INDEX

Title		
SL.NO	**PART A**	**PAGE NO**
1	Write a program to create a 3 X 3 matrices A and B and perform the following operations. a. $A^T.B$ b. $B^T.(A.A^T)$ c. $(A.A^T).B^T$ d. $[(B.B^T)+(A.A^T)-100I_3]^{-1}$	
2	Write a R program to find roots of quadratic equation using user defined function. Test the program user supplied values for all possible cases.	
3	Write R script to generate prime numbers between two numbers using loops.	
4	Write an R program to create a list containing strings, numbers, vectors and logical values and do the following manipulations over the list. a. Access the first element in the list. b. Give the names to the element in the list. c. Add element at some positions in the list. d. Remove the element. e. Print the first and third element. f. Update the third element.	
5	The following table shows the time taken (in minutes) by 100 students to travel to school on a particular day. a. Draw the histogram. b. Draw frequency polygon.	

6 Write a R program to create a Data Frame with following details and do the following operations.

Item Code	Item Category	Item Price
1001	Electronics	700
1002	Desktop supplies	300
1003	Office Supplies	350
1004	USB	400
1005	CD Drive	800

a. Subset the Data frame and display the details of only those items whose price is greater than or equal to 350.
b. Subset the Data frame and display the items where the category is either “Office Supplies” or “Desktop Supplies”.
c. Subset the Data frame and display the items where the Item price between 300 and 700.
d. Compute the sum of all Item Price .
e. Create another Data Frame called “item-details” with three different fields itemCode, ItemQtyonHand and ItemRecordLvl and merge the two frame.

7 Create a factor marital_status with levels Married, single, divorced. Perform the following operations on this factor.

a. Check the variable is a factor.
b. Across the 2nd and 4th element in the factor.
c. Remove third element from the factor.
d. Modify the second element of the factor.
e. Add new level widowed to the factor and add the same level to the factor marital_status.

8 Write a R language Script for following operation on Iris Data Set.

1. Load the Iris Dataset.
2. View first six rows of iris dataset.
3. Summarize iris dataset.
4. Display number of rows and columns.
5. Display columns names of dataset.
6. Create histogram of values for sepal length.
7. Create scatterplot of sepal width vs. sepal length.
8. Create boxplot of sepal width vs sepal length.
9. Find Pearson correlation between Sepal.Length and Petal.Length.
10. Create correlation matrix for dataset.

<table>
<tr><th>SL.NO</th><th>PART B</th><th>PAGE NO</th></tr>
<tr><td>1</td><td>
Write a R program to create a Vector containing following 8 values and perform the following operations.
4 3 0 5 2 9 4 5
a. Find mean, median, mode.
b. Find the range.
c. Find the 35th and 78th percentile.
d. Find the variance and standard deviation.
e. Find the interquartile range.
f. Find the z-score for each value.
</td><td></td></tr>
<tr><td>2</td><td>
Write R script to find the correlation coefficient and type of correlation between advertisement expenses and sales volume using Karl Pearson's coefficient method (Direct Method).
<table>
<tr><td>Firm</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr>
<tr><td>Advertisement Exp. (Rs. In Lakhs)</td><td>11</td><td>13</td><td>14</td><td>16</td><td>16</td><td>15</td><td>15</td><td>14</td><td>13</td><td>13</td></tr>
<tr><td>Sales Volume (Rs. In Lakhs)</td><td>50</td><td>50</td><td>55</td><td>60</td><td>65</td><td>65</td><td>65</td><td>60</td><td>60</td><td>50</td></tr>
</table>
</td><td></td></tr>
<tr><td>3</td><td>
Write a R script to compute the regression equation of y on x from the following data. Predict the value of y when x = 7.
<table>
<tr><td>X</td><td>2</td><td>4</td><td>5</td><td>6</td><td>8</td><td>11</td></tr>
<tr><td>Y</td><td>18</td><td>12</td><td>10</td><td>8</td><td>7</td><td>5</td></tr>
</table>
</td><td></td></tr>
<tr><td>4</td><td>
The times taken by a large group of students to complete a piece of homework, T minutes, are Normally distributed with a mean of 57 minutes and standard deviation of 6.5. Find the probability that the time taken by a random student from the group to complete this homework will be less than 60 minutes.
Write R script to find the probability that the time taken by a random student from the group to complete this homework.
a) Will be less than 60 minutes.
b) Between 50 and 80 minutes.
</td><td></td></tr>
<tr><td>5</td><td>
Write R script to perform the following using binomial distribution.
i. If n=4 and p=0.10, Find P(x=3)
ii. If n=12 and p=.45, Find P(5<=x<=7)
</td><td></td></tr>
</table>

<table>
<tr><td>6</td><td>Perform the following using uniform distribution between 200 and 240.
i. P(x>230)
ii. P(205≤x≤220</td><td></td></tr>
<tr><td>7</td><td>Following are the scores of max vertical jumps before and after the training program. Test whether the training program is helpful to the students (Use Paired t-test).
<table>
<tr><th>Player</th><th>Before Training Program</th><th>After Training Program</th></tr>
<tr><td>Player 1</td><td>22</td><td>24</td></tr>
<tr><td>Player 2</td><td>19</td><td>19</td></tr>
<tr><td>Player 3</td><td>24</td><td>22</td></tr>
<tr><td>Player 4</td><td>24</td><td>22</td></tr>
<tr><td>Player 5</td><td>25</td><td>28</td></tr>
<tr><td>Player 6</td><td>25</td><td>26</td></tr>
<tr><td>Player 7</td><td>28</td><td>28</td></tr>
<tr><td>Player 8</td><td>22</td><td>24</td></tr>
<tr><td>Player 9</td><td>30</td><td>30</td></tr>
<tr><td>Player 10</td><td>27</td><td>29</td></tr>
<tr><td>Player 11</td><td>24</td><td>25</td></tr>
<tr><td>Player 12</td><td>18</td><td>20</td></tr>
<tr><td>Player 13</td><td>16</td><td>17</td></tr>
<tr><td>Player 14</td><td>19</td><td>18</td></tr>
<tr><td>Player 15</td><td>19</td><td>18</td></tr>
<tr><td>Player 16</td><td>28</td><td>28</td></tr>
<tr><td>Player 17</td><td>24</td><td>26</td></tr>
<tr><td>Player 18</td><td>25</td><td>27</td></tr>
<tr><td>Player 19</td><td>25</td><td>27</td></tr>
<tr><td>Player 20</td><td>23</td><td>24</td></tr>
</table></td><td></td></tr>
<tr><td>8</td><td>A company has three manufacturing plants, and company officials want to determine whether there is difference in the average age of workers at the three locations. The following data are the age of five randomly selected workers at each plant. Perform a one-way ANOVA to determine whether there is a significant difference in the ages of the workers at three plants. Use α=0.01. Write R script for the above problem.
<table>
<tr><th>1</th><th>2</th><th>3</th></tr>
<tr><td>29</td><td>32</td><td>25</td></tr>
<tr><td>27</td><td>33</td><td>24</td></tr>
<tr><td>30</td><td>31</td><td>24</td></tr>
<tr><td>27</td><td>34</td><td>25</td></tr>
<tr><td>28</td><td>30</td><td>25</td></tr>
</table></td><td></td></tr>
</table>

