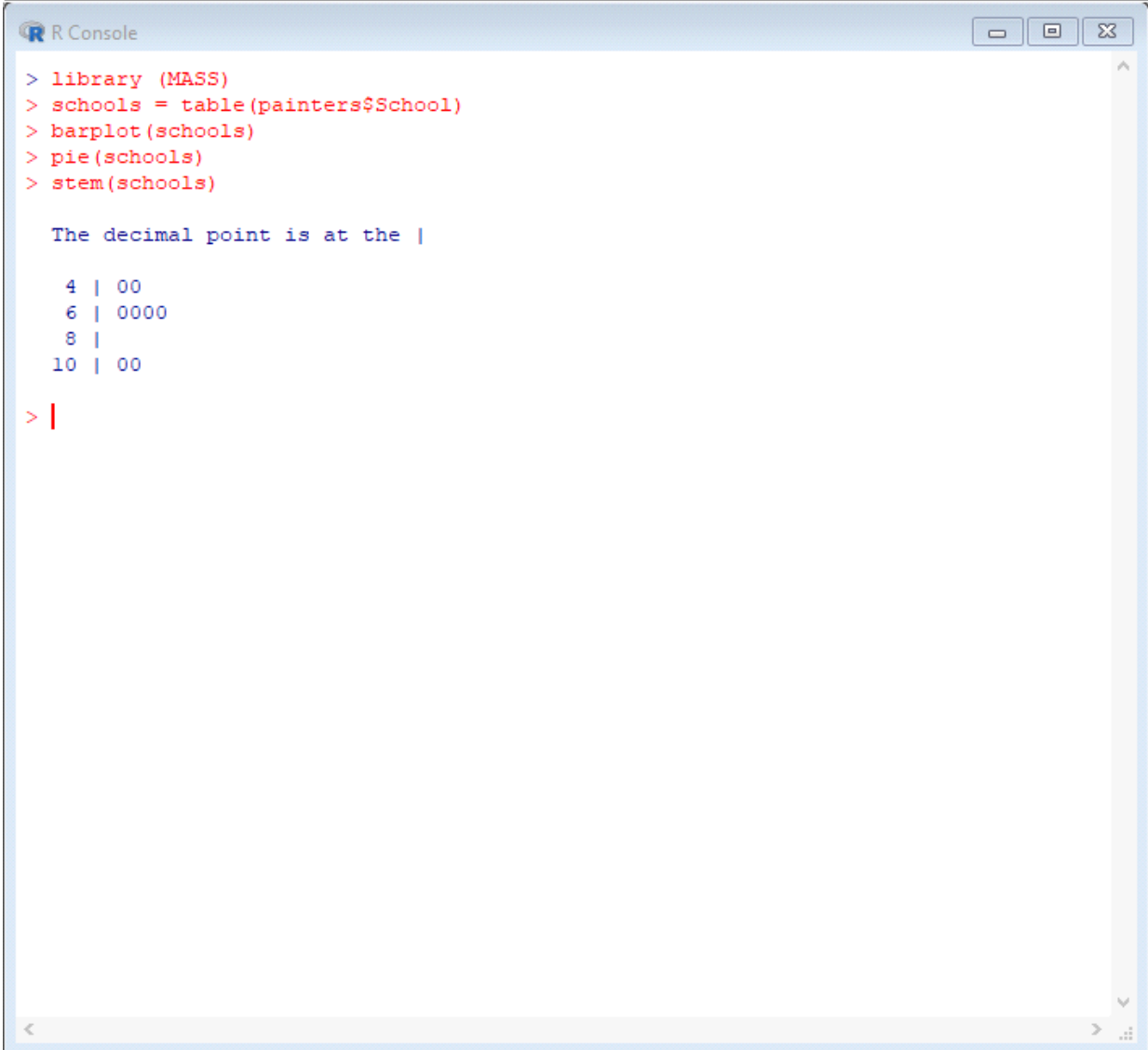


PRACTICAL 1

Aim:- Data presentation.

