R Programming Help

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- **To install r-base**

  Step 1: -

  1) Sudo apt-get update

  2) Sudo apt-get install r-base

- **First Program**

```
# My first program in R Programming
myString <- "Hello, World!"
print (myString)
```

- **Creating Variables in R**

```
> name= "Sachin Tendulkar"
> age <- 49
> name
[1] "Sachin Tendulkar"
> print(age)
[1] 49
>
```

- **Data Types: -**

Basic data types in R can be divided into the following types:

numeric - (16.5, 59, 645)
integer - (11L, 5L, 12L, where the letter "L" declares this as an integer)
complex - (7 + 4i, where "i" is the imaginary part)
character (or string) - ("APSIT", "Data Mining", "11", "TRUE")
logical (or Boolean) - (TRUE or FALSE)
We can use the **class ()** function to check the data type of a variable:

R Console

```
> v <- TRUE
> print (class(v))
[1] "logical"
> print (v)
[1] TRUE
>
> # Numeric data type
> v <- 25.5
> print (class(v))
[1] "numeric"
> print (v)
[1] 25.5
>
> #Integer Data type
> v <- 35L
> print (class(v))
[1] "integer"
>
> #Complex data type
> v <- 5+3i
> print (class(v))
[1] "complex"
> print (v)
[1] 5+3i
>
```

➢ R Arithmetic Operators

Operator	Name	Example
+	Addition	x + y
-	Subtraction	x - y
*	Multiplication	x * y
/	Division	x / y
^	Exponent	x ^ y
%%	Modulus (Remainder from division)	x %% y

➢ R Operator

Operator	Name	Example
==	Equal	x == y
!=	Not equal	x != y
>	Greater than	x > y
<	Less than	x < y
>=	Greater than or equal to	x >= y
<=	Less than or equal to	x <= y

➢ R logical Operator

Operator	Description
&	Element-wise Logical AND operator. It returns TRUE if both elements are TRUE
&&	Logical AND operator - Returns TRUE if both statements are TRUE
|	Elementwise- Logical OR operator. It returns TRUE if one of the statement is TRUE
||	Logical OR operator. It returns TRUE if one of the statement is TRUE.
!	Logical NOT - returns FALSE if statement is TRUE

- **Data structures in R :-**

The frequently used ones are −

- **Vectors**
- **Lists**
- **Matrices**
- **Arrays**
- **Factors**
- **Data Frames**

1) Vector

When you want to create vector with more than one element, you should use **c()** function which means to combine the elements into a vector.

```
> #create a vector
> states <- c("Maharashtra","Goa","Karnataka")
> #print vector
> print (states)
[1] "Maharashtra" "Goa"         "Karnataka"
> #print class/type of the vector
> print (class(states))
[1] "character"
>
```

2) List :-

A list in R can contain many different data types inside it. A list is a collection of data which is ordered and changeable. To create a list, use the list() function:

```
> # Create a list.
> list1 <- list(c(10,15,20),41.3,"APSIT")
>
> # Print the list.
> print(list1)
[[1]]
[1] 10 15 20

[[2]]
[1] 41.3

[[3]]
[1] "APSIT"

> #individual values
> print (list1[1])
[[1]]
[1] 10 15 20

> print (list1[2])
[[1]]
[1] 41.3
```

3) **Matrix :-**

A matrix is a two-dimensional rectangular data set. It can be created using a vector input to the matrix function.

```
> # Create a matrix.
> M = matrix( c('ab','ab','ac','ac','ab','aa'), nrow = 2, ncol = 3, byrow = TRUE)
> print(M)
     [,1] [,2] [,3]
[1,] "ab" "ab" "ac"
[2,] "ac" "ab" "aa"
> print (M[1])
[1] "ab"
> print (M[1,2])
[1] "ab"
> print (M[1,3])
[1] "ac"
> print (M[2,3])
[1] "aa"
>
```

