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Modern College of Engineering, Pune

MCA Department

A.Y.2023-24

(410908) Data Science Laboratory

****

Class : SY-MCA Shift / Div : S3/B Roll Number : 51147

Name : Nisha Harish Parekh Assignment No : 2 Date of Implementation : 29/09/2023

****

Q1) Write a R program to create three vectors a,b,c with 3 integers. Combine the three vectors to become a 3×3 matrix where each column represents a vector. Print the content of the matrix.

Program :

```
v1=c(1,2,3)
print(v1)
v2=c(4,5,6)
print(v2)
v3=c(7,8,9)
print(v3)

matrix1=matrix(c(v1,v2,v3),nrow=3,ncol=3,byrow=TRUE)
print(matrix1)
```

Output :

```
> v1=c(1,2,3)
> print(v1)
[1] 1 2 3
> v2=c(4,5,6)
> print(v2)
[1] 4 5 6
> v3=c(7,8,9)
> print(v3)
[1] 7 8 9
> matrix1=matrix(c(v1,v2,v3),nrow=3,ncol=3,byrow=TRUE)
> print(matrix1)
     [,1] [,2] [,3]
[1,]    1    2    3
[2,]    4    5    6
[3,]    7    8    9
>
```

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Q2) Write a R program to create a list containing a vector, a matrix and a list and give names to the elements in the list. Access the first and second element of the list.

Program :

```
mainlist=list(c(1,2,3),matrix(c(1,2,3,4,5,6,7,8,9),nrow=3,ncol=3,byrow=TRUE),list("red","yellow","blue"))
print(mainlist)

print(mainlist[1])

print(mainlist[2])
```

Output :

```
> mainlist=list(c(1,2,3),matrix(c(1,2,3,4,5,6,7,8,9),nrow=3,ncol=3,byrow=TRUE),list("re
d","yellow","blue"))
> print(mainlist)
[[1]]
[1] 1 2 3

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

[[3]]
[[3]][[1]]
[1] "red"

[[3]][[2]]
[1] "yellow"

[[3]][[3]]
[1] "blue"


> print(mainlist[1])
[[1]]
[1] 1 2 3

> print(mainlist[2])
[[1]]
     [,1] [,2] [,3]
[1,]    1    2    3
[2,]    4    5    6
[3,]    7    8    9
```

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Q3) Write a R program to create an array with three columns, three rows, and two "tables", taking two vectors as input to the array. Print the array.

Program :

```
v1=c(1,2,3)
v2=c(2,4,6,8,10)
array1=array(c(v1,v2),dim=c(3,3,2))
print(array1)
```

Output :

```
> v1=c(1,2,3)
> v2=c(2,4,6,8,10)
> array1=array(c(v1,v2),dim=c(3,3,2))
> print(array1)
, , 1

     [,1] [,2] [,3]
[1,]    1    2    8
[2,]    2    4   10
[3,]    3    6    1

, , 2

     [,1] [,2] [,3]
[1,]    2    4   10
[2,]    3    6    1
[3,]    2    8    2
```

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Q4) Write a R program to create a data frame from four given vectors
name = c('Anastasia', 'Dima', 'Katherine', 'James', 'Emily', 'Michael', 'Matthew', 'Laura', 'Kevin', 'Jonas')
score = c(12.5, 9, 16.5, 12, 9, 20, 14.5, 13.5, 8, 19)
attempts = c(1, 3, 2, 3, 2, 3, 1, 1, 2, 1)
qualify = c('yes', 'no', 'yes', 'no', 'no', 'yes', 'yes', 'no', 'no', 'yes')

Program :

```
dataframe1=data.frame(name = c('Anastasia', 'Dima', 'Katherine', 'James', 'Emily', 'Michael', 'Matthew', 'Laura',
'Kevin', 'Jonas'),
                      score = c(12.5, 9, 16.5, 12, 9, 20, 14.5, 13.5, 8, 19),
                      attempts = c(1, 3, 2, 3, 2, 3, 1, 1, 2, 1),
                      qualify = c('yes', 'no', 'yes', 'no', 'no', 'yes', 'yes', 'no', 'no', 'yes'))
print(dataframe1)
```

