

R for Beginners - R Code File -2

This R code book has been written by [Rohit Dhankar](https://github.com/RohitDhankar) . GitHub - <https://github.com/RohitDhankar>

This is the 2nd in series of R Code Files.

Refer GitHub Repository , for all Data Files -> <https://github.com/RohitDhankar/R-Beginners-Online-Virtual-Learning-Session>

Its a good practice from time to time to keep a track of our current Working Directory and list out all the Objects in our R ENVIRONMENT - specially so when we are committing changes to a Git Remote.

VECTOR Operations

```
getwd()
```

```
## [1] "/home/dhankar/Desktop/R_Own/Proj_1"
```

```
#
```

```
ls()
```

```
## character(0)
```

We could remove any object with command - rm("Object Name")

We can also use print() , to view any objects stored value.

```
# Code Section -1
```

```
a1 <- "FINANCE"
```

```
b1 <- "MARKETING"
```

```
c1 <- "SALES"
```

```
d1 <- 3.1416
```

```
char_vector <- c("x","d","c","f")
```

```
print(a1)
```

```
## [1] "FINANCE"
```

```
#
```

```
print(char_vector)
```

```
## [1] "x" "d" "c" "f"
```

Going further with VECTORS .

We combine two or more vectors to get another vector .

```
# Code Section -2
```

```
num_vector <- c(22,22,33,33,44)
```

```
print(num_vector)
```

```
## [1] 22 22 33 33 44
```

```
num_vector1 <- c(11,12,13,14,15)
```

```
#
```

```
num_vector3 <- c(num_vector,num_vector1)
```

```
print(num_vector3)
```

```
## [1] 22 22 33 33 44 11 12 13 14 15
```

```

#
sort(num_vector3)

## [1] 11 12 13 14 15 22 22 33 33 44

#
order(num_vector3) # Ascending Order of ELEMENTS without SORTING .

## [1] 6 7 8 9 10 1 2 3 4 5

#
# The COLON Operator is same as the seq() function seen later in this text.

seq_1<- 55:50
seq_1

## [1] 55 54 53 52 51 50

#
seq_2<- 50:55
seq_2

## [1] 50 51 52 53 54 55

#
# While the above - seq_1 and seq_2 are stored as Objects withing persistence storage.

50:55 ## is in Memory Only and Not Stored on any persistence storage.

## [1] 50 51 52 53 54 55
## Source -- R Manual -- https://stat.ethz.ch/R-manual/R-devel/library/base/html/Colon.html

Some basic Maths and Stats with VECTORS.

# Code Section -3
num_vector3 + 5

## [1] 27 27 38 38 49 16 17 18 19 20

# Adds NUMERIC VALUE = 5 to all ELEMENTS of the Num Vector.
nmv_1<-c(20,21,211,312,413,5114)
nmv_2<-c(20,21,211,313,414,5214)
#
class(nmv_1) # "numeric" Vector

## [1] "numeric"

#
print(1/nmv_1)

## [1] 0.05000000000 0.0476190476 0.0047393365 0.0032051282 0.0024213075
## [6] 0.0001955417

#
min_max_nmv <- c(min(nmv_1),max(nmv_1))
min_max_nmv ## Output - MIN == 20 , MAX ==5114

## [1] 20 5114

#

```

```

### MATHEMATICAL logical operators and Boolean calculus - present in R .
# - <, <=, >, >=, == for exact equality and != for inequality.

### Boolean calculus
# Given - nmv_1 and nmv_2 are logical expressions,
# thus nmv_1 & nmv_2 is intersection ("AND")
# nmv_1 | nmv_2 is union ("OR")
# !nmv_1 is Negation of nmv_1.

nmv_1 == nmv_2

## [1] TRUE TRUE TRUE FALSE FALSE FALSE
#
nmv_1 != nmv_2

## [1] FALSE FALSE FALSE TRUE TRUE TRUE
#
# Lets introduce NA's - the data wranglers nightmare
#
nmv_3 <- c(11,NA,22,33,44,NA,NA)
nmv_3

## [1] 11 NA 22 33 44 NA NA
# We can use function is.na() , to find out the NOT AVAILABLE missing values
# At a letr stage we shall also look at NA management or IMPUTATION of MISSING VALUES
# Here is a prelim resource --
#
is.na(nmv_3)

## [1] FALSE TRUE FALSE FALSE FALSE TRUE TRUE
#
# Kaggle_Titanic [Multiple Imputation of Missing Values] --
# http://datasciencewithrandpython.blogspot.in/2017/01/kaggle-titanic-initial-analysis-wip.html
#
# Not a NUMBER = NaN
xx <- 0/0.00
xx

## [1] NaN
#
is.nan(xx) ## TRUE

## [1] TRUE
#
is.nan(nmv_3) ## As Many FALSE - as Elements

## [1] FALSE FALSE FALSE FALSE FALSE FALSE FALSE
#
nmv_4 <- nmv_3 + 2 ## Any OPERATION done with a NA value , results in a NA value.
nmv_4

## [1] 13 NA 24 35 46 NA NA