4) Arrays :-

While matrices are confined to two dimensions, arrays can be of any number of dimensions. The array function takes a dim attribute which creates the required number of dimensions. In the below example we create an array with two elements which are 3x3 matrices each.

```
> # Create an array.
> a <- array(c('green','yellow'),dim = c(3,3,2))
> print(a)
, , 1

     [,1]     [,2]     [,3]
[1,] "green"  "yellow" "green"
[2,] "yellow" "green"  "yellow"
[3,] "green"  "yellow" "green"

, , 2

     [,1]     [,2]     [,3]
[1,] "yellow" "green"  "yellow"
[2,] "green"  "yellow" "green"
[3,] "yellow" "green"  "yellow"
```

5) Data Frame :-

Create a Data frame

```
> # Create the data frame.
> student <- data.frame(
+    name  =c("aa","ab","ac"),
+    gender = c("Male", "Male","Female"),
+
+    height = c(152, 171.5, 165),
+    branch = c("comp","comp", "IT"),
+    Age = c(22,20,21),
+    Marks = c(90,75,85)
+ )
> print(student)
  name gender height branch Age Marks
1   aa   Male  152.0   comp  22    90
2   ab   Male  171.5   comp  20    75
3   ac Female  165.0     IT  21    85
>
```

DataFrames are generic data objects of R which are used to store the tabular data. Data frames are considered to be the most popular data objects in R programming because it is more comfortable to analyse the data in the tabular form.

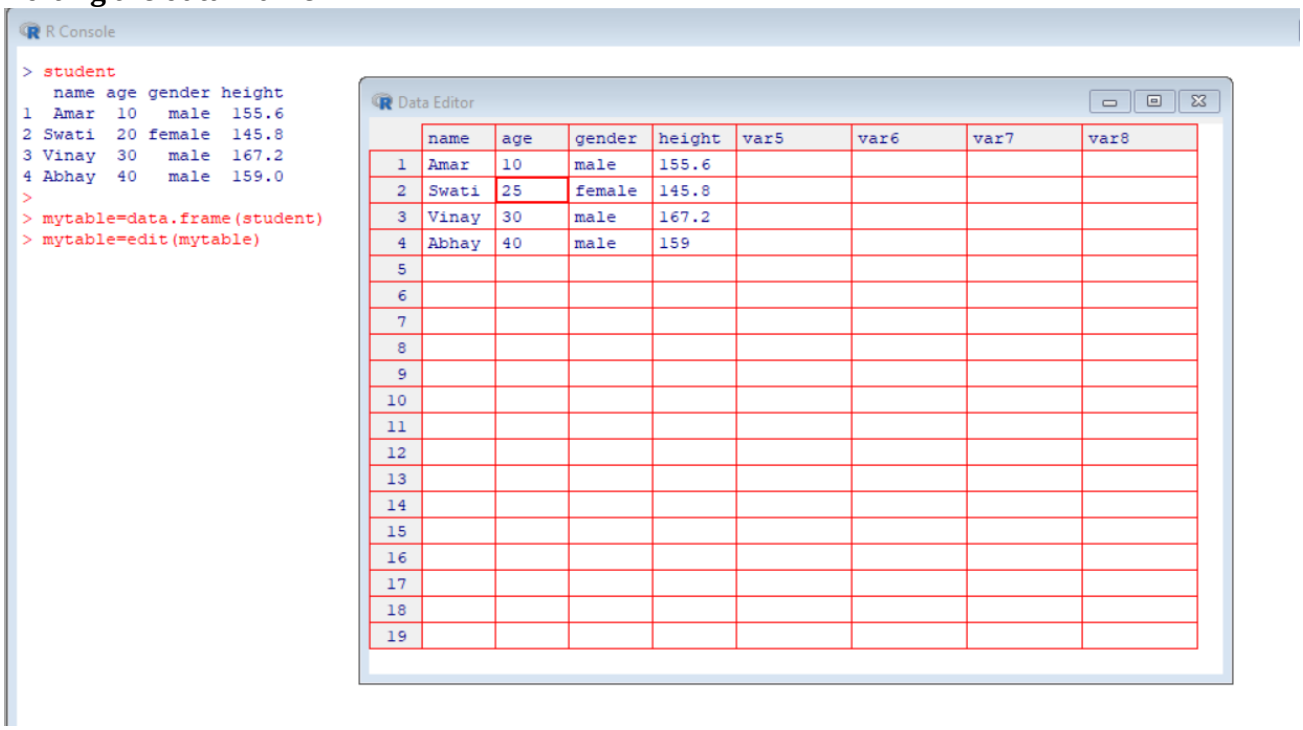
Creating a data frame by reading CSV file

```
> print (getwd())
[1] "C:/Users/Archana/Documents"
> #then copy your .csv file into this location.
> data <- read.csv("testexample.csv")
> print(data)
   day  outlook temp humidity   wind playball
1    1    sunny  hot     high   weak       no
2    2    sunny  hot     high strong       no
3    3 overcast  hot     high   weak      yes
4    4     rain mild     high   weak      yes
5    5     rain cool   normal   weak      yes
6    6     rain cool   normal strong       no
7    7 overcast cool   normal strong      yes
8    8    sunny mild     high   weak       no
9    9    sunny cool   normal   weak      yes
10  10     rain mild   normal   weak      yes
11  11    sunny mild   normal strong      yes
12  12 overcast mild     high strong      yes
13  13 overcast  hot   normal   weak      yes
14  14     rain mild     high strong       no
> |
```

