Project 1: Unit 1

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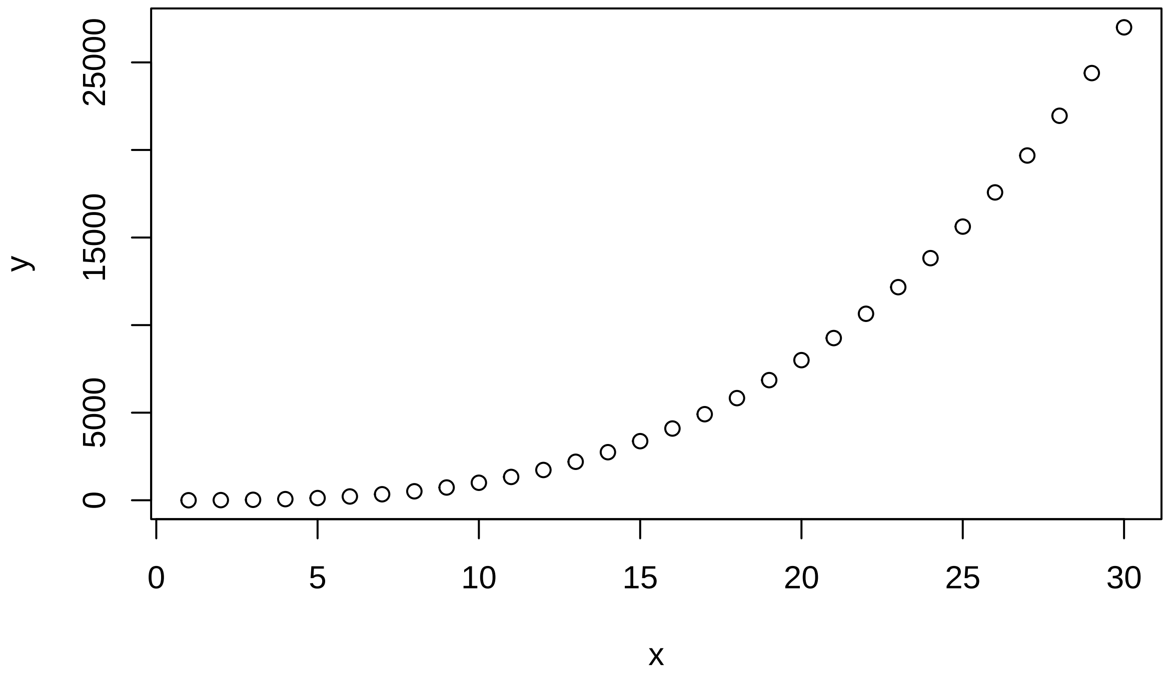
GitHub Repository

Code Execution and Output/Interpretation of Session 4

```r
# vector
x <- c(1:30)
y <- x^3
plot(x,y,)
```



Code Sample 1

Interpretation:

- x is vector having elements 1 to 30.
- y is also vector having elements of x exponentiated of 3.
- plot is a generic function in R to plot, by default in R scatter plot is plotted.

```r
# store the current working using following command:
initial.dir <- getwd()
initial.dir
```

Code Sample 2

```
## [1] "C:/Users/SumanPaudel/Desktop/R For Data Science"
```

Interpretation:

- **initial.dir** object will be assigned the current working directory.

```r
# to change the working directory custom directory
setwd("C:/Users/SumanPaudel/Desktop/R For Data Science")
```

Code Sample 3 ***Interpretation***:

- **setwd()** function will change the working directory to given path.

```r
# loading the necessary packages
library(magrittr)
```

Code Sample 4 ***Interpretation***:

- In R, the **library()** function will load and attach the required packages.

```r
# to set the output file and bypass the output of R console and R Studio
sink('session4.out')
```

Code Sample 5 ***Interpretation***:

- In R, the **sink()** function will set the output file and bypass the output of R console and R Studio.
- until closed, now all the output will be saved in the session4.out file rather than display on.

```r
# load the dataset from the working directory set earlier
iris <- read.csv('iris.csv')
```

Code Sample 6 ***Interpretation***:

- load the iris dataset from csv file using module **read.csv()** function.

```r
# plot the iris dataset to do some analysis
plot(iris)
```

Code Sample 7 ***Interpretation***:

- plot a scatter plot from the iris dataset.
- since we have used **sink()** function earlier now the given output will be saved to session4.out

```r
# summary of iris dataset
summary(iris)
```