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

Output:-



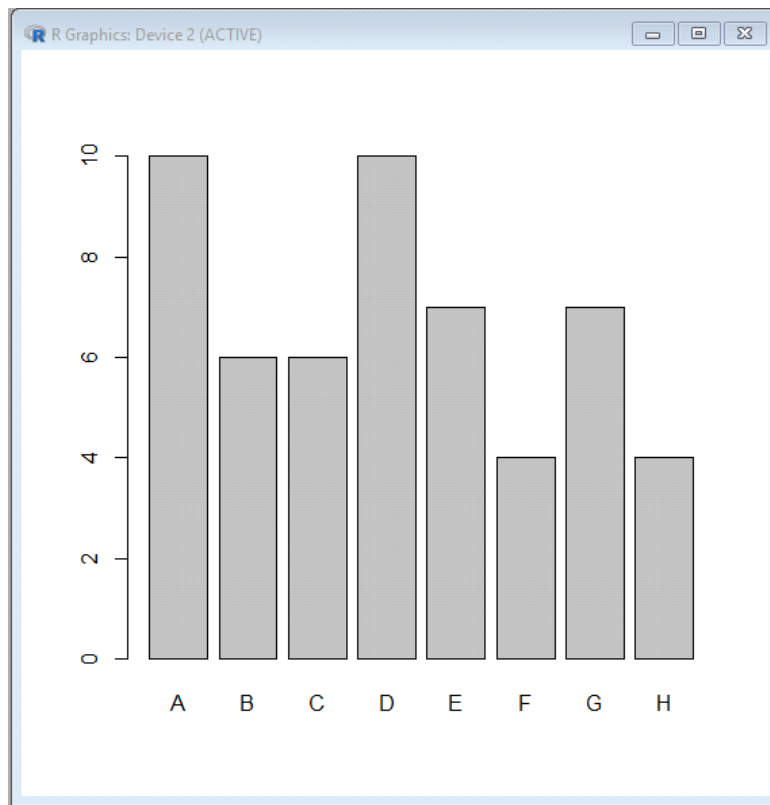
The screenshot shows an R Console window with the following content:

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

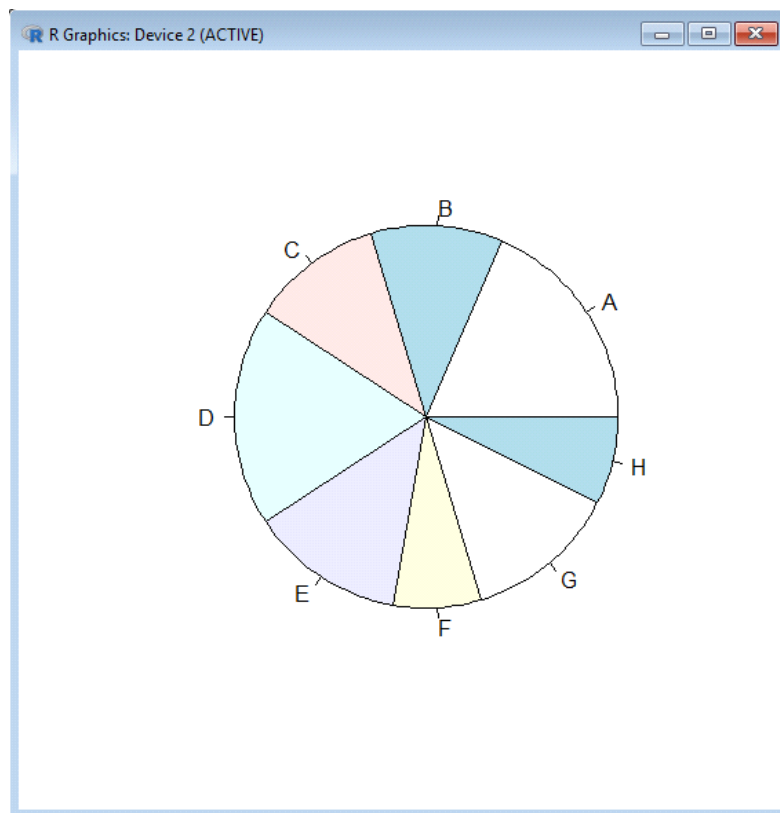
The decimal point is at the |

```
 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
> |