PART-A

/***/

Exp.no-1

Aim : Write a program to create a 3 X 3 matrices A and B and perform the following operations.

a. $A^T .B$

b. $B^T .(A.A^T)$

c. $(A.A^T).B^T$

d. $[(B.B^T)+(A.A^T)-100I3]^{-1}$

Date : /09/2024

/***/

```
A<-matrix(c(1,2,3,4,5,6,7,8,9),nrow=3,ncol=3)
B<-matrix(c(9,8,7,6,5,4,3,2,1),nrow=3,ncol=3)

result_a<-t(A)%*%B
result_b<-t(B)%*%(A%*%t(A))
result_c<-(A%*%t(A))%*%t(B)
result_d<-solve((B%*%t(B))+(A%*%t(A))-100*diag(3))

cat("matrix A:\n")
print(A)
cat("matrix B:\n")
print(B)
cat("\na)AT.B:\n")
print(result_a)
cat("\nb)BT.(A.AT):\n")
print(result_b)
cat("\nc)(A.AT).BT:\n")
print(result_c)
cat("\nd)[(B.BT)+(A.AT)-100*diag(3)]^(-1):\n")
print(result_d)
```

OUTPUT:

matrix A:

```
     [,1] [,2] [,3]
[1,]    1    4    7
[2,]    2    5    8
[3,]    3    6    9
```

matrix B:

```
     [,1] [,2] [,3]
[1,]    9    6    3
[2,]    8    5    2
[3,]    7    4    1
```

a)AT.B:

```
     [,1] [,2] [,3]
[1,]   46   28   10
[2,]  118   73   28
[3,]  190  118   46
```

b)BT.(A.AT):

```
     [,1] [,2] [,3]
[1,] 1848 2202 2556
[2,] 1146 1365 1584
[3,]  444  528  612
```

c)(A.AT).BT:

```
     [,1] [,2] [,3]
[1,] 1332 1098  864
[2,] 1584 1305 1026
[3,] 1836 1512 1188
```

d)[(B.BT)+(A.AT)-100*diag(3)]^(-1):

```
             [,1]         [,2]         [,3]
[1,] -0.006620683  0.004061135  0.004742954
[2,]  0.004061135 -0.005938865  0.004061135
[3,]  0.004742954  0.004061135 -0.006620683
>
```

/***/

Exp no : 2

Aim : Write R program to find roots of quadratic equation using user define function. Test the program user supplied values for all possible cases.

Date : /09/2024

/***/

```
quadtratic_equation <- function(a, b, c)
{
  d <- b^2 -
  4*a*c
  if (d > 0)
  {
    x1 <- (-b+sqrt(d))/(2*a)
    x2 <- (-b-sqrt(d))/(2*a)
    paste("The roots of the equation are real and distinct is:",round(x1),"and",round(x2))
  }
  else if (d == 0)
  {
    x <- -b/(2^a)
    paste("The real and equal roots of the equation is:",round(x))
  }
  else
  {
    paste("The equation has no real roots")
  }
}

a <- as.numeric(readline("Enter the value of a:"))
b <- as.numeric(readline("Enter the value of b:"))
c <- as.numeric(readline("Enter the value of c:"))
quadtratic_equation(a, b, c)
```

<u>OUTPUT:</u>

```
Enter the value of
a:1
Enter the value of
b:-7
Enter the value of
c:10
[1] "The roots of the equation are real and distinct is: 5 and 2"

Enter the value of
a:1
```

```
Enter the value of
b:-2
Enter the value of
c:1
[1] "The real and equal roots of the equation is: 1"

Enter the value of
a:4
Enter the value of
b:5
Enter the value of
c:6
[1] "The equation has no real roots"
```

/***/

Exp no : 3

Aim : Write R script to generate prime numbers between two numbers using loops.

Date : 06/09/2024

/***/

```
generate_prime <- function(a, b)
{
   primes <- c()
   for (n in a:b)
   {
      if(n==2)
         primes <- append(primes, n)
      if(all(n%%2:(n-1)!=0))
      {
         primes <- append(primes, n)
      }
   }
   return(primes)
}

a <- as.numeric(readline("Enter the value of a:"))
b <- as.numeric(readline("Enter the value of b:"))
generate_prime(a, b)
```

OUTPUT:

```
Enter the value of a:1
Enter the value of b:15
> generate_prime(a, b)
> [1] 2 3 5 7 11 13


Enter the value of a:5
Enter the value of b:20
> generate_prime(a, b)
> [1] 5 7 11 13 17 19
```

/**/
Exp no: 4
Aim : Write a R program to create a list containing strings, numbers, vectors and logical Values and do the following manipulations over the list.

a. **Access the first element in the list.**
b. **Give the names to the elements in the list.**
c. **Add element to some positions in the list.**
d. **Remove the element.**
e. **Print the first and third element.**
f. **Update the third element.**

