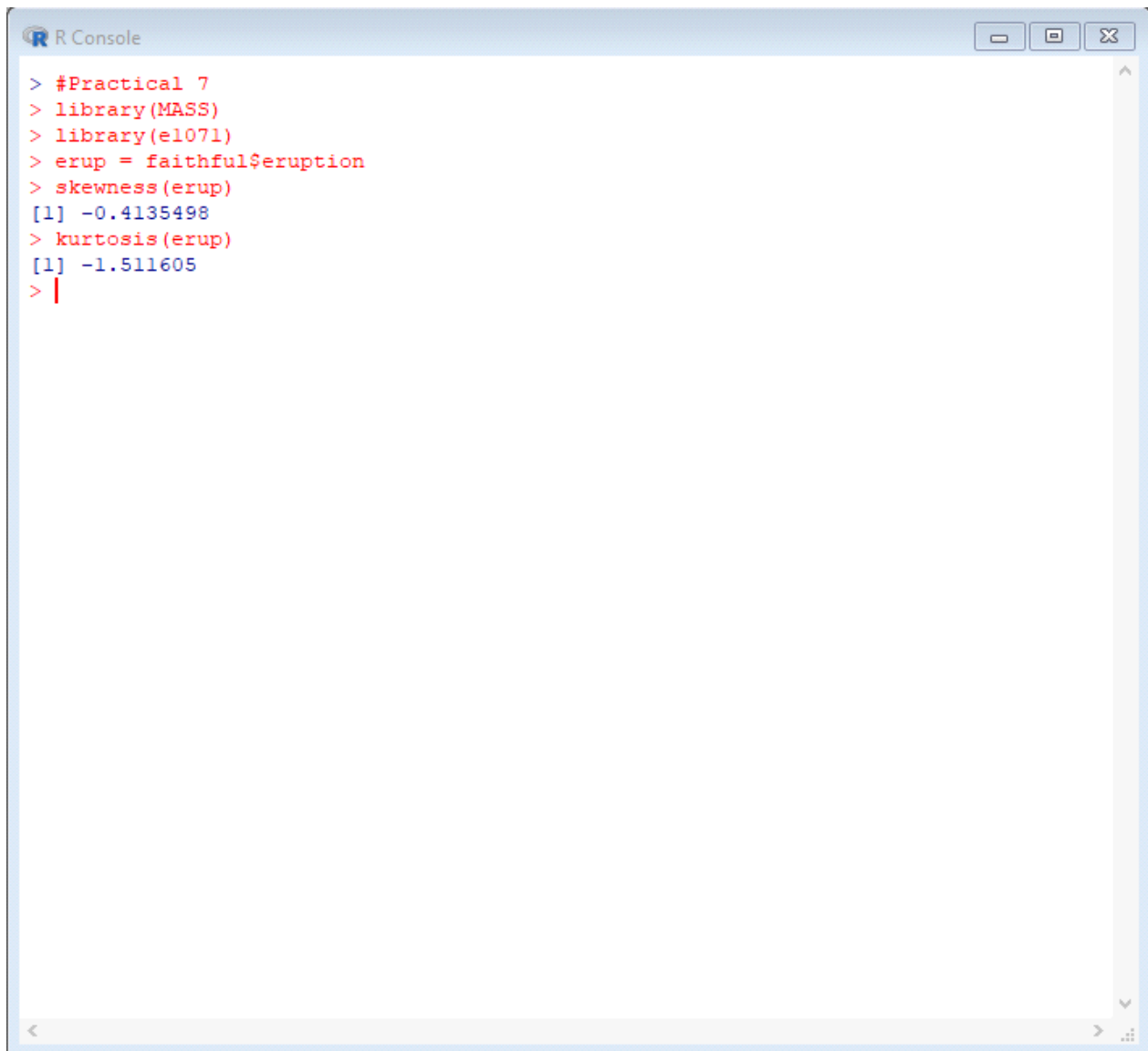
PRACTICAL 7

Aim:- Measures of skewness and kurtosis

```
library(MASS)
library(e1071)
erup = faithful$eruption
skewness(erup)
kurtosis(erup)
```

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Output:-

A screenshot of an R Console window titled "R Console". The window has a light blue header bar with the R logo and standard window controls (minimize, maximize, close). The main area is white and contains the following R code and its output:

```
> #Practical 7
> library(MASS)
> library(e1071)
> erup = faithful$eruption
> skewness(erup)
[1] -0.4135498
> kurtosis(erup)
[1] -1.511605
> |
```

The code is entered in red text, and the output is shown in blue text. A vertical scrollbar is visible on the right side of the console window.