```

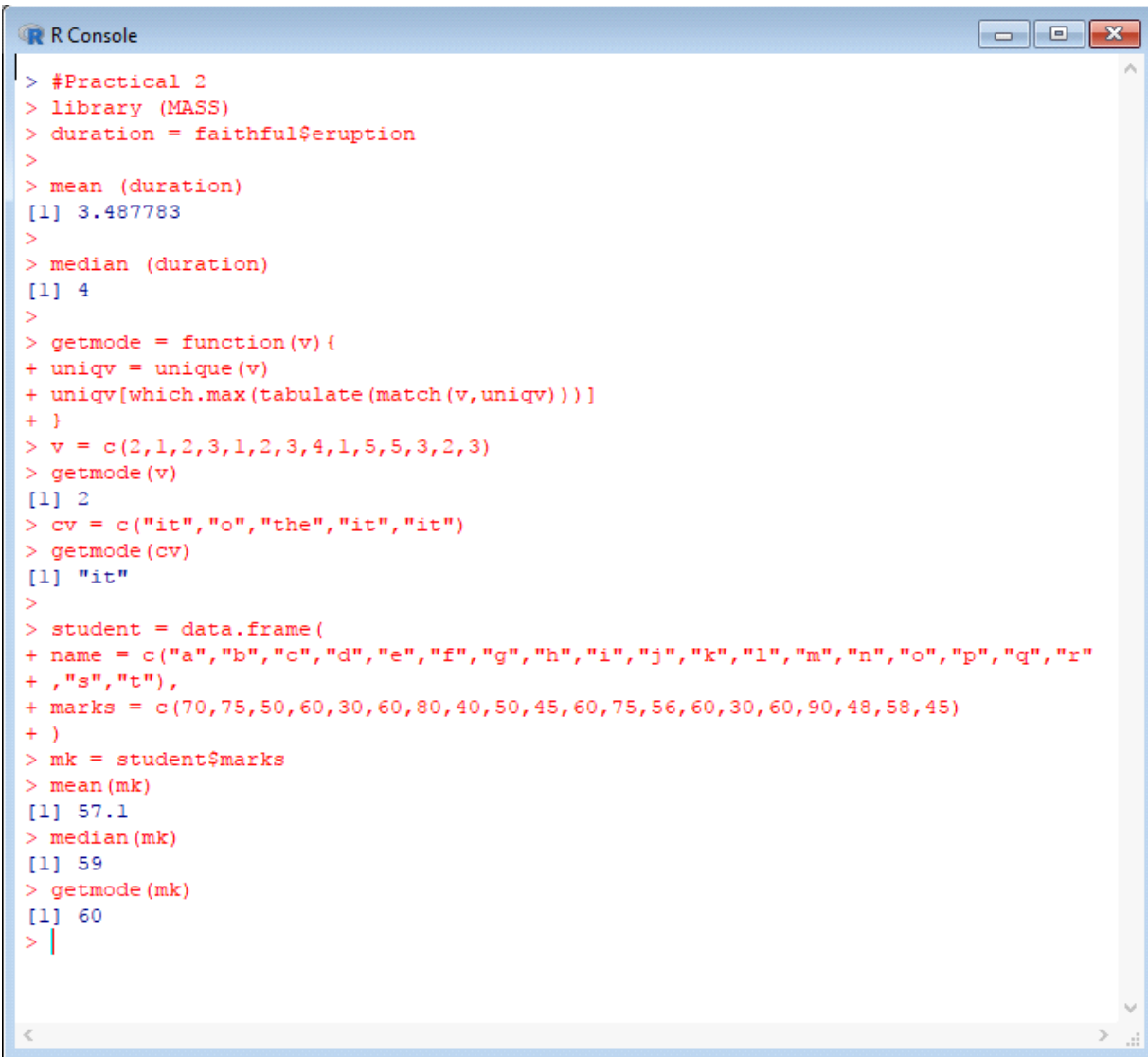
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PRACTICAL 3

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)
```

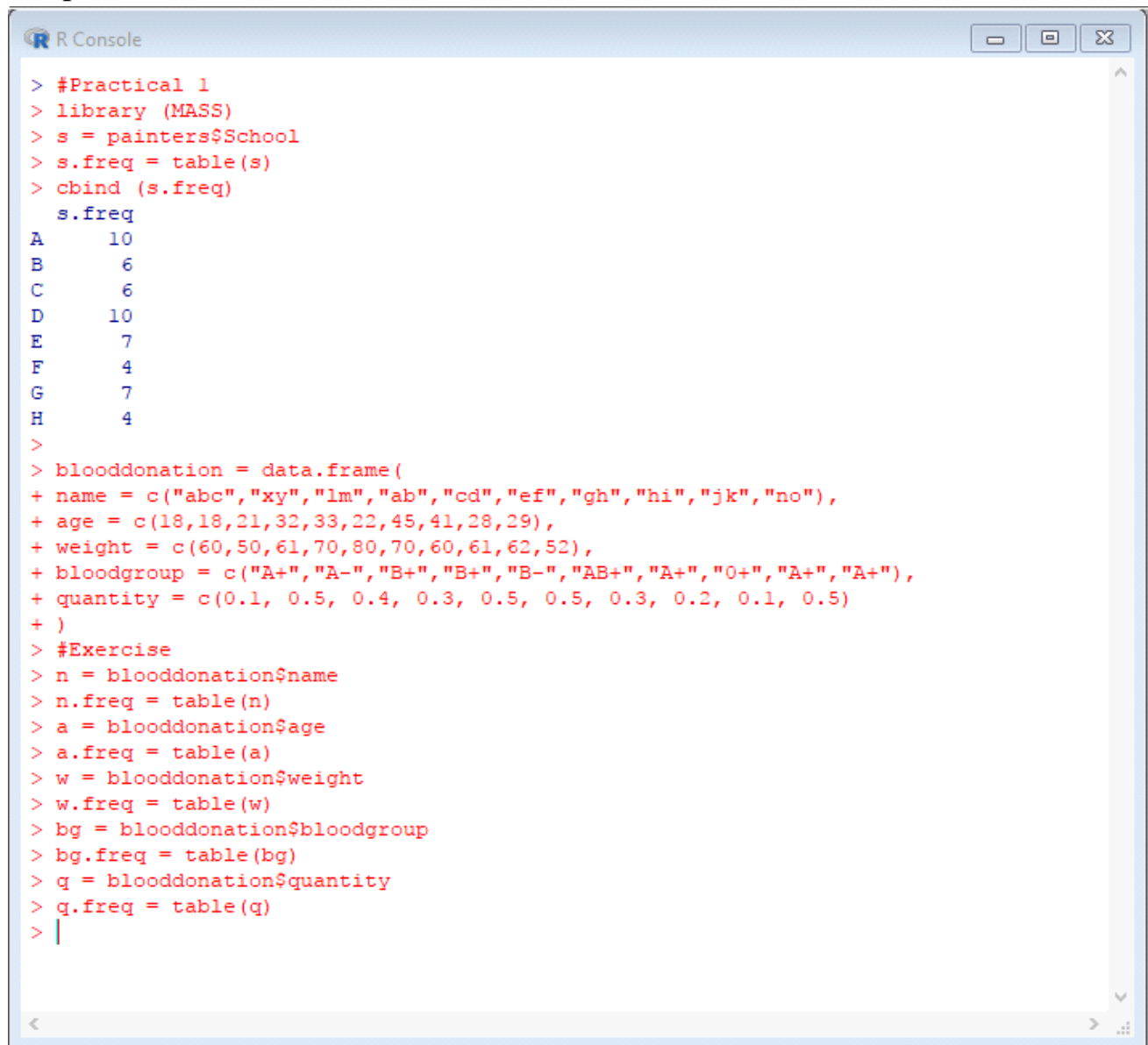
```
bg = blooddonation$bloodgroup
```

```
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()

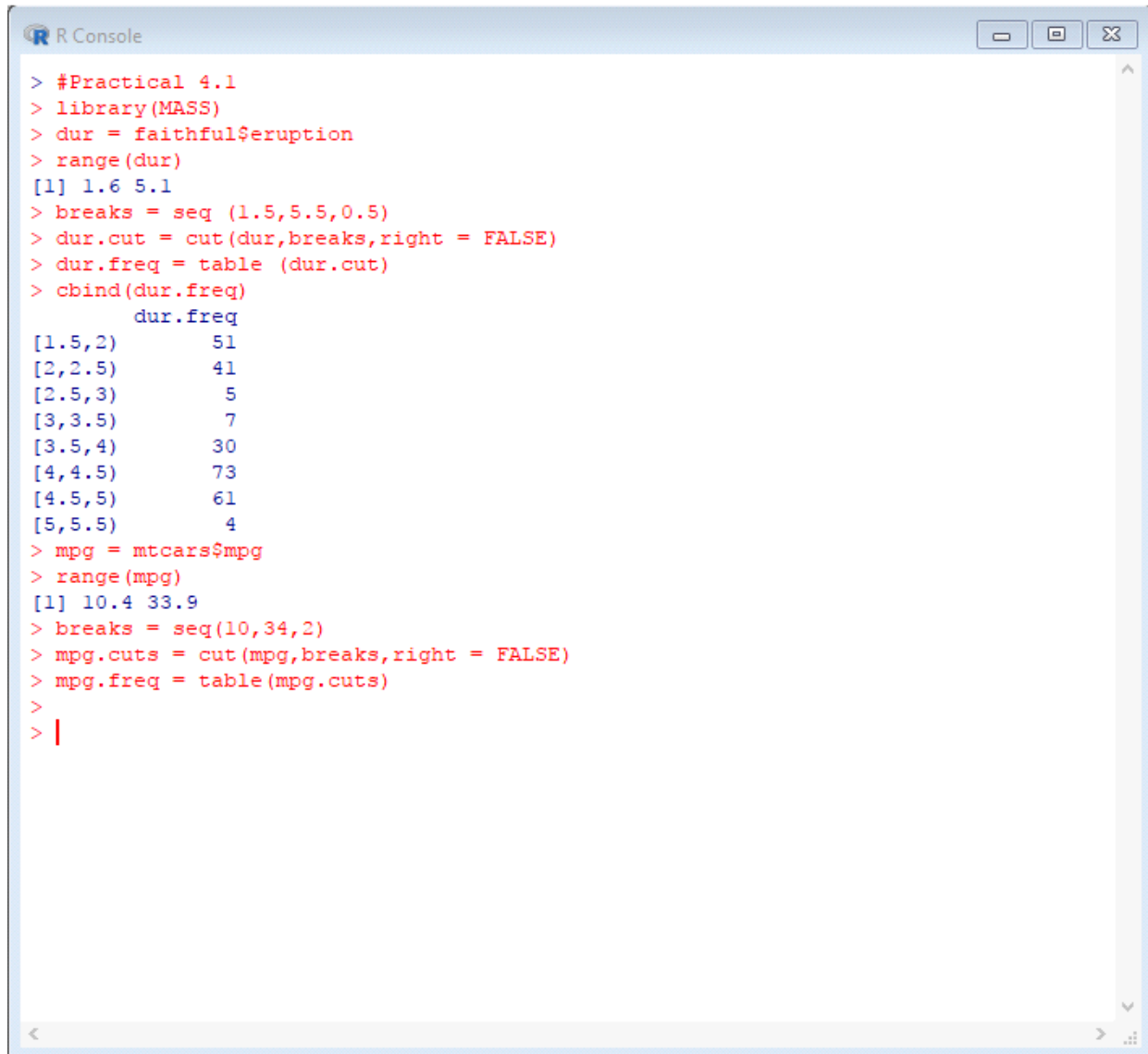
#Practical 5.a