Code Sample 8 ***Interpretation***:

- In R, **summary** summary is a generic function used to produce result summaries of the results of various model fitting functions.
- since we have used **sink()** function earlier now the given output will be saved to session4.out

```
# to close the output file
sink()
```

Code Sample 9 ***Interpretation***:

- Closes the output file that was writing output to it.

```
# unloading the loaded library
detach("package:magrittr")
```

Code Sample 10 ***Interpretation***:

- Unloads the previous loaded package **magrittr**.
- Usually use to unload or remove the path of R objects, packages which was attached by using **library()**.

```
# to change back to original directory
setwd(initial.dir)
```

Code Sample 11 ***Interpretation***:

- change back to the directory path which initial.dir object holds.

```
# load the iris data from UCI machine learning repo (internet archive)
iris <- read.csv(url('https://archive.ics.uci.edu/ml/machine-learning-databases/iris/iris.data'),header
```

Code Sample 12 ***Interpretation***:

- fetch the data from online repo using url then convert the obtained into dataframe from it.
- `header = FALSE` will not set the header for dataframe. Often done when we want to explicitly define column names ourselves

```r
# look first few values of data
head(iris)
```

Code Sample 13

```
##    V1  V2  V3  V4          V5
## 1 5.1 3.5 1.4 0.2 Iris-setosa
## 2 4.9 3.0 1.4 0.2 Iris-setosa
## 3 4.7 3.2 1.3 0.2 Iris-setosa
## 4 4.6 3.1 1.5 0.2 Iris-setosa
## 5 5.0 3.6 1.4 0.2 Iris-setosa
## 6 5.4 3.9 1.7 0.4 Iris-setosa
```

Interpretation:

- fetch the first few records from the iris dataframe
- since in previous line of code we did `header = FALSE` our column name is defined as V1, V2, V3, V4, V5.

```r
# add column names for V1, V2, V3, V4, V5 columns to iris dataframe
names(iris) <- c("Sepal.Length", "Sepal.Width", "Petal.Length", "Petal.Width", "Species")
```

Code Sample 14 ***Interpretation***:

- set the name of columns in the iris dataframe `Sepal.Length`, `Sepal.Width`, `Petal.Length`, `Petal.Width`, and `Species`

```r
# saving the downloaded file to csv in local system
# write.csv(dataframe_name, "path\file_name.csv", row.names=FALSE)
write.csv(iris,'iris.csv')
```

Code Sample 15 ***Interpretation***:

- writes the csv file in the current working directory as `iris.csv` from iris dataframe
- Also we can set the to another path like this ‘write.csv(dataframe_name,filepath)
- for example: `write.csv(iris,'C:/Users/SumanPaudel/Desktop/suman.csv')`

```r
# check working directory using
getwd()
```

Code Sample 16

```
## [1] "C:/Users/SumanPaudel/Desktop/R For Data Science"
```

Interpretation:

- returns the current working directory in the console.

```r
# Using forward pipe operator/s in R
# for using pipes in R we need magrittr library
# Hotkey for pipe i.e. is Ctrl + Shift + M in windows and for MacOS CMD + Shift + M
library(magrittr)
iris$Sepal.Length.SQRT <- iris$Sepal.Length %>% sqrt()
```

Code Sample 17 ***Interpretation***:

- computes the square root of `iris$Sepal.Length` and assign it to the new variable `iris$Sepal.Length.SQRT`
- forward pip are very helpful when forwarding and object into function or call the expression

```r
# The assignment pipe, %<>%, is used to update a value by first piping it into one or more rhs expressi
iris$Sepal.Length %<>% sqrt
```

Code Sample 18 ***Interpretation***:

- computes the square root of `iris$Sepal.Length` and assign computed value to itself.
- while using assignment pipe `%<>%`, we must be careful as original data will be lost.

```r
# random seed
set.seed(123)
```