Output :

```
> dataframe1=data.frame(name = c('Anastasia', 'Dima', 'Katherine', 'James', 'Emily', 'Mich
ael', 'Matthew', 'Laura', 'Kevin', 'Jonas'),
+                       score = c(12.5, 9, 16.5, 12, 9, 20, 14.5, 13.5, 8, 19),
+                       attempts = c(1, 3, 2, 3, 2, 3, 1, 1, 2, 1),
+                       qualify = c('yes', 'no', 'yes', 'no', 'no', 'yes', 'yes', 'no', 'n
o', 'yes'))
> print(dataframe1)
        name score attempts qualify
1  Anastasia  12.5        1     yes
2       Dima   9.0        3      no
3  Katherine  16.5        2     yes
4      James  12.0        3      no
5      Emily   9.0        2      no
6    Michael  20.0        3     yes
7    Matthew  14.5        1     yes
8      Laura  13.5        1      no
9      Kevin   8.0        2      no
10     Jonas  19.0        1     yes
>
```

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Q4) Write a R program to create a factor corresponding to height of women data set, which contains height and weights for a sample of women

Program :

```
dataframe3 = data.frame(name = c('Alice','Carol','Eva','Daisy','Gia'),
                        height = c(172,175,160,180,151),
                        weight = c(56,74,55,75,60))
print(dataframe3)

library(readr)
height_factor = cut(dataframe3$height, breaks = c(140, 160, 170, 180), labels = c("Short", "Medium", "Tall"))
print(height_factor)
```

Output :

```
> dataframe3 = data.frame(name = c('Alice','Carol','Eva','Daisy','Gia'),
+                         height = c(172,175,160,180,151),
+                         weight = c(56,74,55,75,60))
> print(dataframe3)
   name height weight
1 Alice    172     56
2 Carol    175     74
3   Eva    160     55
4 Daisy    180     75
5   Gia    151     60
> library(readr)
> height_factor<-cut(dataframe3$height, breaks = c(140, 160, 170, 180), labels = c("Short",
"Medium", "Tall"))
> print(height_factor)
[1] Tall  Tall  Short Tall  Short
Levels: Short Medium Tall
>
```

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Q6) Use R to create the following two matrices and do the indicated matrix multiplication.

$$\begin{bmatrix} 7 & 9 & 12 \\ 2 & 4 & 13 \end{bmatrix} \times \begin{bmatrix} 1 & 7 & 12 & 19 \\ 2 & 8 & 13 & 20 \\ 3 & 9 & 14 & 21 \end{bmatrix}$$

What is the resulting matrix?

Program :

```
matrix1=matrix(c(7,9,12,2,4,13),nrow=2,ncol=3,byrow=TRUE)
print(matrix1)

matrix2=matrix(c(1,7,12,19,2,8,13,20,3,9,14,21),nrow=3,ncol=4,byrow=TRUE)
print(matrix2)

multiplication=matrix1%*%matrix2
print(multiplication)
```

Output :

```
> matrix1=matrix(c(7,9,12,2,4,13),nrow=2,ncol=3,byrow=TRUE)
> print(matrix1)
     [,1] [,2] [,3]
[1,]    7    9   12
[2,]    2    4   13
> matrix2=matrix(c(1,7,12,19,2,8,13,20,3,9,14,21),nrow=3,ncol=4,byrow=TRUE)
> print(matrix2)
     [,1] [,2] [,3] [,4]
[1,]    1    7   12   19
[2,]    2    8   13   20
[3,]    3    9   14   21
> multiplication=matrix1%*%matrix2
> print(multiplication)
     [,1] [,2] [,3] [,4]
[1,]   61  229  369  565
[2,]   49  163  258  391
>
```

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Q7) WAP to Print the Fibonacci Sequence.