```
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:-An R Console window titled "R Console" with standard window controls (minimize, maximize, close) in the top right. The console displays the following R code and its output:

```
> #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
> |
```

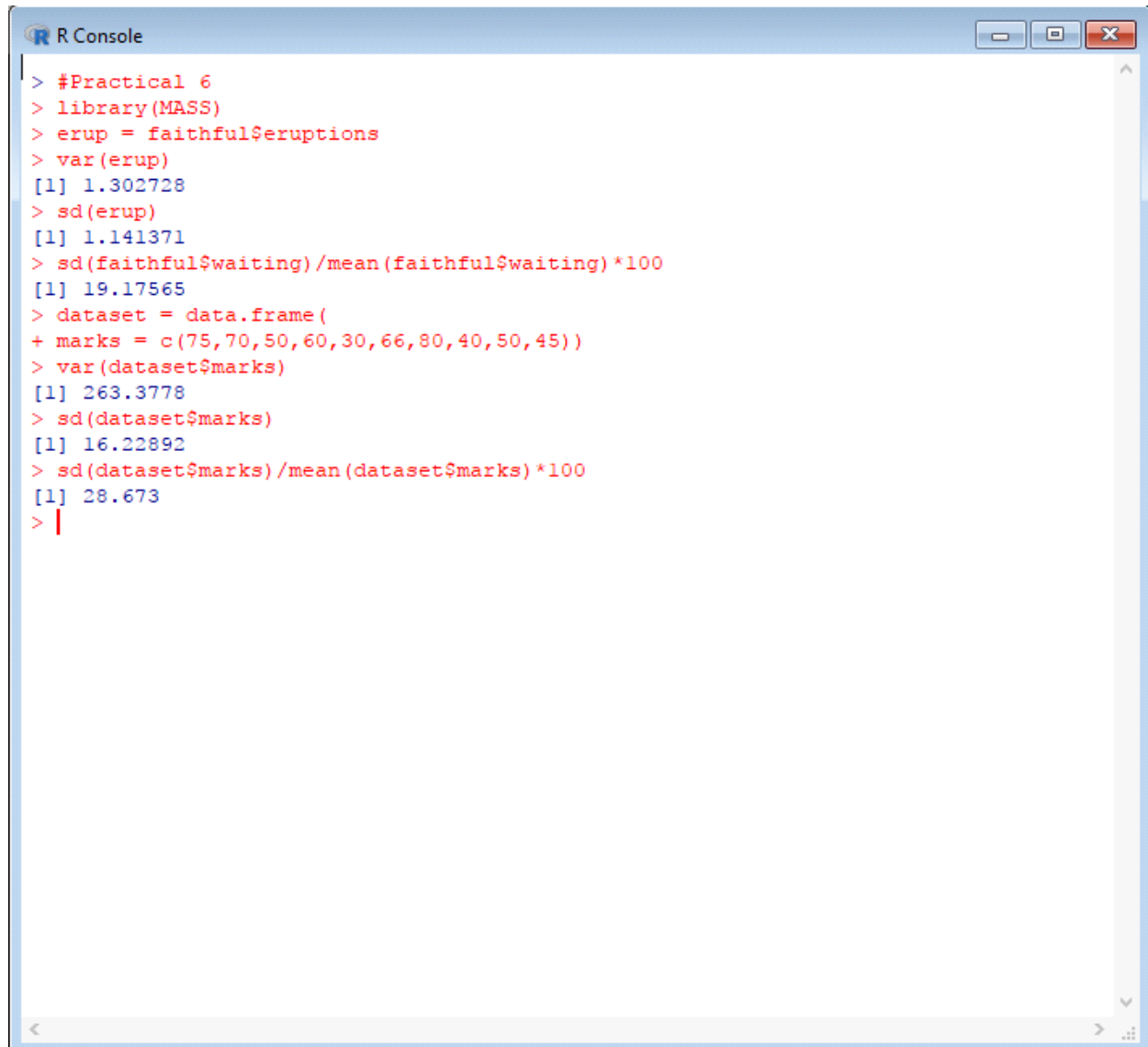