Selecting a subset of data frame

```
> data <- read.csv("newexample.csv")
> print(data)
  id     name salary start_date        dept
1  1    Rohan   6230 2012-01-01          IT
2  2   Danish   5150 2013-09-23 Operations
3  3 Michelle   6116 2014-11-15          IT
4  4     Ryan   7290 2014-05-11          HR
5  5    Gauri   8430 2015-03-27     Finance
6  6     Nina   5780 2013-05-21          IT
7  7   Simona   6320 2013-07-30 Operations
8  8     Guru   7220 2014-06-17     Finance
> #Get the maximum salary
> # Create a data frame.
> data <- read.csv("newexample.csv")
>
> # Get the max salary from data frame.
> sal <- max(data$salary)
> print(sal)
[1] 8430
> #Get the details of the person with max salary
> # Create a data frame.
> data <- read.csv("newexample.csv")
>
> # Get the max salary from data frame.
> sal <- max(data$salary)
>
> # Get the person detail having max salary.
> max_sal <- subset(data, salary == max(salary))
> print(max_sal)
  id  name salary start_date    dept
5  5 Gauri   8430 2015-03-27 Finance
> |
```

Editing the data frame



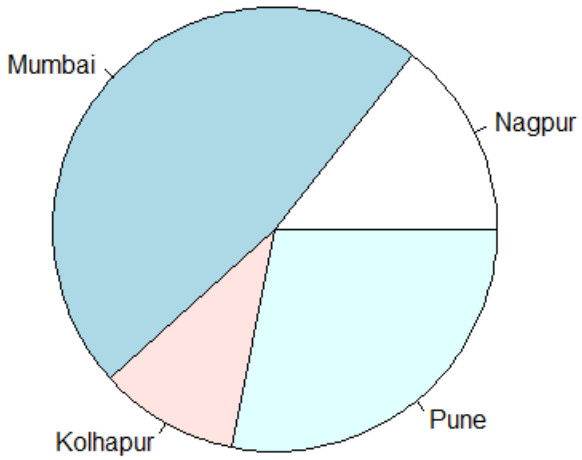

```
> student
   name age gender height
1  Amar  10   male  155.6
2 Swati  20 female  145.8
3 Vinay  30   male  167.2
4 Abhay  40   male  159.0
>
> mytable=data.frame(student)
> mytable=edit(mytable)
>
> print(mytable)
   name age gender height
1  Amar  10   male  155.6
2 Swati  25 female  145.8
3 Vinay  30   male  167.2
4 Abhay  40   male  159.0
>
```