Program :

```
print_fibonacci = function(n)
{
  a = 0
  b = 1
  for (i in 1:n)
  {
     cat(a, " ")
     next_term = a + b
     a = b
     b = next_term
  }
  cat("\n")
}
n = 6
print_fibonacci(n)
```

Output :

```
> print_fibonacci = function(n)
+ {
+    a = 0
+    b = 1
+    for (i in 1:n)
+    {
+        cat(a, " ")
+        next_term = a + b
+        a = b
+        b = next_term
+    }
+    cat("\n")
+ }
> n = 6
> print_fibonacci(n)
0  1  1  2  3  5
>
```

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Q8) WAP to import data in R from csv, excel, txt file.

1) Read csv file :-

Program :

```
read.csv('C:\\Users\\DELL\\OneDrive\\Desktop\\file1.csv',header = FALSE)
```

Output :

```
> read.csv('C:\\Users\\DELL\\OneDrive\\Desktop\\file1.csv',header = FALSE)
       V1   V2               V3
1 Roll no Name       Department
2
3       1  ABC Computer Science
4       2  XYZ       Mechanical
5       3  PQR            Civil
>
```

2) Read txt file :-

Program :

```
read.table('C:\\Users\\DELL\\OneDrive\\Desktop\\file2.txt', sep="\t")
```

Output :

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```
> read.table('C:\\Users\\DELL\\OneDrive\\Desktop\\file2.txt', sep="\t")
       V1    V2               V3
1 Roll no Name       Department
2
3       1  ABC Computer Science
4       2  XYZ       Mechanical
5       3  PQR            Civil
>
```

3) Read excel file :-

Program :

```
library("readxl")
read_excel("C:\\Users\\DELL\\OneDrive\\Desktop\\file.xlsx")
```

Ouput :

```
> library("readxl")
> read_excel("C:\\Users\\DELL\\OneDrive\\Desktop\\file.xlsx")
# A tibble: 4 x 3
  `Roll no` Name  Department
      <dbl> <chr> <chr>
1        NA NA    NA
2         1 ABC   Computer Science
3         2 XYZ   Mechanical
4         3 PQR   Civil
>
```

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Q9) WAP to export data from R to CSV, Excel, Text File and Google drive.

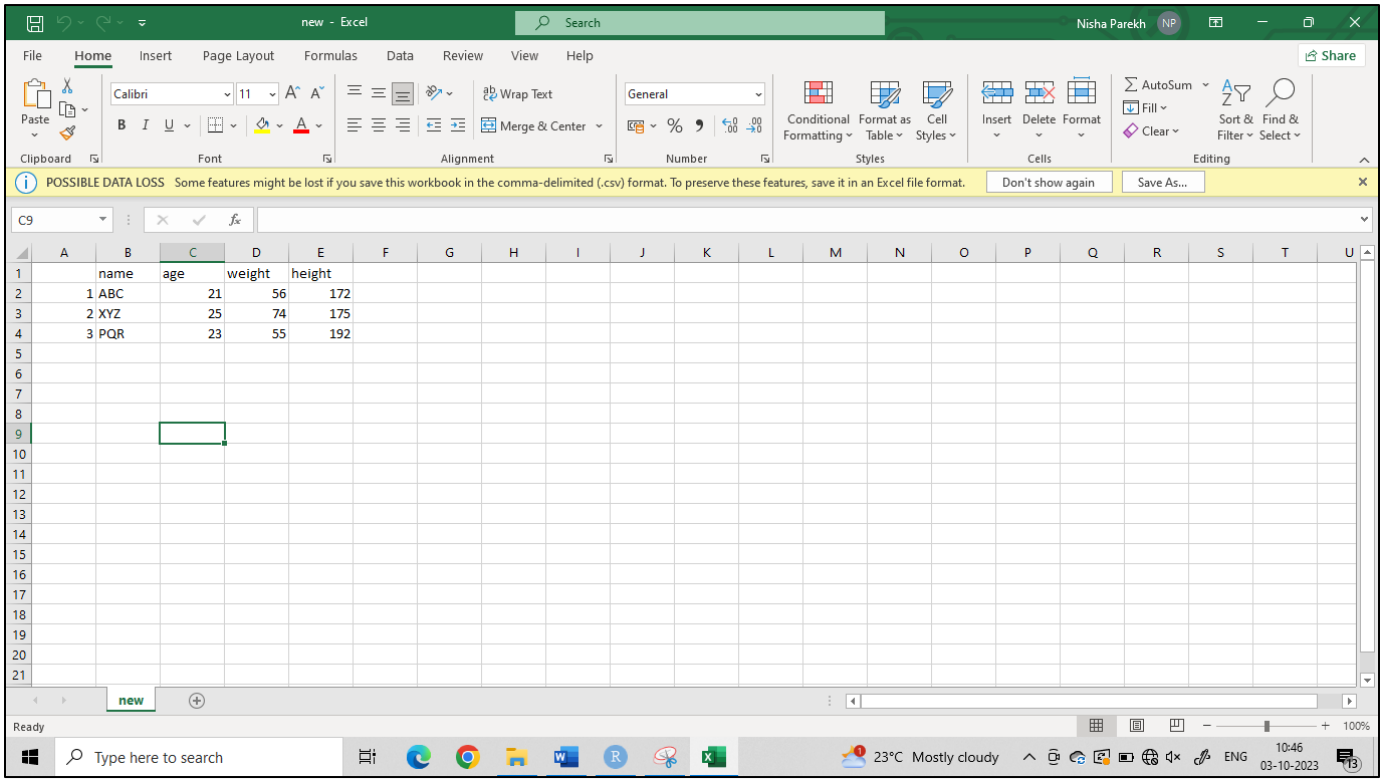
Program :

