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Problem 1

1. Data Manipulation

o Create a data frame in R with at least three columns (e.g., Name, Age, Marks).

o Perform the following operations:

* Add a new column to the data frame.
* Filter rows based on a condition (e.g., Marks &gt; 50).
* Sort the data frame by a specific column (e.g., Age).
* Save the modified data frame as a CSV file.

> df = data.frame( Name= c("Om", "Omkar", "Omsiddh", "Paaras", "Omik"), Age = rep(19, times= 5), Marks = c(98, 76, 69, 47, 95))

> new\_col\_df = cbind(df, grade = c("A", "B", "C","D", "A"))

> filter = subset(new\_col\_df, Marks>50)

> filter

Name Age Marks grade

1 Om 19 98 A

2 Omkar 19 76 B

3 Omsiddh 19 69 C

5 Omik 19 95 A

> sortedData = new\_col\_df[order(new\_col\_df$Age),]

> print(sortedData)

Name Age Marks grade

1 Om 19 98 A

2 Omkar 19 76 B

3 Omsiddh 19 69 C

4 Paaras 19 47 D

5 Omik 19 95 A

> sortedData = new\_col\_df[order(new\_col\_df$Marks),]

> print(sortedData)

Name Age Marks grade

4 Paaras 19 47 D

3 Omsiddh 19 69 C

2 Omkar 19 76 B

5 Omik 19 95 A

1 Om 19 98 A

> write.csv(new\_col\_df, "output.csv")

> new\_df = read.csv("output.csv")

> new\_df

X Name Age Marks grade

1 1 Om 19 98 A

2 2 Omkar 19 76 B

3 3 Omsiddh 19 69 C

4 4 Paaras 19 47 D

5 5 Omik 19 95 A

Problem 2

2. Basic Mathematical Operations

o Generate two vectors of random numbers and perform:

* Element-wise addition and multiplication.
* Compute the square root and exponential of the vector elements.

> v1 = c(1,2,3,4,5)

> v2 = c(2,3,4)

> v1+v2 #if length of both vector is not same

[1] 3 5 7 6 8

Warning message:

In v1 + v2 :

longer object length is not a multiple of shorter object length

> v2 = c(9,8,7,6,5)

> v3 = v1+v2

> v3

[1] 10 10 10 10 10

> v4 = sqrt(v1)

> v4

[1] 1.000000 1.414214 1.732051 2.000000

[5] 2.236068

> v5 = exp(v1)

> v5

[1] 2.718282 7.389056 20.085537

[4] 54.598150 148.413159

Problem 3

3. Matrix Operations

o Create a 3×33 \times 33×3 matrix and compute:

* Transpose of the matrix.
* Matrix multiplication with another matrix.

> mat1 = matrix(c(1,2,3,4,5,6,7,8,9), 3, 3)

> mat2 = matrix(rep(1, times = 9), 3, 3)

> mat1

[,1] [,2] [,3]

[1,] 1 4 7

[2,] 2 5 8

[3,] 3 6 9

> mat2

[,1] [,2] [,3]

[1,] 1 1 1

[2,] 1 1 1

[3,] 1 1 1

> t(mat1)

[,1] [,2] [,3]

[1,] 1 2 3

[2,] 4 5 6

[3,] 7 8 9

> t(mat2)

[,1] [,2] [,3]

[1,] 1 1 1

[2,] 1 1 1

[3,] 1 1 1

> print(mat1\*mat2)

[,1] [,2] [,3]

[1,] 1 4 7

[2,] 2 5 8

[3,] 3 6 9

Problem 4

4. Data Visualization

* Create a histogram to display the distribution of one column (e.g., Marks).
* Generate a scatterplot showing the relationship between Age and Marks using ggplot2.

> hist(new\_col\_df$Marks)

> d1 = data.frame(x= new\_col\_df$Age, y = new\_col\_df$Marks)

> View(d1)

> library(ggplot2)

> ggplot(d1, aes(x = new\_col\_df$Age, y = new\_col\_df$Marks))+ geom\_point(color = "blue", size = 3) + ggtitle("SCATTERPLOT using ggplot2")+ xlab("Age") + ylab("Marks")