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PRACTICAL 6

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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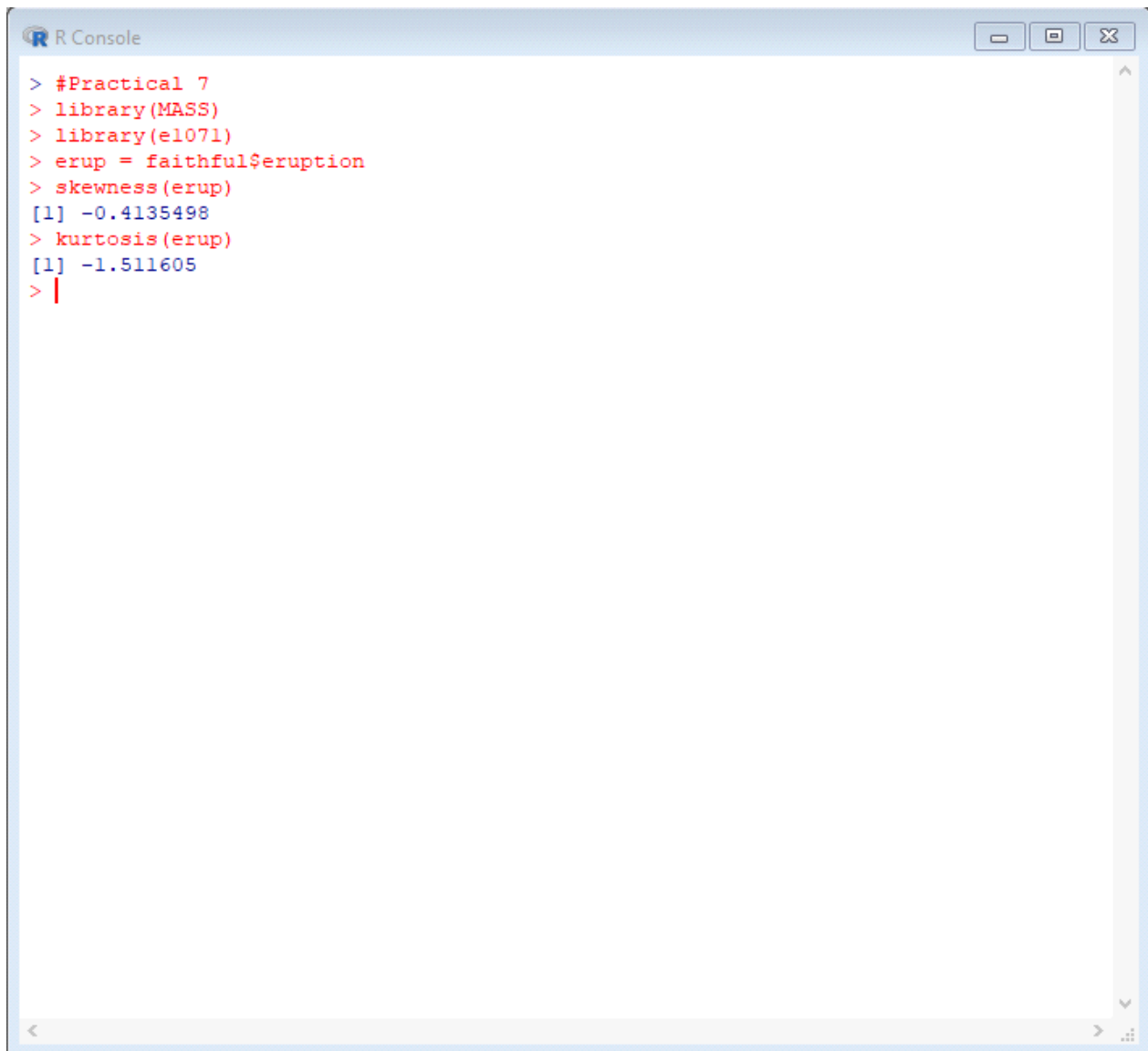
PRACTICAL 7

Aim:- Measures of skewness and kurtosis

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

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Output:-

The image shows a screenshot of an R Console window. The window has a title bar that says "R Console" and standard window control buttons (minimize, maximize, close) on the right. The console area contains the following text: a red prompt character ">" followed by "#Practical 7", then another red ">" followed by "library(MASS)", then a red ">" followed by "library(e1071)", then a red ">" followed by "erup = faithful\$eruption", then a red ">" followed by "skewness(erup)", then a blue "[1]" followed by "-0.4135498", then a red ">" followed by "kurtosis(erup)", then a blue "[1]" followed by "-1.511605", and finally a red ">" followed by a vertical bar "|". The console has a vertical scrollbar on the right and a horizontal scrollbar at the bottom.