```
dataframe2 = data.frame(name = c('ABC','XYZ','PQR'),
                        age = c(21,25,23),
                        height = c(56,74,55),
                        weight = c(172,175,192))
print(dataframe2)
```

1) Export csv file :

```
write.csv(dataframe2, file = "new.csv")
```

Output :



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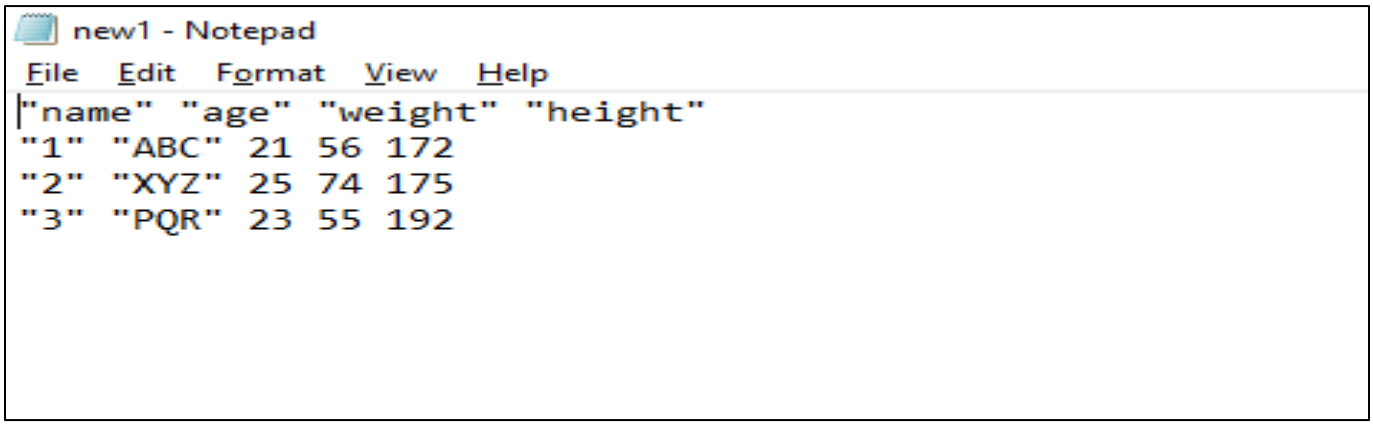
****

2) Export txt file :