Date : /08/2024
/**/

```
list_data <- list("Red", c(21,32,11), TRUE,
51.23)list_data

paste("a.Access the first element in the
list:")list_data[1]

paste("b.Names of the elements in the list:")
names(list_data) <- c("color", "marks", "flag",
"average")list_data

paste("c.Add element to some positions in the
list:")
 p1 = as.numeric(readline("Enter position to
insert:"))
list_data <- append(list_data, "Mangalore", after
= p1-1)
 list_data

paste("d.Remove the element:")
p2 = as.numeric(readline("Enter position to
remove:"))
list_data[-p2]

paste("e.Print the first and third
element:")
 list_data[1]
list_data[3]

paste("f.Update the third
element:")
 list_data[3] <- 88.97
list_data
```

OUTPUT:

```
  list_data <- list("Red", c(21,32,11), TRUE, 51.23)
> list_data
[[1]]
[1] "Red"
[[2]]
[1] 21 32 11
[[3]]
[1] TRUE
[[4]]
[1] 51.23

[1] "a.Access the first element in the list:"
> list_data[1]
[1] "Red"

[1] "b.Names of the elements in the list:"
> names(list_data) <- c("color", "marks", "flag", "average")
> list_data
$color
[1] "Red"
$marks
[1] 21 32 11
$flag
[1] TRUE
$average
[1] 51.23

[1] "c.Add element to some positions in the list:"
Enter position to insert:2
> list_data <- append(list_data, "Mangalore", after = p1-1)
> list_data
$color
[1] "Red"
[[2]]
[1] "Mangalore"
$marks
[1] 21 32 11
$flag
[1] TRUE
$average
[1] 51.23
```

```
[1] "d.Remove the element:"
Enter position to remove:3
> list_data[-p2]
$color
[1] "Red"
[[2]]
[1] "Mangalore"
$flag
[1] TRUE
$average
[1] 51.23

[1] "e.Print the first and third element:"
> list_data[1]
$color
[1] "Red"
> list_data[3]
$flag
[1] TRUE

[1] "f.Update the third element:"
> list_data[3] <- 88.97
> list_data
$color
[1] "Red"
$marks
[1] 21 32 11
$flag
[1] 88.97
$average
[1] 51.23
```

/***/
Exp no: 5
Aim : The following table shows the time taken (in minutes) by 100 students to travel to school on a particular day.

Time	**0-5**	**5-10**	**10-15**	**15-20**	**20-25**
No. of students	**5**	**25**	**40**	**17**	**13**

a. Draw the histogram.
b. Draw frequency polygon.

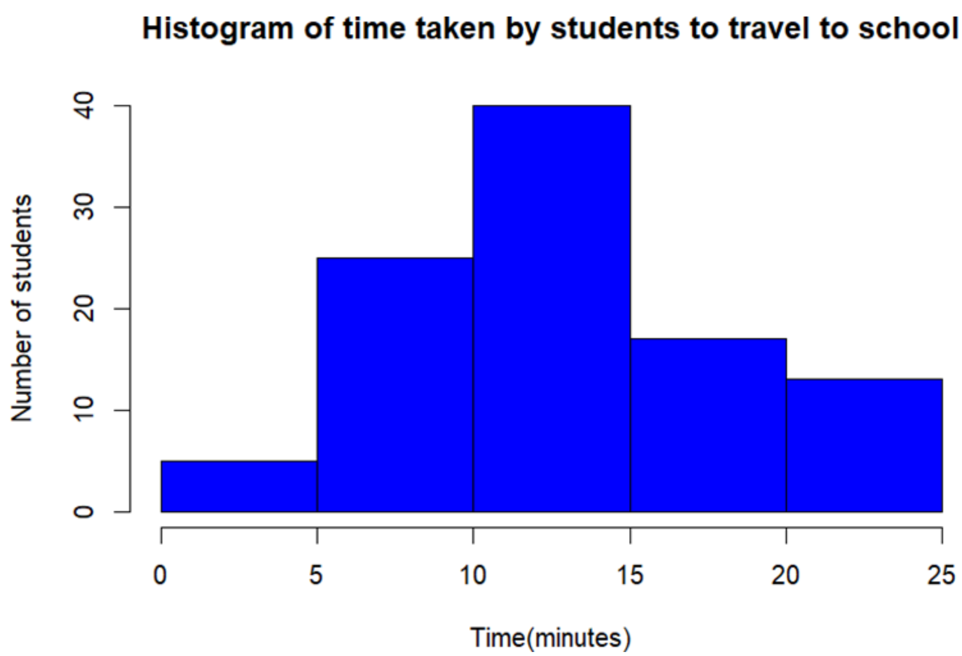
Date : /08/2024
/***/

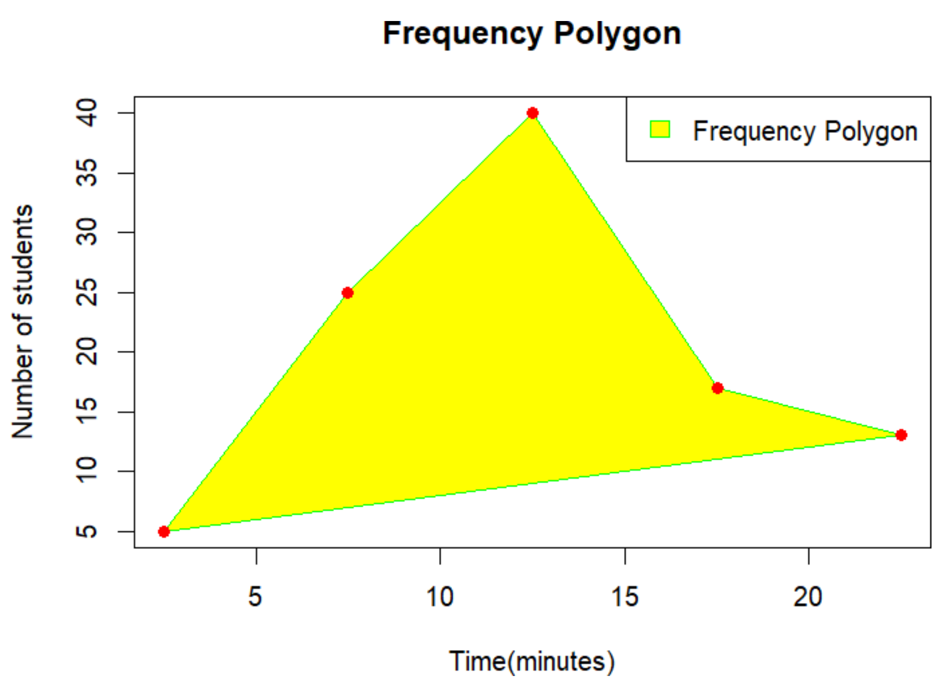
```
no_of_students <- c(5, 25, 40, 17, 13)
midpoints <- c(2.5, 7.5, 12.5, 17.5, 22.5)
time_taken <- c(rep(2.5, 5), rep(7.5, 25), rep(12.5, 40), rep(17.5, 17), rep(22.5, 13))

hist(time_taken,
   breaks = c(0, 5, 10, 15, 20, 25),
   col = "blue",
   xlab = "Time(minutes)",
   ylab="Number of
   students",
   main="Histogram of time taken by students to travel to school")

plot(midpoints,
   no_of_students,type = "n",
   xlab = "Time(minutes)",
   ylab ="Number of
   students",main =
   "Frequency Polygon")
polygon(midpoints, no_of_students, col = "yellow", border =
"green")points(midpoints, no_of_students, pch = 16, col =
"red")
legend("topright", legend = "Frequency Polygon", fil = "yellow", border = "green")
```