PRACTICAL NO:8

Aim:- Correlation and regression

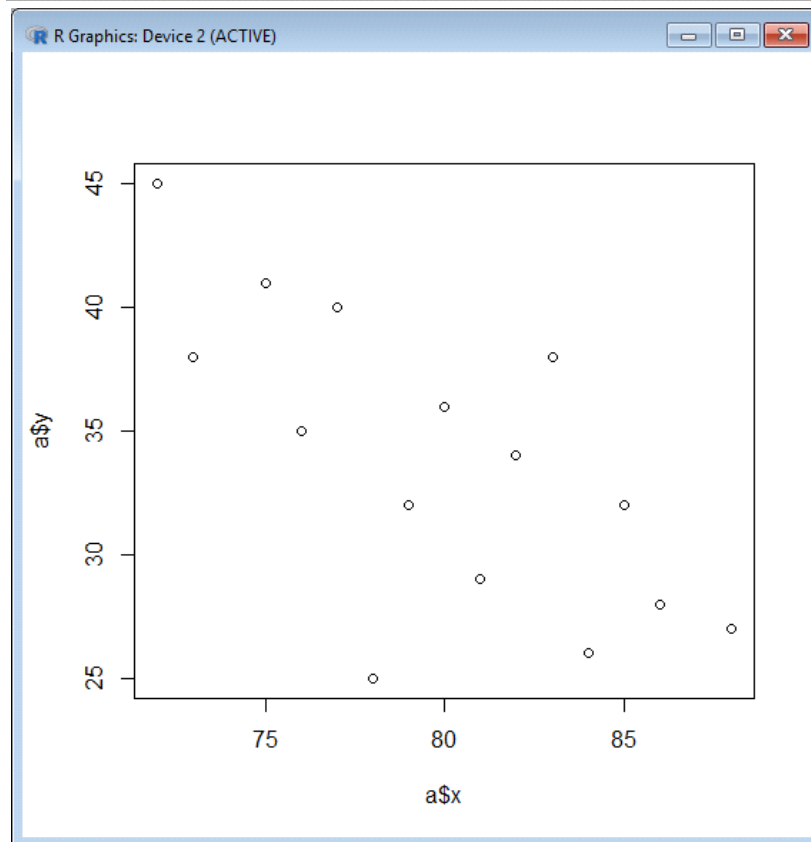
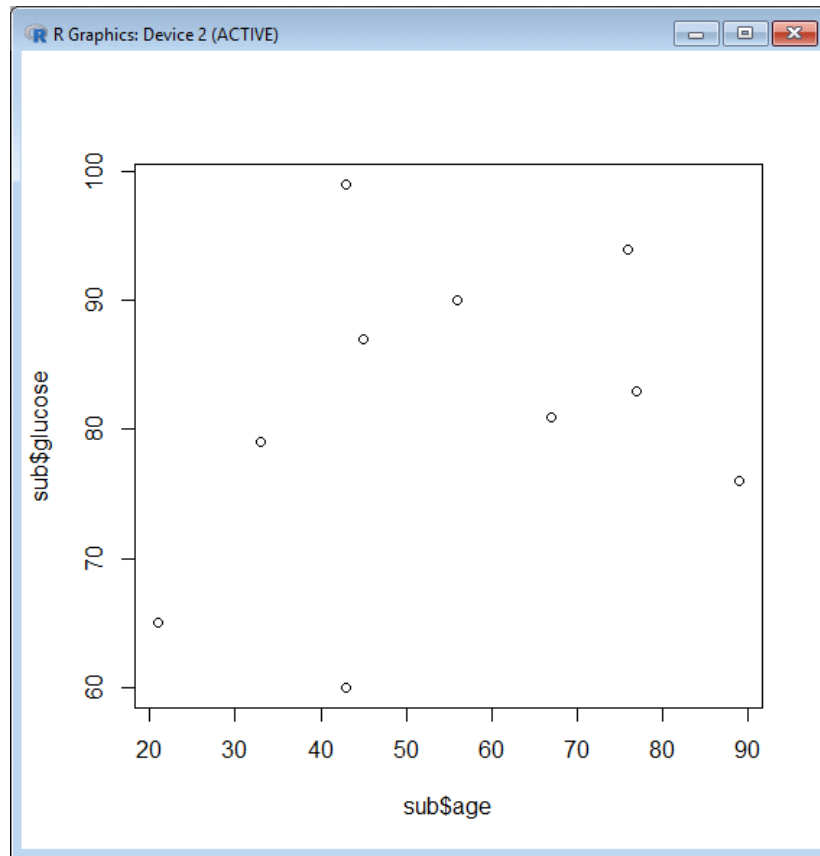
```
library(MASS)
cor(faithful$waiting,faithful$eruptions)
cor(painters$Drawing,painters$Colour)
sub = data.frame(subject = c(1:10),
age = c(43,21,33,45,67,77,56,89,76,43),
glucose = c(99,65,79,87,81,83,90,76,94,60)
)
cor(sub$age,sub$glucose)
plot(sub$age,sub$glucose)
a = data.frame(
x = c(72,73,75,76,77,78,79,80,81,82,83,84,85,86,88),
y = c(45,38,41,35,40,25,32,36,29,34,38,26,32,28,27)
)
cor(a$x,a$y)
plot(a$x,a$y)
```