```
write.table(dataframe2, file = "new1.txt")
```

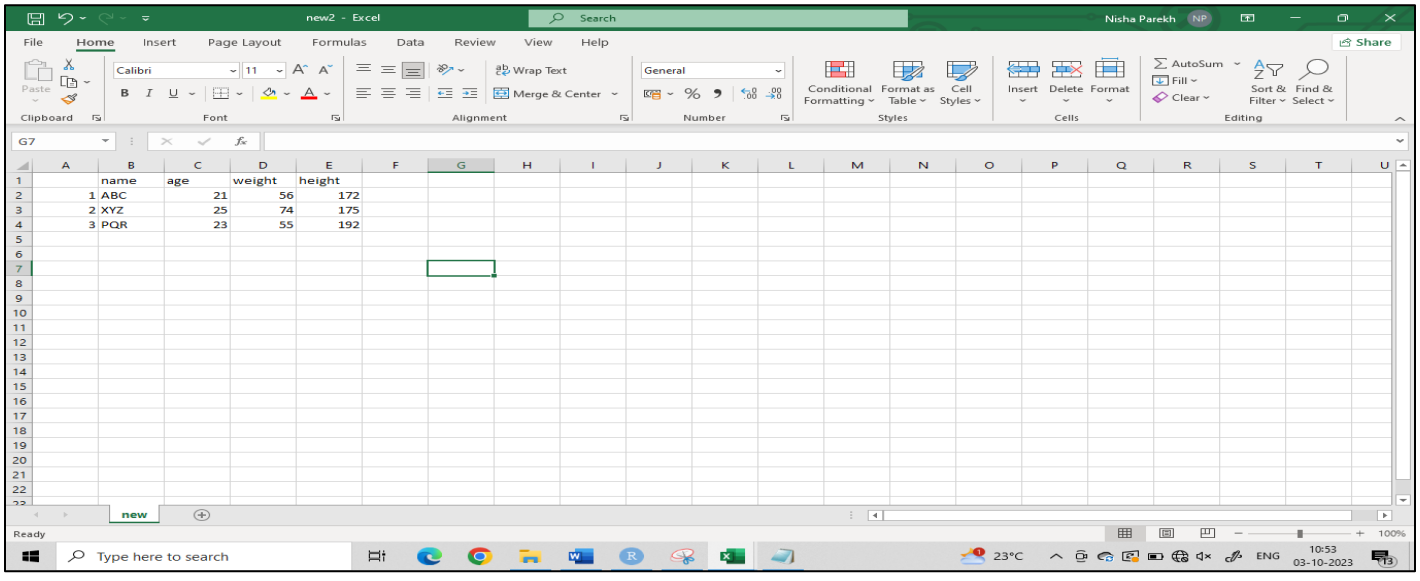
Ouput :



3) Export excel file :

```
library("xlsx")
write.xlsx(dataframe2, file = "new2.xlsx")
```

Ouput :



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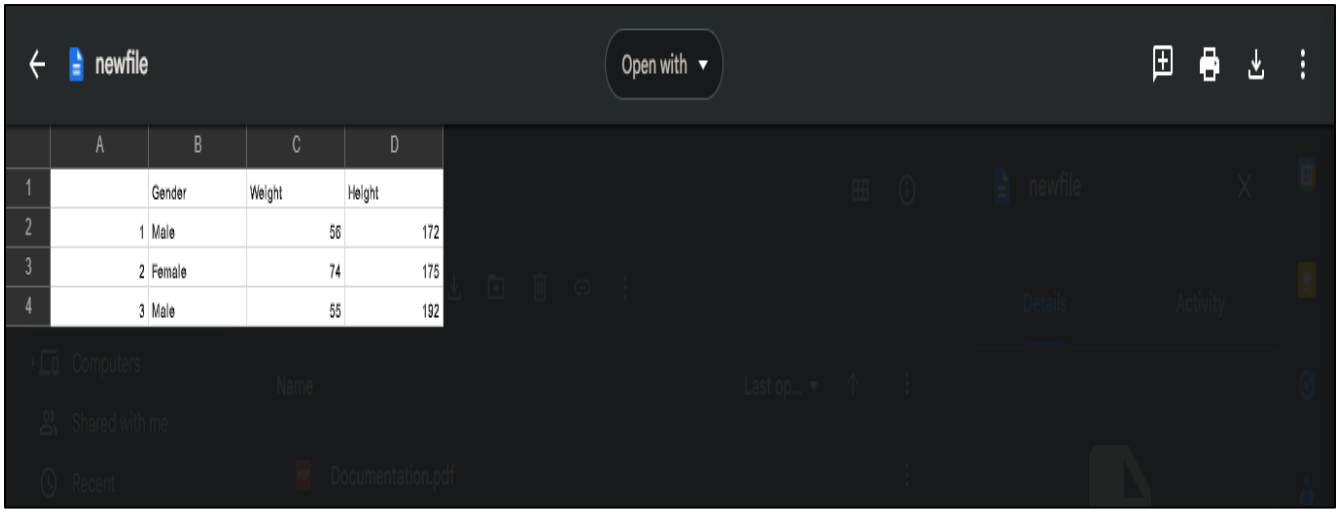
4) Export to google drive :