OUTPUT:


Histogram of time taken by students to travel to school
Number of students
0
10
20
30
40
0
5
10
15
20
25
Time(minutes)


Frequency Polygon
Frequency Polygon
Number of students
5
10
15
20
25
30
35
40
5
10
15
20
Time(minutes)

/***/

Exp no: 6

Aim : Write an R program to create a Data Frame with following details and do the following operations.

Item Code	Item Category	Item Price
1001	Electronics	700
1002	Desktop supplies	300
1003	Office Supplies	350
1004	USB	400
1005	CD Drive	800

a. **Subset the Data frame and display the details of only those items whose price if greater than or equal to 350.**
b. **Subset the Data frame and display only the items where the category is either "Office Supplies" or "Desktop Supplies".**
c. **Subset the Data frame and display the items where the Itemprice between 300 and 700.**
d. **Compute the sum of all ItemPrice.**
e. **Create another Data Frame called "item-details" with three different fields itemCode, ItemQtyonHand and ItemReorderLvl and merge the two frames.**

Date : /08/2024

/***/

```
Data <- data.frame(itemCode = c(1001,1002,1003,1004,1005),
                   itemCategory = c("Electronics", "Desktop Supplies", "Office Supplies", "USB",
                   "CD-Drive"),itemprice = c(700,300,350,400,800))
subset_a < -Data[Data$itemprice >= 350,]
subset_b <- Data[Data$itemCategory%in%c("Office Supplies", "Desktop
Supplies"),]
subset_c <- Data[Data$itemprice >= 300 & Data$itemprice <= 700,]
total_price <- sum(Data$itemprice)
item_details <- data.frame(itemCode = c(1001,1002,1003,1004,1005),
                           itemQtyonHand =
                           c(10,15,20,5,12),
                           itemReorderLvl=c(2,5,3,4,6))
merge_data <- merge(Data, item_details, by = "itemCode")

print("a.subset greater than =
350")print(subset_a)
print("b.subset item is office or
desktop:")print(subset_b)
print("c.between 300 and
700")print(subset_c)
print("d.sum of the
item")print(total_price)
```

```
print("e.Merge Data")
print(merge_data)
```

OUTPUT:

```
[
1] "a.subset greater than = 350"

  itemCode    itemCategory itemprice
1     1001     Electronics       700
3     1003 Office Supplies       350
4     1004             USB       400
5     1005        CD-Drive       800

[1] "b.subset item is office or desktop:"

  itemCode            itemCategory            itemprice
2     1002                 Desktop Supplies       300
3     1003                Office Supplies          350

[1] "c.between 300 and 700"

  itemCode     itemCategory          itemprice
1     1001      Electronics               700
2     1002     Desktop Supplies          300
3     1003     Office Supplies            350
4     1004              USB                 400

[1] "d.sum of the item"

[1] 2550

[1] "e.Merge Data"

  itemCode     itemCategory itemprice itemQtyonHand itemReorderLvl
1     1001      Electronics       700            10              2
2     1002 Desktop Supplies       300            15              5
3     1003  Office Supplies       350            20              3
4     1004              USB      400             5              4
5     1005         CD-Drive       800            12              6
>
```

/***/

Exp no: 7

Aim : Create a factor marital_status with levels Married, single, divorced. Perform the following operations on this factor.

- **a. Check the variable is a factor.**
- **b. Access the 2nd and 4th element in the factor.**
- **c. Remove third element from the factor.**
- **d. Modify the second element of the factor.**
- **e. Add new level widowed to the factor and add the same level to the factor marital status.**

Date : /09/2024

/***/

```
marital_status <- factor(c("Married", "Single", "Divorced", "Married", "Single",
"Divorced"))

print("a.  Check the variable is a factor")
is.factor(marital_status)

print("b. Access the 2nd and 4th element in the
factor")marital_status[c(2, 4)]

print("c. Remove third element from the
factor ")marital_status[-3]

print("d. Modify the second element of the
factor")marital_status[2]  <- "Married"
print(marital_status)

print("e. Add new level widowed to the factor and add the same level to the factor
marital_status")marital_status <- factor(marital_status, levels = c(levels(marital_status),
"Widowed")) print(marital_status)
marital_status <- factor(c(as.character(marital_status),
"Widowed"))print(marital_status)
```

OUTPUT:

```
  marital_status <- factor(c("Married", "Single", "Divorced", "Married", " Single", "Divorced"))

 [1] "a. Check the variable is a factor"
> is.factor(marital_status)
[1] TRUE

 [1] "b. Access the 2nd and 4th element in the factor"
> marital_status[c(2, 4)]
[1] Single  Married
Levels:  Single Divorced Married

 [1] "c. Remove third element from the factor "
```

```
> marital_status[-3]
[1] Married  Single   Married   Single  Divorced
Levels:  Single Divorced Married


 [1] "d. Modify the second element of the factor"
> marital_status[2] <- "Married"
> print(marital_status)
[1] Married  Married  Divorced Married   Single  Divorced
Levels:  Single Divorced Married

 [1] "e. Add new level widowed to the factor and add the same level to the factor marital_status"
> marital_status <- factor(marital_status, levels = c(levels(marital_status), "Widowed"))
> print(marital_status)
[1] Married  Married  Divorced Married   Single  Divorced
Levels:  Single Divorced Married Widowed

> marital_status <- factor(c(as.character(marital_status), "Widowed"))
> print(marital_status)
[1] Married  Married  Divorced Married   Single  Divorced Widowed
Levels:  Single Divorced Married Widowed
```

/***/

Exp no: 8

Aim : Write a R language Script for following operation on Iris Data Set.