- **R Graphics**

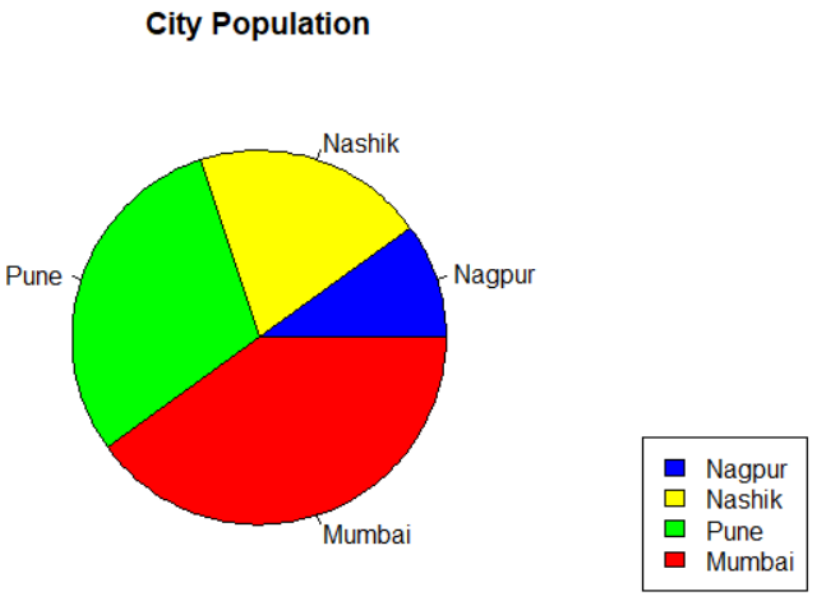
1) Pie chart: -

A pie chart is a circular graphical view of data. Use the pie() function to draw pie charts:

```
> # Create data for the graph.
> x <- c(21, 69, 15, 41)
> labels <- c("Nagpur", "Mumbai", "Kolhapur", "Pune")
>
> # Plot the chart.
> pie(x,labels)
>
```



```
> # Create a vector of pies
> x <- c(10,20,30,40)
>
> # Create a vector of labels
> mylabel <- c("Nagpur", "Nashik", "Pune", "Mumbai")
>
>
> # Create a vector of colors
> colors <- c("blue", "yellow", "green", "red")
>
> # Display the pie chart with colors
> pie(x, label = mylabel, main = "City Population", col = colors)
>
> # Display the explanation box
> legend("bottomright", mylabel, fill = colors)
>
```



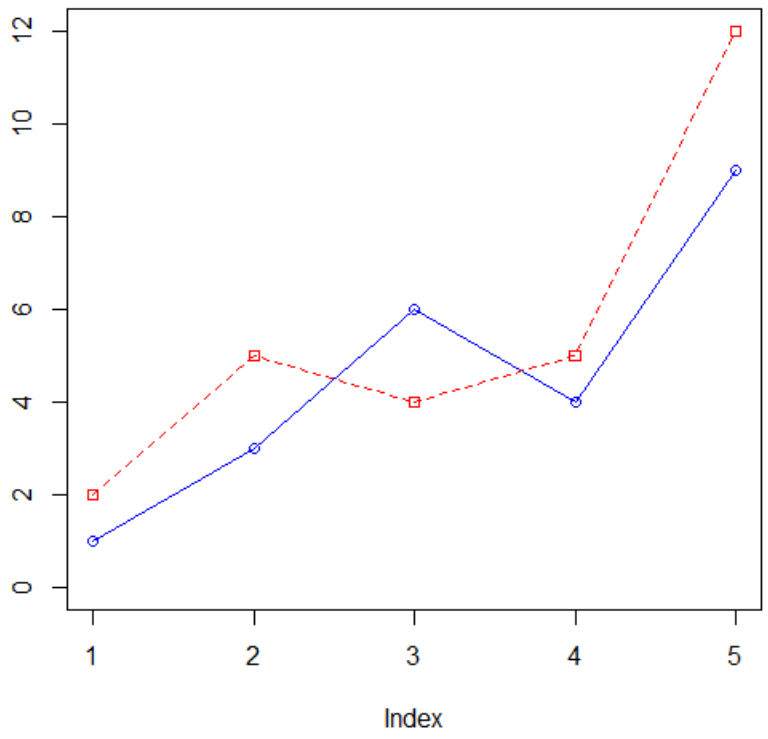
2) Line Charts :-

```
> # Define the cars vector with 5 values
> cars <- c(1, 3, 6, 4, 9)
>
> # Graph the cars vector with all defaults
> plot(cars)
>
```

```
> # Define the cars vector with 5 values
> cars <- c(1, 3, 6, 4, 9)
>
> # Graph cars using blue points overlayed by a line
> plot(cars, type="o", col="blue")
>
```