```
library("googledrive")
library("googlesheets4")
drive_upload('new.csv', name = "newfile1")
drive_browse("newfile")
```

Output :

```
> drive_upload("new.csv", name = "newfile")
r
C:/Users/DELL/AppData/Local/gargle/gargle/Cache between R sessions?
1: Yes
2: No
Selection: drive_browse("newfile")
Enter a number between 1 and 2, or enter 0 to exit.
Selection: 1
The httpuv package enables a nicer Google auth experience, in many cases, but it
isn't installed.
Would you like to install it now?
1: Yes
2: No
Selection: 1
```



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Q10) Write a R program to create an array of two 3x3 matrices each with 3 rows and 3 columns from two vectors. Print the second row of the second matrix of the array and the element in the 3rd row and 3rd column of the 1st matrix.

Program :

```
matrix1=matrix(c(1,2,3,4,5,6,7,8,9),nrow=3,ncol=3,byrow=TRUE)
print(matrix1)

matrix2=matrix(c(11,12,13,14,15,16,17,18,19),nrow=3,ncol=3,byrow=TRUE)
print(matrix2)

matrix_array <- array(c(matrix1, matrix2), dim = c(3, 3, 2))
print(matrix_array[2, , 2])
print(matrix_array[3, 3, 1])
```

Ouput :

```
> matrix1=matrix(c(1,2,3,4,5,6,7,8,9),nrow=3,ncol=3,byrow=TRUE)
> print(matrix1)
     [,1] [,2] [,3]
[1,]    1    2    3
[2,]    4    5    6
[3,]    7    8    9
> matrix2=matrix(c(11,12,13,14,15,16,17,18,19),nrow=3,ncol=3,byrow=TRUE)
> print(matrix2)
     [,1] [,2] [,3]
[1,]   11   12   13
[2,]   14   15   16
[3,]   17   18   19
> matrix_array <- array(c(matrix1, matrix2), dim = c(3, 3, 2))
> print(matrix_array[2, , 2])
[1] 14 15 16
> print(matrix_array[3, 3, 1])
[1] 9
>
```

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Q11) VAT has different rate according to the product purchased. Imagine we have three different kind of products with different VAT applied:

Categories	Product	VAT
A	Book, magazine, newspaper, etc...	8%
B	Vegetable, meat, beverage, etc...	10%
C	Tee-shirt, jean, pant, etc...	20%

Write a chain to apply the correct VAT rate to the product customer bought and calculate a price.

Program :

```
nprice=readline();
price=as.integer(nprice);
print(price)

category<-readline(prompt = "Enter category : ")
if(category == 'A')
{
  cat('A vat rate of 8% is applied.','The total price is : ',price+price*0.08);
}else if(category == 'B')
{
  cat('B vat rate of 10% is applied.','The total price is : ',price+price*0.1);
}else
{
  cat('C vat rate of 20% is applied.','The total price is : ',price+price*0.2);
}
```

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Output :