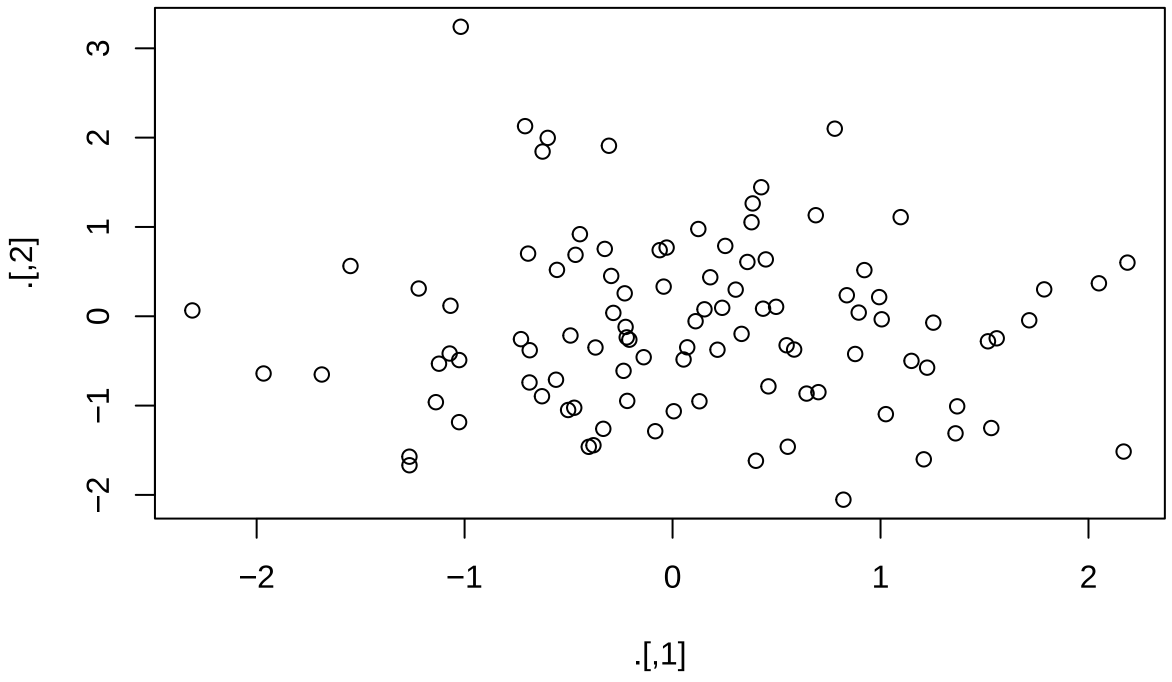
Code Sample 19 ***Interpretation***:

- sets random seed to generate random number that can be reproduced
- widely used when dealing with classification problems in machine learning

```r
# rnorm generated the random value from normal distribution
rnorm(200) %>%
  matrix(ncol = 2) %>%
  plot %>%
  colSums
```

Code Sample 20

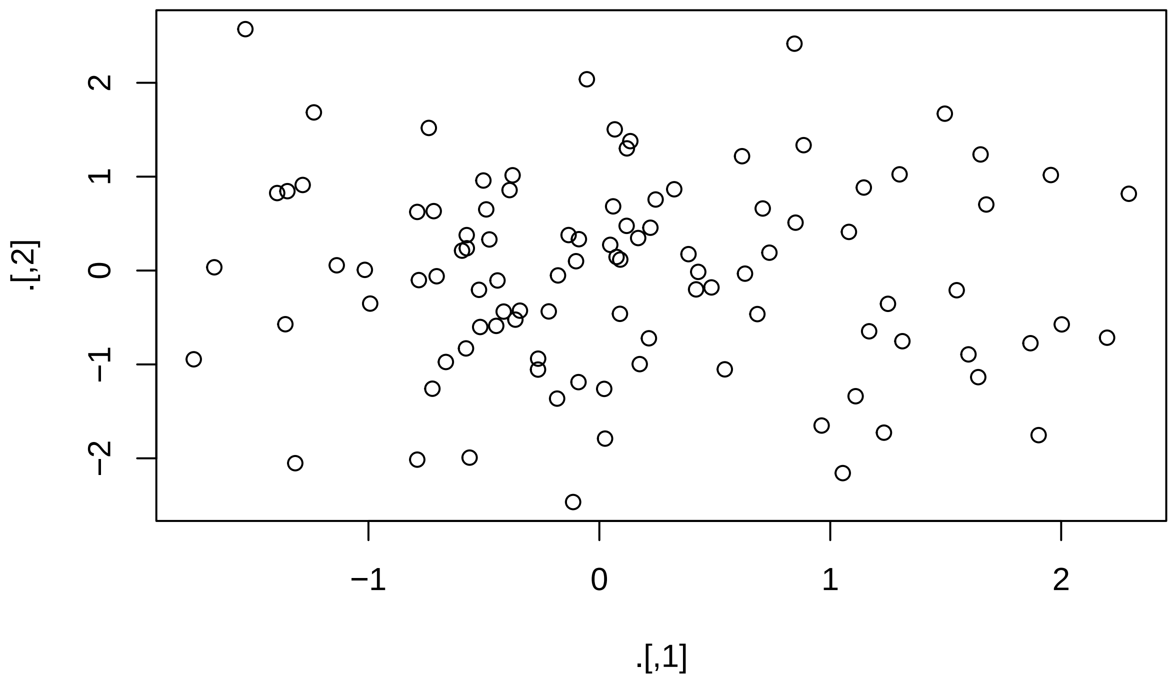
```
## Error in colSums(.): 'x' must be an array of at least two dimensions
```