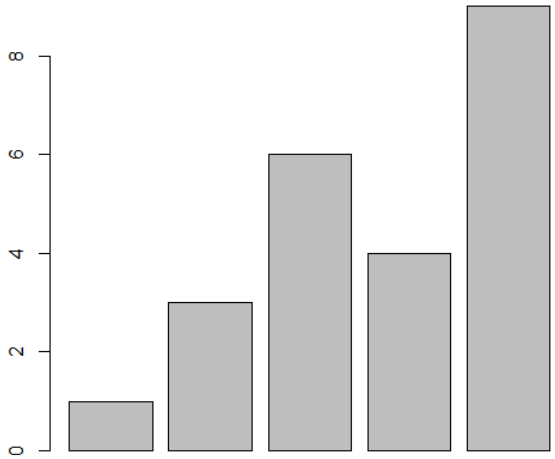
Two vectors for comparison: -

```
> # Define 2 vectors
> cars <- c(1, 3, 6, 4, 9)
> trucks <- c(2, 5, 4, 5, 12)
>
> # Graph cars using a y axis that ranges from 0 to 12
> plot(cars, type="o", col="blue", ylim=c(0,12))
>
> # Graph trucks with red dashed line and square points
> lines(trucks, type="o", pch=22, lty=2, col="red")
>
```



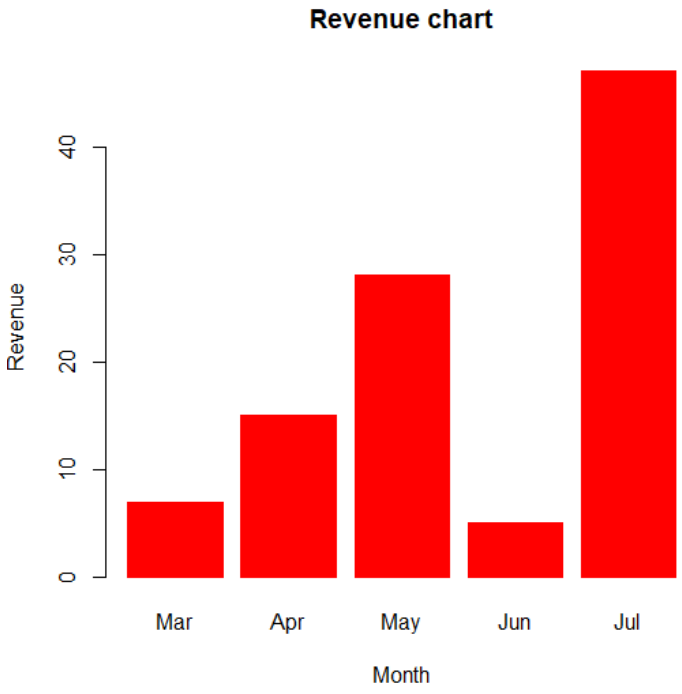
3) Bar Charts :-

```
> # Define the cars vector with 5 values
> cars <- c(1, 3, 6, 4, 9)
>
> # Graph cars
> barplot(cars)
>
```