```
> nprice=readline();
50
> price=as.integer(nprice);
> print(price)
[1] 50
> category<-readline(prompt = "Enter category : ")
Enter category : A
> if(category == 'A')
+ {
+   cat('A vat rate of 8% is applied.','The total price is : ',price+price*0.08);
+ }else if(category == 'B')
+ {
+   cat('B vat rate of 10% is applied.','The total price is : ',price+price*0.1);
+ }else
+ {
+   cat('C vat rate of 20% is applied.','The total price is : ',price+price*0.2);
+ }
A vat rate of 8% is applied. The total price is :  54
>
```

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Q12) A cloth showroom has announced the following seasonal discounts on purchase of items. Write a R program using switch and if statement to compute the net amount paid by a customer.

Purchase Amount	Discount	
	Mill Cloth	Handloom Items
0-100	-	5%
101-200	5%	7.5%
201-300	7.5%	10%
301 and Above	10%	15.0%

Program :

```
purchase_amt<-readline('Enter the cost price of the product: ')
int_purchase_amt<-as.integer(purchase_amt)
print(int_purchase_amt)

val<-readline('<Press 1> for Mill Products and <Press 2> for Handloom Products: ')
val<-as.integer(val)

mill_discount<-function(x)
{
 if(x>0 & x<=100)
 {
  print('Discount not available')
 }
 else if(x>100 & x<=200)
 {
  cat('Discount available of 5%','Amount after applying discount: ',x-(x*0.05))
 }
 else if(x>200 & x<=300)
 {
  cat('Discount available of 7.5%','Amount after applying discount: ',x-(x*0.75))
 }
 else if(x>300)
 {
  cat('Discount available of 10%','Amount after applying discount: ',x-(x*0.10))
 }
}
```

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```
handloom_discount<-function(x)
{
  if(x>0 & x<=100)
  {
    print('Discount available of 5%','Amount after applying discount: ',x-(x*0.05))
  }
  else if(x>100 & x<=200)
  {
    cat('Discount available of 7.5%','Amount after applying discount: ',x-(x*0.75))
  }
  else if(x>200 & x<=300)
  {
    cat('Discount available of 10%','Amount after applying discount: ',x-(x*0.10))
  }
  else if(x>300)
  {
    cat('Discount available of 15%','Amount after applying discount: ',x-(x*0.15))
  }
}

switch(val,
       mill_discount(int_purchase_amt),
       handloom_discount(int_purchase_amt))
```

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Output :

```
> purchase_amt<-readline('Enter the cost price of the product: ')
Enter the cost price of the product: 150
> int_purchase_amt<-as.integer(purchase_amt)
> print(int_purchase_amt)
[1] 150
> val<-readline('<Press 1> for Mill Products and <Press 2> for Handloom Products: ')
<Press 1> for Mill Products and <Press 2> for Handloom Products: 1
> val<-as.integer(val)
> mill_discount<-function(x)
+ {
+   if(x>0 & x<=100)
+   {
+     print('Discount not available')
+   }
+   else if(x>100 & x<=200)
+   {
+     cat('Discount available of 5%','Amount after applying discount: ',x-(x*0.05))
+   }
+   else if(x>200 & x<=300)
+   {
+     cat('Discount available of 7.5%','Amount after applying discount: ',x-(x*0.75))
+   }
+   else if(x>300)
+   {
+     cat('Discount available of 10%','Amount after applying discount: ',x-(x*0.10))
+   }
+ }
>
> handloom_discount<-function(x)
+ {
+   if(x>0 & x<=100)
+   {
+     print('Discount available of 5%','Amount after applying discount: ',x-(x*0.05))
+   }
+   else if(x>100 & x<=200)
+   {
+     cat('Discount available of 7.5%','Amount after applying discount: ',x-(x*0.75))
+   }
+   else if(x>200 & x<=300)
+   {
+     cat('Discount available of 10%','Amount after applying discount: ',x-(x*0.10))
+   }
+   else if(x>300)
+   {
+     cat('Discount available of 15%','Amount after applying discount: ',x-(x*0.15))
+   }
+ }
> switch(val,
+        mill_discount(int_purchase_amt),
+        handloom_discount(int_purchase_amt))
Discount available of 5% Amount after applying discount:  142.5
>
```

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Name : Nisha Harish Parekh Assignment No : 2 Date of Implementation : 29/09/2023

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Q13) Find Sum of Series $1^2+2^2+3^2+.....+n^2$.