Interpretation:

- `rnom(200` generates 200 random number from a normal distribution
- then generated values are converted to matrix with 100 * 2 size.
- then plots the values into scatter plot
- when using `colSums` throws an error because code wont get computed after using plot because it won't return anything except the figure or plot.
- To work around this problem, we can use the "tee" pipe.

```
# rnorm generated the random value from normal distribution
rnorm(200) %>%
  matrix(ncol = 2) %T>%
  plot %>%
  colSums
```



Code Sample 21

```
## [1] 12.046511 -3.622291
```

Interpretation:

- `rnom(200` generates 200 random number from a normal distribution
- then generated values are converted to matrix with 100 * 2 size.

- then plots the values into scatter plot
- when using `colSums` throws an error because code wont get computed after using plot because it won't return anything except the figure or plot.
- To work around this problem, we can use the "tee" pipe.

```r
# The exposing pipe operator "%$%"
iris %>%
  subset(Sepal.Length > mean(Sepal.Length)) %$%
  cor(Sepal.Length, Sepal.Width)
```

Code Sample 22

```
## [1] 0.3365679
```

Interpretation:

- `rnom(`200 generates 200 random number from a normal distribution
- then generated values are converted to matrix with 100 * 2 size.
- then plots the values into scatter plot
- when using `colSums` throws an error because code wont get computed after using plot because it won't return anything except the figure or plot.
- To work around this problem, we can use the "tee" pipe.

```r
# The exposing pipe operator "%$%"
cor(iris$Sepal.Length, iris$Sepal.Width)
```

Code Sample 23

```
## [1] -0.114702
```

Interpretation:

- `rnom(`200 generates 200 random number from a normal distribution
- then generated values are converted to matrix with 100 * 2 size.
- then plots the values into scatter plot
- when using `colSums` throws an error because code wont get computed after using plot because it won't return anything except the figure or plot.
- To work around this problem, we can use the "tee" pipe.

When Not to Use the Pipe

The pipe (`%>%`) is a powerful tool in R, but it's not always the best choice for every situation. Here are some scenarios where we might want to consider alternative approaches:

- If pipes involves more than ten steps, consider breaking it down into smaller chunks with meaningful intermediate objects. This makes debugging easier and improves code readability.
- Pipes work best when transforming a single primary object. If you're dealing with multiple inputs or combining several outputs, the pipe may not be the most suitable tool.
- When your code starts resembling a directed graph with intricate dependencies, using pipes can lead to confusing and convoluted code.
- When developing internal packages pipe might not be the best go to tool.

Final Notes

- `%>%` are used widely in R
- `%<>%` used when assignment of variables are required
- `%T%` and `%$%` used when required explicitly on rare occasion.

Code Execution and Output/Interpretation of Session 5

Naming Convention In R lllowercase - `adjustcolor`
period.separated - `plot.new`
underscore_separated - `numeric_version`
lowerCamelCase - `addTaskCallback`
UpperCamelCase - `SignatureMethod`

The link https://www.r-bloggers.com/2014/07/consistent-naming-conventions-in-r/ suggest to use underscore sperated variable name as it provides better readbility of code.

```r
# column vector
round(3.14)
```

Code Sample 1

```
## [1] 3
```

```r
round(3.14, digits = 2)
```

```
## [1] 3.14
```

Interpretation:

- `round(3.14)` rounds the value 3.14.
- `round(3.14, digits = 2)` to nearest 2 digits.

```r
# factorial of 3
factorial(3)
```

```
## [1] 6
```

```r
# factorial of 3*2
factorial(2*3)
```

```
## [1] 720
```