1. **Load the Iris Dataset.**
2. **View first six rows of iris dataset.**
3. **Summarize iris dataset.**
4. **Display number of rows and columns.**
5. **Display column names of dataset.**
6. **Create histogram of values for sepal length.**
7. **Create scatterplot of sepal width vs. sepal length.**
8. **Create boxplot of sepal width vs. sepal length.**
9. **Find Pearson correlation between Sepal.Length and Petal.Length.**
10. **Create correlation matrix for dataset.**

Date : /09/2024

/***/

```
cat("1. Load the Iris Dataset ")
data("iris")

cat("2. View first six rows of iris dataset")
head(iris)

cat("3. Summarize iris dataset")
summary(iris)

cat("4. Display number of rows and columns")
dim(iris)

cat("5. Display column names of dataset")
names(iris)

cat("6. Create histogram of values for sepal length")
hist(iris$Sepal.Length,
    col = "blue",
    xlab = "Length",
    ylab = "Frequency",
    main = "Histogram")

cat("7. Create scatterplot of sepal width vs. sepal length")
plot(iris$Sepal.Width, iris$Sepal.Length,
    col = "blue",
    xlab = "Sepal Width",
    ylab = "Sepal Length",
    main = "Scatterplot")

cat("8. Create boxplot of sepal width vs. sepal length")
boxplot(Sepal.Width ~ Sepal.Length,
```

```
    data  = iris,
    border = "green",
    col = "blue",
    xlab = "Sepal  Width",
    ylab = "Sepal Length",
    main = "Boxplot")

cat("9. Find Pearson correlation between Sepal.Length and Petal.Length")
cor(iris$Sepal.Length, iris$Sepal.Width, method=c("pearson"))

cat("10. Create correlation matrix for dataset")
cor_matrix <- cor(iris[, 1:4])
cor_matrix
```

OUTPUT:

1. Load the Iris Dataset

```
> data("iris")
```

2. View first six rows of iris dataset

```
> head(iris)
  Sepal.Length Sepal.Width Petal.Length Petal.Width Species
1          5.1         3.5          1.4         0.2  setosa
2          4.9         3.0          1.4         0.2  setosa
3          4.7         3.2          1.3         0.2  setosa
4          4.6         3.1          1.5         0.2  setosa
5          5.0         3.6          1.4         0.2  setosa
6          5.4         3.9          1.7         0.4  setosa
```

3. Summarize iris dataset

```
> summary(iris)
  Sepal.Length    Sepal.Width     Petal.Length    Petal.Width          Species
 Min.   :4.300   Min.   :2.000   Min.   :1.000   Min.   :0.100   setosa    :50
 1st Qu.:5.100   1st Qu.:2.800   1st Qu.:1.600   1st Qu.:0.300   versicolor:50
 Median :5.800   Median :3.000   Median :4.350   Median :1.300   virginica :50
 Mean   :5.843   Mean   :3.057   Mean   :3.758   Mean   :1.199
 3rd Qu.:6.400   3rd Qu.:3.300   3rd Qu.:5.100   3rd Qu.:1.800
 Max.   :7.900   Max.   :4.400   Max.   :6.900   Max.   :2.500
```

4. Display number of rows and columns

```
> dim(iris)
[1] 150   5
```

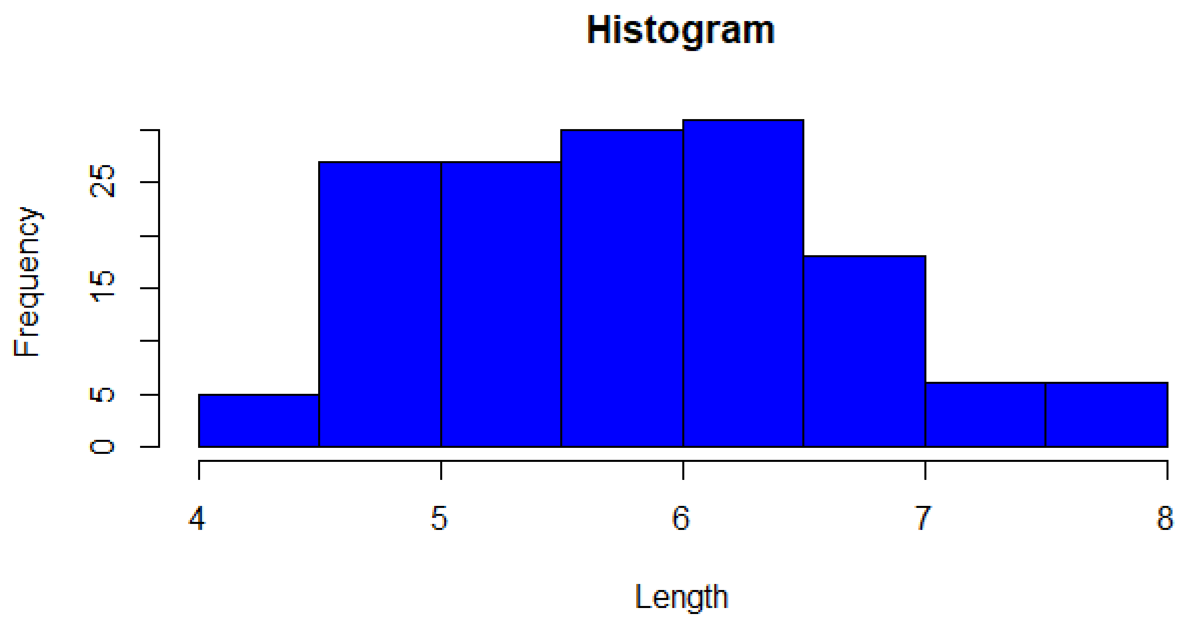
5. Display column names of dataset

```
> names(iris)
[1] "Sepal.Length" "Sepal.Width"  "Petal.Length" "Petal.Width"  "Species"
```