Program :

```
number=readline(prompt="Enter the number upto which you want their sum of series: ")
num=as.integer(number)
print(num)
sum=(num*(num+1)*(2*num+1))/6
print(sum)
```

Output :

```
> number=readline(prompt="Enter the number upto which you want their sum of series: ")
Enter the number upto which you want their sum of series: 5
> num=as.integer(number)
> print(num)
[1] 5
> sum=(num*(num+1)*(2*num+1))/6
> print(sum)
[1] 55
>
```

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Q14) Write a R program to print the numbers from 1 to 100 and print "Fizz" for multiples of 3, print "Buzz" for multiples of 5, and print "FizzBuzz" for multiples of both.

Program :

```
for(n in 1:100)
{
  if(n%%3==0 && n%%5==0)
  {
    print('FizzBuzz')
  }else if(n%%3==0)
  {
    print('Fizz')
  }else if(n%%5==0)
  {
    print('Buzz')
  }else
  {
    print(n)
  }
}
```

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Output :

```
[1] 1
[1] 2
[1] "Fizz"
[1] 4
[1] "Buzz"
[1] "Fizz"
[1] 7
[1] 8
[1] "Fizz"
[1] "Buzz"
[1] 11
[1] "Fizz"
[1] 13
[1] 14
[1] "FizzBuzz"
[1] 16
[1] 17
[1] "Fizz"
[1] 19
[1] "Buzz"
[1] "Fizz"
[1] 22
[1] 23
[1] "Fizz"
[1] "Buzz"
[1] 26
[1] "Fizz"
[1] 28
[1] 29
[1] "FizzBuzz"
[1] 31
[1] 32
[1] "Fizz"
[1] 34
[1] "Buzz"
[1] "Fizz"
[1] 37
[1] 38
[1] "Fizz"
[1] "Buzz"
[1] 41
[1] "Fizz"
[1] 43
[1] 44
[1] "FizzBuzz"
[1] 46
[1] 47
[1] "Fizz"
[1] 49
[1] "Buzz"
[1] "Fizz"
[1] 52
[1] 53
[1] "Fizz"
[1] "Buzz"
[1] 56
[1] "Fizz"
[1] 58
[1] 59
[1] "FizzBuzz"
[1] 61
[1] 62
[1] "Fizz"
[1] 64
[1] "Buzz"
[1] "Fizz"
[1] 67
[1] 68
[1] "Fizz"
[1] "Buzz"
[1] 71
[1] "Fizz"
[1] 73
[1] 74
[1] "FizzBuzz"
[1] 76
[1] 77
[1] "Fizz"
[1] 79
[1] "Buzz"
[1] "Fizz"
[1] 82
[1] 83
[1] "Fizz"
[1] "Buzz"
[1] 86
[1] "Fizz"
[1] 88
[1] 89
[1] "FizzBuzz"
[1] 91
[1] 92
[1] "Fizz"
[1] 94
[1] "Buzz"
[1] "Fizz"
[1] 97
[1] 98
[1] "Fizz"
[1] "Buzz"
>
```

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Q15) Write a R Program to find the sum of digits of a number reducing it to one digit using repeat loop.

Program :

```
sum_of_digits <- function(num)
{
  while (num >= 10)
  {
    num_str <- as.character(num)
    digit_sum <- sum(as.numeric(strsplit(num_str, "")[[1]]))
    num <- digit_sum
  }
  return(num)
}
num <- 1234
result <- sum_of_digits(num)
cat("Sum of digits reduced to one digit:", result, "\n")
```

Output :

```
> sum_of_digits <- function(num)
+ {
+   while (num >= 10)
+   {
+     num_str <- as.character(num)
+     digit_sum <- sum(as.numeric(strsplit(num_str, "")[[1]]))
+     num <- digit_sum
+   }
+   return(num)
+ }
> num <- 1234
> result <- sum_of_digits(num)
> cat("Sum of digits reduced to one digit:", result, "\n")
Sum of digits reduced to one digit: 1
>
```