Interpretation:

- `factorial(3)` gives the factorial of 3 which is 6.
- `factorial(3)` gives the factorial of `2*3` which is 720.

```r


# mean of sequence 1:6
mean(1:6)
```

Code Sample 2

```
## [1] 3.5
```

```r
# mean of vector 1 to 30
mean(c(1:30))
```

```
## [1] 15.5
```

Interpretation:

- `mean(1:6)` computes the mean of sequenec 1:6
- `mean(c(1:6)` computes the mean of vector 1:30

```r
# random sampling without and with replacement in R using sample function
# sample size 1 without replacement
die <- 1:6
sample(x = die, size = 1)
```

Code Sample 3

```
## [1] 1
```

```r
# sample size 1 without replacement
sample(x = die, size = 1)
```

```
## [1] 4
```

```r
# sample size 1 with replacement
sample(x = die, size = 1, replace = TRUE)
```

```
## [1] 1
```

Interpretation:

- `sample(x = die, size = 1)` samples the size of 1 from die without replacement. without replacement means each element can only be selected once.
- `sample(x = die, size = 1, replace = TRUE)` samples the size of 1 from die with replacement. with replacement means elements can be selected more than once.

```r
# sample size 2 without replacement
sample(x = die, size = 2)
```

```
## [1] 3 1
```

```r
# sample size 2 without replacement
sample(x = die, size = 2)
```

```
## [1] 3 6
```

```r
# sample size 2 with replacement
sample(x = die, size = 2, replace = TRUE)
```

```
## [1] 2 3
```

Interpretation:

- `sample(x = die, size = 2)` samples the size of 2 from die without replacement. without replacement means each element can only be selected once.
- `sample(x = die, size = 2, replace = TRUE)` samples the size of 2 from die with replacement. with replacement means elements can be selected more than once.

```r
# load the iris dataset from current working directory
iris <- read.csv('iris.csv')
set.seed(123)
```

Code Sample 4 ***Interpretation***:

- `iris <- read.csv('iris.csv')` load the iris dataset from current working directory to iris object.
- `set.seed(123)` generates the random number which can be reproduced again.

```r
# training testing sample
tt.sample <- sample(c(TRUE, FALSE), nrow(iris), replace=T, prob=c(0.7,0.3))
train <- iris[tt.sample,]
test <- iris[!tt.sample,]
```

Code Sample 5 ***Interpretation***:

- `tt.sample <- sample(c(TRUE, FALSE), nrow(iris), replace=T)` samples the value given TRUE or FALSE for FALSE number of rows on iris dataset with replacement also with probability weights 0.7 for TRUE and 0.3 for FALSE and store to tt.sample variable.
- train holds traning sample that are subsetted values from tt.sample in iris dataset. Rows corresponding to TRUE in tt.sample are selected
- test holds test sample that are subsetted values which are not TRUE for training set. Rows corresponding to not TRUE in tt.sample are selected
- `!` alters the outcome like `TRUE` becomes `FALSE`.

```r
# user defined function in R

my_function <- function(){
  ## my function which does nothing
}
```

Code Sample 6 ***Interpretation***:

- x is column vector having elements 1 to 30.

- y is also vector having elements of x exponentiated of 3.

- plot is a generic function in R to plot, by default scatter plot is plotted.

```r
# user define function 1 : roll()
# simple function with no argument
roll <- function() {
  die <- 1:6
  dice <- sample(die, size = 2, replace = TRUE)
  cat("Dice Rolled:", dice, '\n')
  sum(dice)
}
```

Code Sample 7 ***Interpretation***:

- x is column vector having elements 1 to 30.
- y is also vector having elements of x exponentiated of 3.
- plot is a generic function in R to plot, by default scatter plot is plotted.

```r
# first roll()
cat('First Roll:', roll())
```

Code Sample 8

```
## Dice Rolled: 3 6
## First Roll: 9
```

```r
# second roll()
cat('Second Roll:', roll())
```

```
## Dice Rolled: 1 3
## Second Roll: 4
```

```r
# third roll()
cat('Third Roll:', roll())
```

```
## Dice Rolled: 5 2
## Third Roll: 7
```

Interpretation:

- x is column vector having elements 1 to 30.
- y is also vector having elements of x exponentiated of 3.
- plot is a generic function in R to plot, by default scatter plot is plotted.

```r
roll2 <- function(dice = 1:6) {
  dice <- sample(dice, size = 2, replace = TRUE)
  cat("Dice Rolled:", dice, '\n')
  sum(dice)
}
```

Code Sample 9 ***Interpretation***:

- x is column vector having elements 1 to 30.
- y is also vector having elements of x exponentiated of 3.
- plot is a generic function in R to plot, by default scatter plot is plotted.

```r
# first roll()
cat('First Roll:', roll2())
```

Code Sample 10

```
## Dice Rolled: 6 6
## First Roll: 12
```

Interpretation:

- x is column vector having elements 1 to 30.
- y is also vector having elements of x exponentiated of 3.
- plot is a generic function in R to plot, by default scatter plot is plotted.

```r
roll3 <- function(dice) {
  dice <- sample(dice, size = 2, replace = TRUE)
  sum(dice)
}
```

Code Sample 11 ***Interpretation***:

- x is column vector having elements 1 to 30.

- y is also vector having elements of x exponentiated of 3.
- plot is a generic function in R to plot, by default scatter plot is plotted.

```
roll3(dice = 1:6)
```

Code Sample 12

```
## [1] 5
```

```
roll3(dice = 1:12)
```

```
## [1] 11
```

```
roll3(dice = 1:24)
```

```
## [1] 40
```

Interpretation:

- x is column vector having elements 1 to 30.
- y is also vector having elements of x exponentiated of 3.
- plot is a generic function in R to plot, by default scatter plot is plotted.

```
# Function in R: Continued...

# function which prints the chunk of given character vector best_practice
best_practice <- c('Let', 'the', 'computer', 'do', 'the', 'work')
print_words <- function(sentence) {
  print(sentence[1])
  print(sentence[2])
  print(sentence[3])
  print(sentence[4])
  print(sentence[5])
  print(sentence[6])
}
```

Code Sample 13 ***Interpretation***:

- x is column vector having elements 1 to 30.
- y is also vector having elements of x exponentiated of 3.
- plot is a generic function in R to plot, by default scatter plot is plotted.

```
print_words(best_practice)
```

Code Sample 14

```
## [1] "Let"
## [1] "the"
## [1] "computer"
## [1] "do"
## [1] "the"
## [1] "work"
```

```
print_words(best_practice[-6])
```

```
## [1] "Let"
## [1] "the"
## [1] "computer"
## [1] "do"
## [1] "the"
## [1] NA
```

```
best_practice[-6]
```

```
## [1] "Let"      "the"      "computer" "do"       "the"
```

Interpretation:

- x is column vector having elements 1 to 30.
- y is also vector having elements of x exponentiated of 3.
- plot is a generic function in R to plot, by default scatter plot is plotted.

```r
# for loops in R
# for (variable in collection) {
#   do things with variable
# }
print_words <- function(sentence) {
  for (word in sentence) {
    print(word)
  }
}
```

Code Sample 15 ***Interpretation***:

- x is column vector having elements 1 to 30.
- y is also vector having elements of x exponentiated of 3.
- plot is a generic function in R to plot, by default scatter plot is plotted.

```r
print_words(best_practice)
```

Code Sample 16

```
## [1] "Let"
## [1] "the"
## [1] "computer"
## [1] "do"
## [1] "the"
## [1] "work"
```

```r
print_words(best_practice[-6])
```

```
## [1] "Let"
## [1] "the"
## [1] "computer"
## [1] "do"
## [1] "the"
```

Interpretation:

- x is column vector having elements 1 to 30.
- y is also vector having elements of x exponentiated of 3.
- plot is a generic function in R to plot, by default scatter plot is plotted.

```r
# Conditionals in R
if (y < 20) {
  x <- "Too low"
} else {
  x <- "Too high"
}
```

Code Sample 17 ***Interpretation***:

- x is column vector having elements 1 to 30.
- y is also vector having elements of x exponentiated of 3.
- plot is a generic function in R to plot, by default scatter plot is plotted.

```r
# if else in R
check.y <- function(y) {
  if (y < 20) {
    print("Too Low")
  } else {
    print("Too High")
  }
}

check.y(10)
```

Code Sample 18

```
## [1] "Too Low"
```

```r
check.y(30)
```

```
## [1] "Too High"
```

Interpretation:

- x is column vector having elements 1 to 30.
- y is also vector having elements of x exponentiated of 3.
- plot is a generic function in R to plot, by default scatter plot is plotted.

```r
# binary variables using `ifelse`
y <- 1:40
ifelse(y<20, 'Too low', 'Too high')
```

Code Sample 19

```
##  [1] "Too low"  "Too low"  "Too low"  "Too low"  "Too low"  "Too low"
##  [7] "Too low"  "Too low"  "Too low"  "Too low"  "Too low"  "Too low"
## [13] "Too low"  "Too low"  "Too low"  "Too low"  "Too low"  "Too low"
## [19] "Too low"  "Too high" "Too high" "Too high" "Too high" "Too high"
## [25] "Too high" "Too high" "Too high" "Too high" "Too high" "Too high"
## [31] "Too high" "Too high" "Too high" "Too high" "Too high" "Too high"
## [37] "Too high" "Too high" "Too high" "Too high"
```

```r
# logical
ifelse(y<20, TRUE, FALSE)
```

```
##  [1]  TRUE  TRUE  TRUE  TRUE  TRUE  TRUE  TRUE  TRUE  TRUE  TRUE  TRUE  TRUE
## [13]  TRUE  TRUE  TRUE  TRUE  TRUE  TRUE  TRUE FALSE FALSE FALSE FALSE FALSE
## [25] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [37] FALSE FALSE FALSE FALSE
```

```r
# binary
y <- 1:40
ifelse(y<20, 1, 0)
```

```
##  [1] 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
## [39] 0 0
```

Interpretation:

- x is column vector having elements 1 to 30.
- y is also vector having elements of x exponentiated of 3.
- plot is a generic function in R to plot, by default scatter plot is plotted.

```r
# multiple if else conditions
if (this) {
  # do that
} else if (that) {
  # do something else
} else if (that) {
  # do something else
} else{
  # remaining
}
```

Code Sample 20 ***Interpretation***:

- x is column vector having elements 1 to 30.
- y is also vector having elements of x exponentiated of 3.
- plot is a generic function in R to plot, by default scatter plot is plotted.

```r
check.x <- function(x=1:99){
  if (x<20){
    print("Less than 20")
  }
  else {
    if (x < 40){
      print("20-39")
    }
    else {
      print("40-99")
    }
  }
}

check.x(15)
```

Code Sample 20

```
## [1] "Less than 20"
```

```r
check.x(30)
```

```
## [1] "20-39"
```

```r
check.x(45)
```

```
## [1] "40-99"
```

Interpretation:

- x is column vector having elements 1 to 30.
- y is also vector having elements of x exponentiated of 3.
- plot is a generic function in R to plot, by default scatter plot is plotted.

```r
x <- 1:99
x1 <- ifelse(x<20, 1,0)
x2.1 <- ifelse(x<20, '<20', '20+')

x
```

Code Sample 20

```
##  [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
## [26] 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
## [51] 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75
## [76] 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99
```

```r
x1
```

```
##  [1] 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
## [39] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
## [77] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
```

```r
x2.1
```

```
##  [1] "<20" "<20" "<20" "<20" "<20" "<20" "<20" "<20" "<20" "<20" "<20" "<20"
## [13] "<20" "<20" "<20" "<20" "<20" "<20" "<20" "20+" "20+" "20+" "20+" "20+"
## [25] "20+" "20+" "20+" "20+" "20+" "20+" "20+" "20+" "20+" "20+" "20+" "20+"
## [37] "20+" "20+" "20+" "20+" "20+" "20+" "20+" "20+" "20+" "20+" "20+" "20+"
## [49] "20+" "20+" "20+" "20+" "20+" "20+" "20+" "20+" "20+" "20+" "20+" "20+"
## [61] "20+" "20+" "20+" "20+" "20+" "20+" "20+" "20+" "20+" "20+" "20+" "20+"
## [73] "20+" "20+" "20+" "20+" "20+" "20+" "20+" "20+" "20+" "20+" "20+" "20+"
## [85] "20+" "20+" "20+" "20+" "20+" "20+" "20+" "20+" "20+" "20+" "20+" "20+"
## [97] "20+" "20+" "20+"
```

Interpretation:

- x is column vector having elements 1 to 30.
- y is also vector having elements of x exponentiated of 3.
- plot is a generic function in R to plot, by default scatter plot is plotted.

```r
x3 <- ifelse(x<20,1,ifelse(x<40,2,3))
x3
```