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

PRACTICAL NO:8

Aim:- Correlation and regression

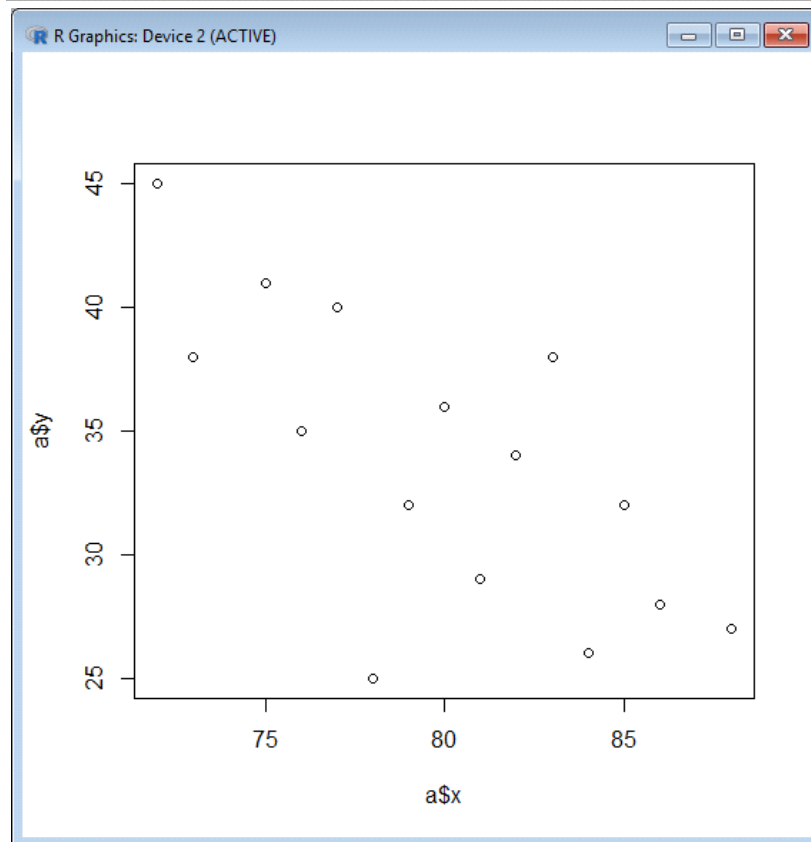
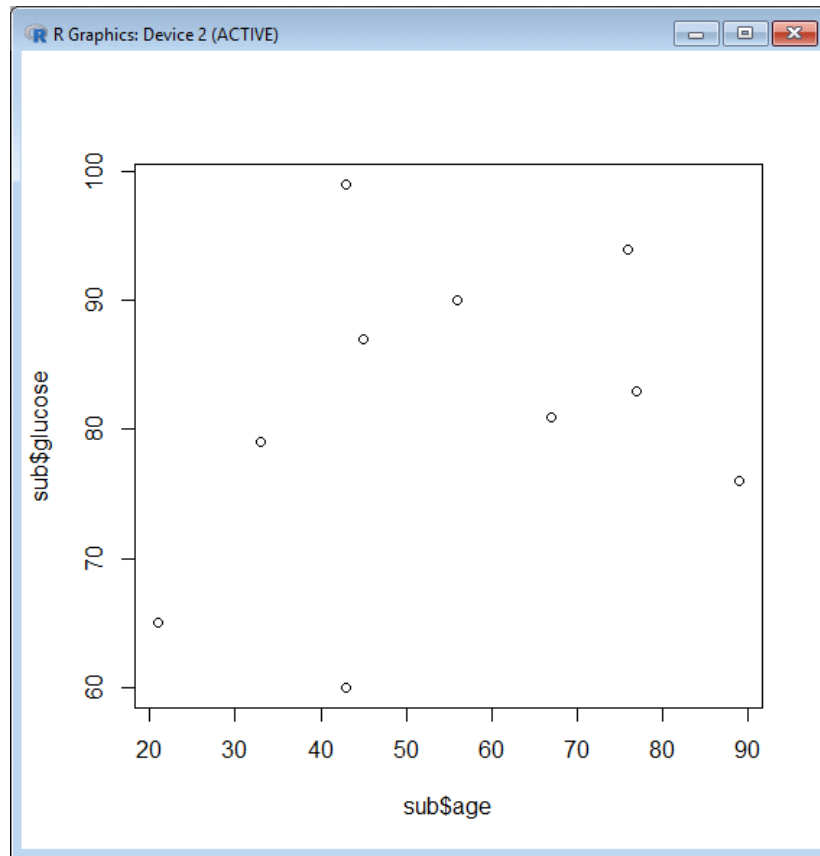
```
library(MASS)
cor(faithful$waiting,faithful$eruptions)
cor(painters$Drawing,painters$Colour)
sub = data.frame(subject = c(1:10),
age = c(43,21,33,45,67,77,56,89,76,43),
glucose = c(99,65,79,87,81,83,90,76,94,60)
)
cor(sub$age,sub$glucose)
plot(sub$age,sub$glucose)
a = data.frame(
x = c(72,73,75,76,77,78,79,80,81,82,83,84,85,86,88),
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=m/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
```

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
[1] 10 11 12 13 14 15
```

[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
```