6. Create histogram of values for sepal length

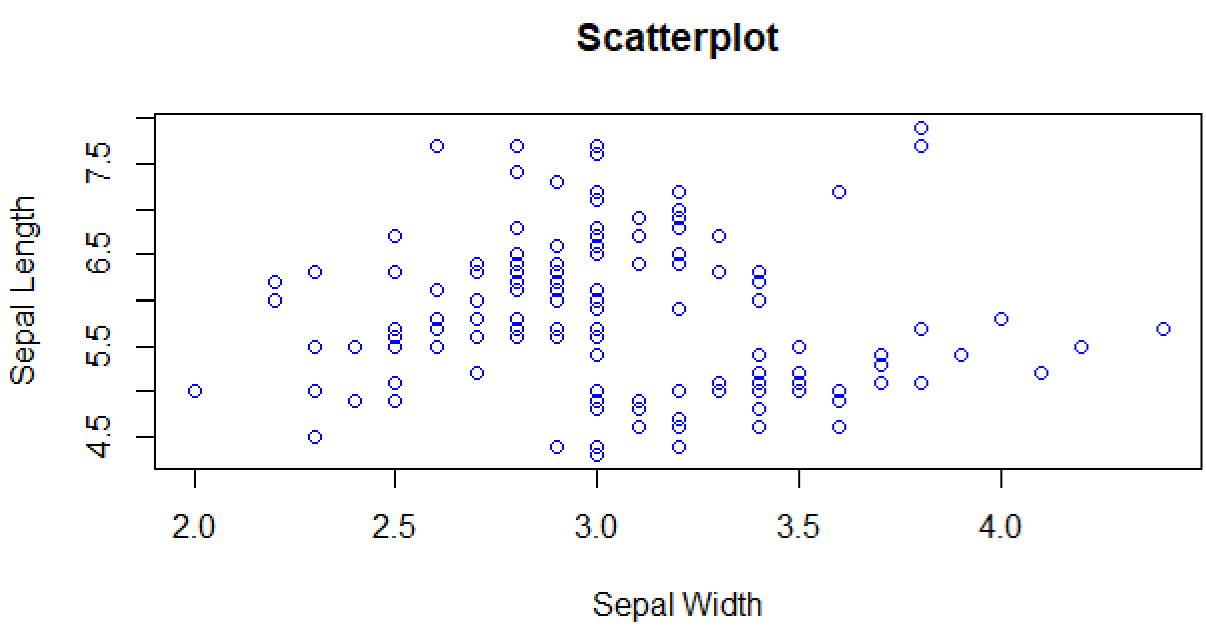
```
> hist(iris$Sepal.Length,

  col = "blue",
     xlab = "Length",
ylab = "Frequency",
  main = "Histogram")
```



7. Create scatterplot of sepal width vs. sepal length

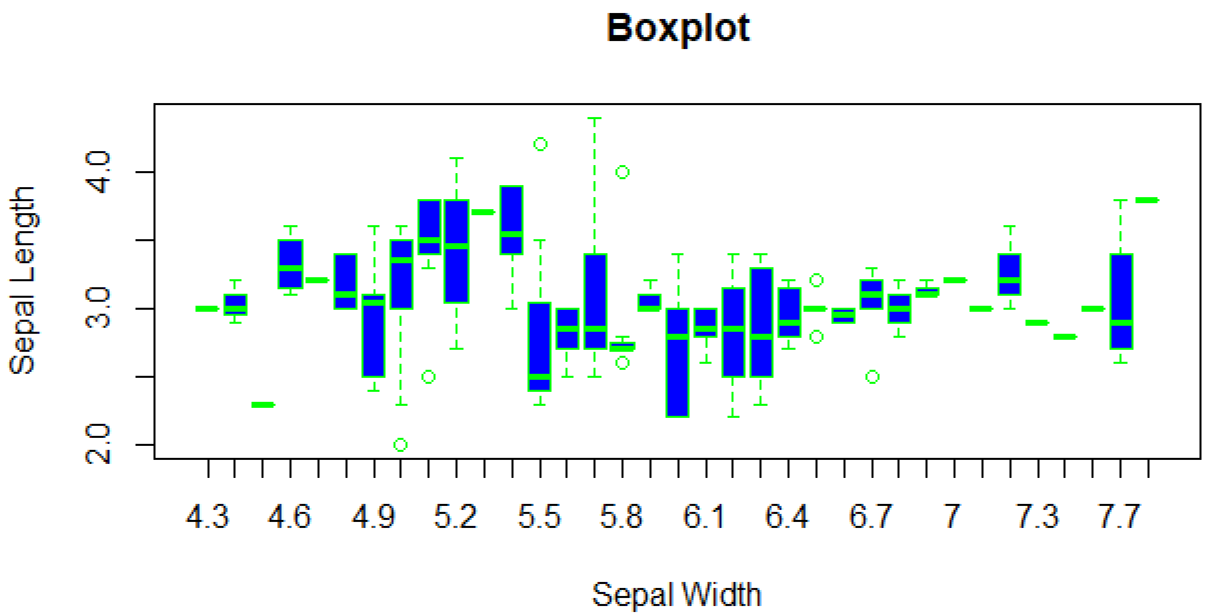
```
> plot(iris$Sepal.Width, iris$Sepal.Length,
       col = "blue",
       xlab = "Sepal Width",
       ylab = "Sepal Length",
       main = "Scatterplot")
```



8. Create boxplot of sepal width vs. sepal length

```
> boxplot(Sepal.Width ~ Sepal.Length,

        data = iris,
         border = "green",
         col = "blue",
         xlab = "Sepal Width",
        ylab = "Sepal Length",
        main = "Boxplot")
```



9. Find Pearson correlation between Sepal.Length and Petal.Length

```
> cor(iris$Sepal.Length, iris$Sepal.Width, method=c("pearson"))
[1] -0.1175698
```

10. Create correlation matrix for dataset

```
> cor_matrix <- cor(iris[, 1:4])
> cor_matrix
             Sepal.Length Sepal.Width Petal.Length Petal.Width
Sepal.Length    1.0000000  -0.1175698    0.8717538   0.8179411
Sepal.Width    -0.1175698   1.0000000   -0.4284401  -0.3661259
Petal.Length    0.8717538  -0.4284401    1.0000000   0.9628654
Petal.Width     0.8179411  -0.3661259    0.9628654   1.0000000
```

PART-B

/***/

Exp no: 1

Aim : Write a R program to create a Vector containing following 8 values and perform the following operations.