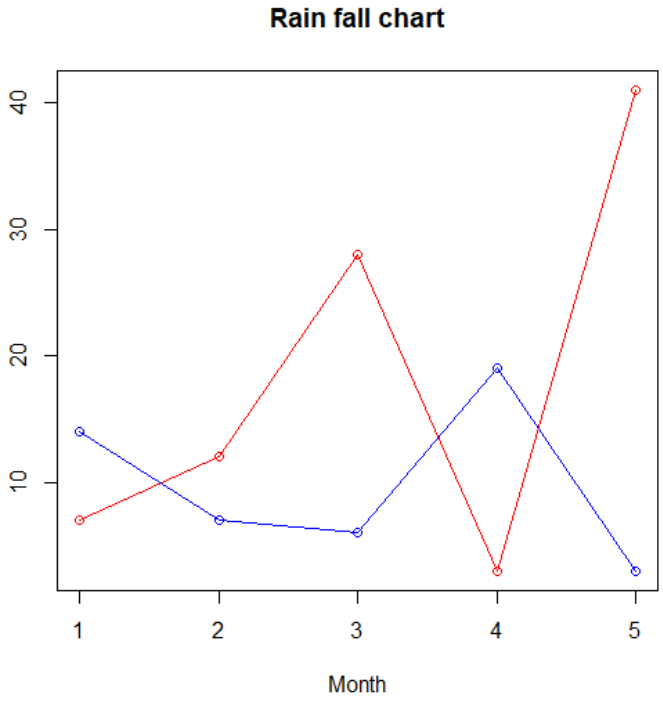


Colours in Bar chart

```
> # Create the data for the chart
> H <- c(7,15,28,5,47)
> M <- c("Mar","Apr","May","Jun","Jul")
>
> # Plot the bar chart
> barplot(H,names.arg=M,xlab="Month",ylab="Revenue",col="red",
+ main="Revenue chart",border="red")
>
```

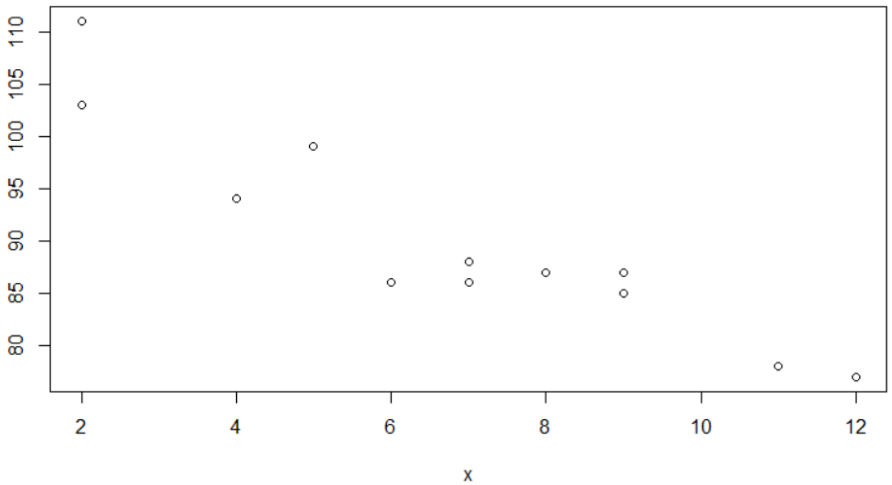


```
> # Create the data for the chart.
> v <- c(7,12,28,3,41)
> t <- c(14,7,6,19,3)
>
>
>
> # Plot the bar chart.
> plot(v,type = "o",col = "red", xlab = "Month", ylab = "Rain fall",
+    main = "Rain fall chart")
>
> lines(t, type = "o", col = "blue")
>
>
```



4) Scatter Plot :-

```
> x <- c(5,7,8,7,2,2,9,4,11,12,9,6)
> y <- c(99,86,87,88,111,103,87,94,78,77,85,86)
>
> plot(x, y)
```



```
> # day one, the carno and speed of 12 cars:
> x1 <- c(5,7,8,7,2,9,4,11,12,9,6)
> y1 <- c(99,86,87,88,111,103,87,94,77,85,86)
>
> # day two, the carno and speed of 15 cars:
> x2 <- c(2,8,1,15,8,12,9,7,3,11,4,7,14,12)
> y2 <- c(100,105,84,90,99,90,95,94,100,79,112,91,80,85)
>
> plot(x1, y1, main="Observation of Speed of Cars", xlab="Car number", ylab="Car speed", col="red", cex=2, pch=19)
> points(x2, y2, col="blue", cex=2, pch=19)
>
```