Code Sample 20

```
##  [1] 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
## [39] 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3
## [77] 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3
```

```
# represents the frequency distribution of categorical  data.
# It essentially counts the occurrences of unique values within a dataset and presents the result in a
table(x3)
```

```
## x3
##  1  2  3
## 19 20 60
```

Interpretation:

- x is column vector having elements 1 to 30.
- y is also vector having elements of x exponentiated of 3.
- plot is a generic function in R to plot, by default scatter plot is plotted.

```
iris <- within(iris, {
  Petal.cat <- NA
  Petal.cat[Petal.Length < 1.6] <- "Small"
  Petal.cat[Petal.Length >= 1.6 &
              Petal.Length < 5.1] <- "Medium"
  Petal.cat[Petal.Length >= 5.1] <- "Large"
})

iris$Petal.cat
```

Code Sample 20

```
##   [1] "Small"  "Small"  "Small"  "Small"  "Small"  "Medium" "Small"  "Small"
##   [9] "Small"  "Small"  "Small"  "Medium" "Small"  "Small"  "Small"  "Small"
##  [17] "Small"  "Small"  "Medium" "Small"  "Medium" "Small"  "Small"  "Medium"
##  [25] "Medium" "Medium" "Medium" "Small"  "Small"  "Medium" "Medium" "Small"
##  [33] "Small"  "Small"  "Small"  "Small"  "Small"  "Small"  "Small"  "Small"
##  [41] "Small"  "Small"  "Small"  "Medium" "Medium" "Small"  "Medium" "Small"
##  [49] "Small"  "Small"  "Medium" "Medium" "Medium" "Medium" "Medium" "Medium"
##  [57] "Medium" "Medium" "Medium" "Medium" "Medium" "Medium" "Medium" "Medium"
##  [65] "Medium" "Medium" "Medium" "Medium" "Medium" "Medium" "Medium" "Medium"
##  [73] "Medium" "Medium" "Medium" "Medium" "Medium" "Medium" "Medium" "Medium"
##  [81] "Medium" "Medium" "Medium" "Large"  "Medium" "Medium" "Medium" "Medium"
##  [89] "Medium" "Medium" "Medium" "Medium" "Medium" "Medium" "Medium" "Medium"
##  [97] "Medium" "Medium" "Medium" "Medium" "Large"  "Large"  "Large"  "Large"
## [105] "Large"  "Large"  "Medium" "Large"  "Large"  "Large"  "Large"  "Large"
## [113] "Large"  "Medium" "Large"  "Large"  "Large"  "Large"  "Large"  "Medium"
## [121] "Large"  "Medium" "Large"  "Medium" "Large"  "Large"  "Medium" "Medium"
## [129] "Large"  "Large"  "Large"  "Large"  "Large"  "Large"  "Large"  "Large"
## [137] "Large"  "Large"  "Medium" "Large"  "Large"  "Large"  "Large"  "Large"
## [145] "Large"  "Large"  "Medium" "Large"  "Large"  "Large"
```

```
table(iris$Petal.cat)
```

```
##
##  Large Medium  Small
##     42     71     37
```

Interpretation:

- x is column vector having elements 1 to 30.
- y is also vector having elements of x exponentiated of 3.
- plot is a generic function in R to plot, by default scatter plot is plotted.

```
if (temp <= 0) {
  "freezing"
}
else if (temp <= 10) {
  "cold"
}
else if (temp <= 20) {
  "cool"
}
else if (temp <= 30) {
  "warm"
}
else {
  "hot"
}
```

Code Sample 20 ***Interpretation***:

- x is column vector having elements 1 to 30.
- y is also vector having elements of x exponentiated of 3.
- plot is a generic function in R to plot, by default scatter plot is plotted.

```r
# Multiple Conditions: If, else if, else if, else if
temp <- function(x) {
  if (temp <= 0) {
    "freezing"
  }
  else if (temp <= 10) {
    "cold"
  }
  else if (temp <= 20) {
    "cool"
  }
  else if (temp <= 30) {
    "warm"
  }
  else {
    "hot"
  }
}
```

Code Sample 20 ***Interpretation***:

- x is column vector having elements 1 to 30.
- y is also vector having elements of x exponentiated of 3.
- plot is a generic function in R to plot, by default scatter plot is plotted.