4 3 0 5 2 9 4 5

a. Find mean, median, mode.

b. Find the range.

c. Find the 35th and 78th percentile.

d. Find the variance and standard deviation.

e. Find the interquartile range.

f. Find the z-score for each value.

Date : /09/2024

/***/

```
vec<-c(4,3,0,5,2,9,4,5)

paste("Mean=",mean(vec))

paste("Median=",median(vec))

#getmode<-function(v){

 # uniqv<-unique(v)

  #uniqv[which.max(tabulate(match(v,uniqv)))]

#}


#mode<-getmode(vec)


table_vec<-table(vec)

mode<-as.numeric(names(table_vec)[table_vec==max(table_vec)])

paste("Mode=",mode)

paste("Range=",diff(range(vec)))

quantile(vec,prob=c(0.35,0.78))

paste("Variance=",var(vec))

paste("Standard deviation=",sd(vec))

paste("Interquartile range=",IQR(vec))

vec_zscore<-((vec-mean(vec))/sd(vec))

vec_zscore
```

OUTPUT:

```
> vec<-c(4,3,0,5,2,9,4,5)
> paste("Mean=",mean(vec))
[1] "Mean= 4"


> paste("Median=",median(vec))
[1] "Median= 4"

> table_vec<-table(vec)
> mode<-as.numeric(names(table_vec)[table_vec==max(table_vec)])
> paste("Mode=",mode)
[1] "Mode= 4" "Mode= 5"

> paste("Range=",diff(range(vec)))
[1] "Range= 9"

> quantile(vec,prob=c(0.35,0.78))
 35%  78%
3.45 5.00

> paste("Variance=",var(vec))
[1] "Variance= 6.85714285714286"

> paste("Standard deviation=",sd(vec))
[1] "Standard deviation= 2.61861468283191"

> paste("Interquartile range=",IQR(vec))
[1] "Interquartile range= 2.25"

> vec_zscore<-((vec-mean(vec))/sd(vec))
> vec_zscore
[1]  0.0000000 -0.3818813 -1.5275252  0.3818813 -0.7637626  1.9094065  0.0000000
[8]  0.3818813
```

/***/

Exp no: 2

Aim : Write R script to find the correlation coefficient and type of correlation between advertisement expenses and sales volume using Karl Pearson's coefficient method (Direct Method).

Firm	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Advertisement Exp. (Rs. In Lakhs)	**11**	**13**	**14**	**16**	**16**	**15**	**15**	**14**	**13**	**13**
Sales Volume (Rs. In Lakhs)	**50**	**50**	**55**	**60**	**65**	**65**	**65**	**60**	**60**	**50**

Date : /09/2024

/***/

```
advertisement_exp<c(11,13,14,16,16,15,15,14,13,
13)
sales_volume<-c(50,50,55,60,65,65,65,60,60,50)

mean_ad_exp<-
mean(advertisement_exp)
mean_sales_volume<mean(sales_volum
e)
sum_deviation_product<-sum((advertisement_exp-
mean_ad_exp)*(sales_volume- mean_sales_volume))
sum_squared_dev_ad_exp<-sum((advertisement_exp-mean_ad_exp)^2)
sum_squared_dev_sales_volume<-sum((sales_volume-mean_sales_volume)^2)
correlation_coefficient<-
sum_deviation_product/sqrt(sum_squared_dev_ad_exp*sum_squared_dev_sales_vol
ume) if(correlation_coefficient>0){
  correlation_type<-"positive correlation"
} else if
(correlation_coefficient<0){
  correlation_type<-"Negative correlation"
} else{
  correlation_type<-"No correlation"
}
cat("Correlation Coeffiecient:",correlation_coefficient,"\n")
cat("Type of correlation:",correlation_type,"\n")>
```

OUTPUT:

Correlation Coeffiecient: 0.7865665

Type of correlation: positive correlation

/***/

Exp no: 3

Aim : Write a R script to compute the regression equation of y on x from the following data. Predict the value of y when x = 7.

X	2	4	5	6	8	11
Y	18	12	10	8	7	5

Date : /03/2024

/***/

```
x<-c(2,4,5,6,8,11)
y<-c(18,12,10,8,7,5)

model<-lm(y~x)
summary(model)
 new_data<-
data.frame(x=7)
predicted_y<-predict(model,newdata=new_data)

cat("Regressionequation:y=",round(coefficients(model)[1],2),"+",round(coefficients(model)[2],2
),"x\n")
cat("Predicted y when x=7:",round(predicted_y,2),"\n")
```

OUTPUT:

Regressionequation:y= 18.04 + -1.34 x
Predicted y when x=7: 8.66

/***/

Exp no: 4

Aim : The times taken by a large group of students to complete a piece of homework, T minutes, are Normally distributed with a mean of 57 minutes and standard deviation of 6.5. Find the probability that the time taken by a random student from the group to complete this homework will be less than 60 minutes.