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Output:-

```
R Console
> #Practical 8
> library(MASS)
> cor(faithful$waiting,faithful$eruptions)
[1] 0.9008112
> cor(paintings$Drawing,painter$Colour)
Error in is.data.frame(y) : object 'painter' not found
> sub = data.frame(subject = c(1:10),
+ age = c(43,21,33,45,67,77,56,89,76,43),
+ glucose = c(99,65,79,87,81,83,90,76,94,60)
+ )
> cor(sub$age,sub$glucose)
[1] 0.3017455
> plot(sub$age,sub$glucose)
> a = data.frame(
+ x = c(72,73,75,76,77,78,79,80,81,82,83,84,85,86,88),
+ y = c(45,38,41,35,40,25,32,36,29,34,38,26,32,28,27)
+ )
> cor(a$x,a$y)
[1] -0.6940616
> plot(a$x,a$y)
> |
```

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Example 18: An urn contains 10 white, 6 red and 9 black balls. If 6 balls are drawn at random find the probability that

- (i) Four of the balls drawn are white
- (ii) Two is of each colour
- (iii) None is red
- (iv) At least one is white

Solution: R code is

```
>n=choose(25,6)
> m1=choose(10,4)*choose(15,2)
> p1=m1/n
> m2=choose(10,2)*choose(9,2)*choose(6,2)
> P2=m2/n
> m3=choose(19,4)
> p3=m3/n
> m4=choose(15,6)
> p4=1-m4/n
> cat("Prob four of the balls drawn are white=",p1)
Prob four of the balls drawn are white= 0.1245059
> cat("Prob Two is of each colour =",p2)
Prob Two is of each colour = 0.3666667
> cat("Prob None is red=",p3)
Prob None is red= 0.02188594
> cat("Prob at least one is white 1=",p4)
Prob at least one is white 1= 0.9717391
```

[1] 10 11 12 13 14 15

```
> p1=m1/n;p2=m2/n;p3=m3/n;p4=m4/n
> cat("Prob that token drawn has a number less than 6 =", p1)
Prob that token drawn has a number less than 6 = 0.2
> cat("Prob that token drawn has a number greater than 20 =", p2)
Prob that token drawn has a number greater than 20 = 0.2
> cat("Prob that token drawn has a number multiple of 5 =", p3)
Prob that token drawn has a number multiple of 5 = 0.2
> cat("Prob that token drawn has a number lying between 10 and 15, both inclusive =", p4)
Prob that token drawn has a number lying between 10 and 15, both inclusive = 0.24
```

Example 20: A stockist has 40 items in a lot. Out of which 30 are non-defective and 10 are defective. A customer selects 6 items from the lot. What is the probability that out of these six items (i) all items are non-defective (ii) four are non defective and two is defective.

Solution : R code is

```
> n= choose (40,6);m1= choose (30,6);m2= choose(30,4)* choose(10,2)
> p1=m1/n;p2=m2/n
> cat("Prob all selected are non-defective =",p1)
Prob all selected are non-defective = 0.1546942
> cat("Prob among selected 4 are non-defective and 2 defective =",p2)
Prob among selected 4 are non-defective and 2 defective = 0.3212879.
```

Example 21: A box contains 25 tokens numbered 1,2,3.....25. A token is drawn from a box and a number on it is observed. Obtain the probability that token drawn has a number

- (i) less than 6
- (ii) greater than 20
- (iii) multiple of 5
- (iv) lying between 10 and 15, both inclusive.

Write sample space and events.

Solution:

R code is

```
> s=seq(1,25);n=length(s)
> s
[1] 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
> e1=seq(1,5);m1= length(e1)
> e1
[1] 1 2 3 4 5
> e2=seq(21,25);m2= length(e2)
> e2
[1] 21 22 23 24 25
> e3=seq(5,25,5);m3= length(e3)
> e3
[1] 5 10 15 20 25
> e4=seq(10,15);m4= length(e4)
> e4
```