Write R script to find the probability that the time taken by a random student from the group to complete this homework.

a) Will be less than 60 minutes.

b) Between 50 and 80 minutes

Date : /09/2024

/***/

```
mean_time <-57
std_deviation<-
6.5

prob_less_than_60<-pnorm(60,mean=mean_time,sd=std_deviation)
cat("probability that time is less than 60
minutes:",prob_less_than_60,"\n")

prob_between_50_and_80<pnorm(80,mean=mean_time,sd=std_deviati
on)- pnorm(50,mean=mean_time,sd=std_deviation)
cat("Probability that time is between 50 and 80 minutes:",prob_between_50_and_80,"\n")
```

OUTPUT:

```
> cat("probability that time is less than 60 minutes:",prob_less_than_60,"\n")
probability that time is less than 60 minutes: 0.6777938

> cat("Probability that time is between 50 and 80 minutes:",prob_between_50_and_80,"\n")
Probability that time is between 50 and 80 minutes: 0.8590415
```

/***/

Exp no: 5

Aim : Write R script to perform the following using binomial distribution.

i. **If n=4 and p=0.10, Find P(x=3)**
ii. **If n=12 and p=.45, Find P(5<=x<=7)**

Date : /09/2024

/**/

```
n1<-4
p1<0.10
prob_x_3<dbinom(3,size=n1,prob=
p1)n2<-12
p2<-0.45
prob_x_between_5_7<-
sum(dbinom(5:7,size=n2,prob=p2))

cat("i.p(x=3)=",prob_x_3,"\n")
cat("ii.p(5<=x<=7)=",prob_x_between_5_7,"\n")
```

OUTPUT:

```
cat("i.p(x=3)=",prob_x_3,"\n")
i.p(x=3)= 0.0036

cat("ii.p(5<=x<=7)=",prob_x_between_5_7,"\n")
ii.p(5<=x<=7)= 0.583828
```

/**/

Exp no: 6

Aim : Perform the following using uniform distribution between 200 and 240.

i. P(x>230)

ii. P(205≤x≤220)

Date : /09/2024

/**/

```
n<-10000
random_numbers<-runif(n,min=200,max=240)

probability_x_gt_230<-
mean(random_numbers>230)
cat("i.P(x>230):",probability_x_gt_230,"\n")

probability_x_between_205_and_220<-mean(random_numbers>=205&
random_numbers<=220)
cat("ii.P(205<=x<=220):",probability_x_between_205_and_220,"\n")
```

OUTPUT:

```
> cat("i.P(x>230):",probability_x_gt_230,"\n")
i.P(x>230): 0.2552

> cat("ii.P(205<=x<=220):",probability_x_between_205_and_220,"\n")
ii.P(205<=x<=220): 0.3794
```

/***/

Exp no: 7

Aim : Following are the scores of max vertical jumps before and after the trainingprogram. Test whether the training program is helpful to the students (Use Pairedt-test).

Player	Before Training Program	After Training Program
Player 1	22	24
Player 2	19	19
Player 3	24	22
Player 4	24	22
Player 5	25	28
Player 6	25	26
Player 7	28	28
Player 8	22	24
Player 9	30	30
Player 10	27	29
Player 11	24	25
Player 12	18	20
Player 13	16	17
Player 14	19	18
Player 15	19	18
Player 16	28	28
Player 17	24	26
Player 18	25	27
Player 19	25	27
Player 20	23	24

Date : /09/2024

/***/

```
data<-data.frame(
 player=1:20,
 before=c(22,20,19,24,25,25,28,22,30,27,24,18,16,19,19,28,24,25,25,23),
 after=c(24,22,19,22,28,26,28,24,30,29,25,20,17,18,18,28,26,27,27,24))
result<-t.test(data$before,data$after,paired=TRUE)
cat("paired t_test result:\n")
cat("t-
value:",result$statistic,"\n")
cat("p-
value:",result$p.value,"\n")
cat("degrees of freedom:",result$parameter,"\n")
cat("confidence interval of the
difference:",result$conf.int,"\n")
cat("effect size(cohen'sd):",(mean(data$before)-mean(data$after))/sd(data$before-
data$after),"\n") alpha<-0.05
if(result$p.value<alpha){
 cat("the training program is statistically significant in improving max vertical jumps.\n")
}else{
```

```
  cat("there is no significant improvemnet in max vertical  jumps after the training program.\n")
}
```

OUTPUT:

paired t_test result:

t-value: -3.226173

p-value: 0.004445371

degrees of freedom: 19

confidence interval of the difference: -1.566325 -0.3336745

effect size(cohen'sd): -0.7213943

the training program is statstically significant in improving max vertical jumps.

/**/

Exp no: 8

Aim : A company has three manufacturing plants, and company officials want to determine whether there is difference in the average age of workers at the threelocations. The following data are the age of five randomly selected workers at eachplant. Perform a one-way ANOVA to determine whether there is a significantdifference in the ages of the workers at three plants. Use α=0.01. Write R script forthe above problem.

1	**2**	**3**
29	**32**	**25**
27	**33**	**24**
30	**31**	**24**
27	**34**	**25**
28	**30**	**25**

Date : /09/2024

/***/

```
plant1   <-   c(29,27,30,27,28)
plant2   <-   c(32,33,31,34,30)
plant3 <- c(25,24,24,25,25)

data1 <- data.frame(
  Plant = factor(rep(1:3,each = 5)),
  Age = c(plant1,plant2,plant3)
)
data1
result <- aov(Age~Plant,data = data1)
summary(result)
pvalue <- summary(result)[[1]][["Pr(>F)"]][1]
alpha <- 0.01
pvalue
if(pvalue<alpha){
  cat("There is a sgnificant in the mean ages of workers at three plants (p-value = ",pvalue,")")
}else{
  cat("There is no sgnificant in the mean ages of workers at three plants (p-value = ",pvalue,")")
}
```

OUTPUT:

```
> data1 Plant Age
1     1  29
2     1  27
3     1  30
4     1  27
5     1  28
6     2  32
7     2  33
8     2  31
9     2  34
```

```
10    2  30
11    3  25
12    3  24
13    3  24
14    3  25
15    3  25

> result <- aov(Age~Plant,data = data1)

> summary(result)
          Df Sum Sq Mean Sq F value  Pr(>F) Plant
              2  136.9  68.47  45.64 2.46e-06 ***
Residuals   12   18.0   1.50
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

> pvalue <- summary(result)[[1]][["Pr(>F)"]][1]

> alpha <- 0.01

> pvalue
[1] 2.459041e-06

> if(pvalue<alpha){
+  cat("There is a significant in the mean ages of workers at three plants (p-value = ",pvalue,")")
+ }else{
+  cat("There is no  ..." ... [TRUNCATED]
There is a significant in the mean ages of workers at three plants (p-value =  2.459041e-06 )
```