```

```

#
# Code Section -4

num_vector1 * num_vector3

## [1] 242 264 429 462 660 121 144 169 196 225
# First 5 elements of - num_vector3 multiplied by the Five Elements
# of num_vector1 and again the Next 5 elements of num_vector3
# multiplied by the Five Elements of num_vector1

# Concatenate Strings - Its often required to PASTE together CHAR VARIABLES
# to create more Complex CHAR VARIABLES
# R has a handy function called PASTE -
# ?paste() # Uncomment to see help
# Concatenate vectors after converting to character.

col_names_1 <- paste(c("N","P","Q","R"), 1:20, sep="")
col_names_1

## [1] "N1" "P2" "Q3" "R4" "N5" "P6" "Q7" "R8" "N9" "P10" "Q11"
## [12] "R12" "N13" "P14" "Q15" "R16" "N17" "P18" "Q19" "R20"
#
col_names_2 <- paste(c("X","Y","Z"), 1:3, sep="")
col_names_2

## [1] "X1" "Y2" "Z3"
#
col_names_3 <- paste(c("M","N","P"), col_names_2, sep="")
col_names_3

## [1] "MX1" "NY2" "PZ3"
#
#
col_names_4 <- paste( col_names_2,c("M","N","P"), sep="")
col_names_4

## [1] "X1M" "Y2N" "Z3P"
# As seen above very handy for creating COLUMN NAMES or VARIABLE LABELS
# Kindly notice - PASTE() follows the Order of R OBJECTS provided
# and converts them to CHAR VECTORS.

```

Check out the LENGTH of a VECTOR with length()

```

# Code Section -5

```

```

length(num_vector1 * num_vector3)

```

```

## [1] 10

```

```

# Code Section -6

```

```

#num_vector1 %*% num_vector3 # Error in num_vector1 %*% num_vector3 : non-conformable arguments
# Vectors are not of same Length above - below they are of same length

```

```

nv <- c(1,2,3,4,5)
nv1 <- c(6,7,8,9,10)

nv %*% nv1 # Inner Product of same Length Vectors

##      [,1]
## [1,] 130

# Algebraic Dot Product as defined by Wikipedia - "https://en.wikipedia.org/wiki/Dot_product"

```

Operate upon a ELEMENT of the Vector.

```

# Code Section -7

log(num_vector3[2]) # Log Base 2 of 22

```

```
## [1] 3.091042
```

```

#
log(22)

```

```
## [1] 3.091042
```

```
#
```

Converting a CHAR Vector into a NUMERIC Vector .

```

# Code Section -8
ch_v <- c("11","12","13","14","15")
#
class(ch_v)

```

```
## [1] "character"
```

```

#ch_v + 2 # Error in ch_v + 2 : non-numeric argument to binary operator
# Cant do a Math operation on CHAR Vector - lets Convert into NUM Vector
#
nm_v <- as.numeric(ch_v)
#
class(nm_v)

```

```
## [1] "numeric"
```

```
nm_v + 2
```

```
## [1] 13 14 15 16 17
```

```

#
#Summary of the Num Vector as below :-
#
summary(nm_v+2)

```

```

##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##       13      14      15      15      16      17

```

```

#
summary(nm_v+5)

```

```

##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##       16      17      18      18      19      20

```

```

#
sum(nm_v+5)

## [1] 90

#
sd(nm_v+5)

## [1] 1.581139

#
max(nm_v+5)

## [1] 20

#
min(nm_v+5)

## [1] 16

#
mean(nm_v+5)

## [1] 18

#
median(nm_v+5)

## [1] 18

#
#The Quantile -
#
quantile(nm_v+5)

##    0%   25%   50%   75%  100%
##    16    17    18    19    20

#
quantile(nm_v+100)

##    0%   25%   50%   75%  100%
##   111   112   113   114   115

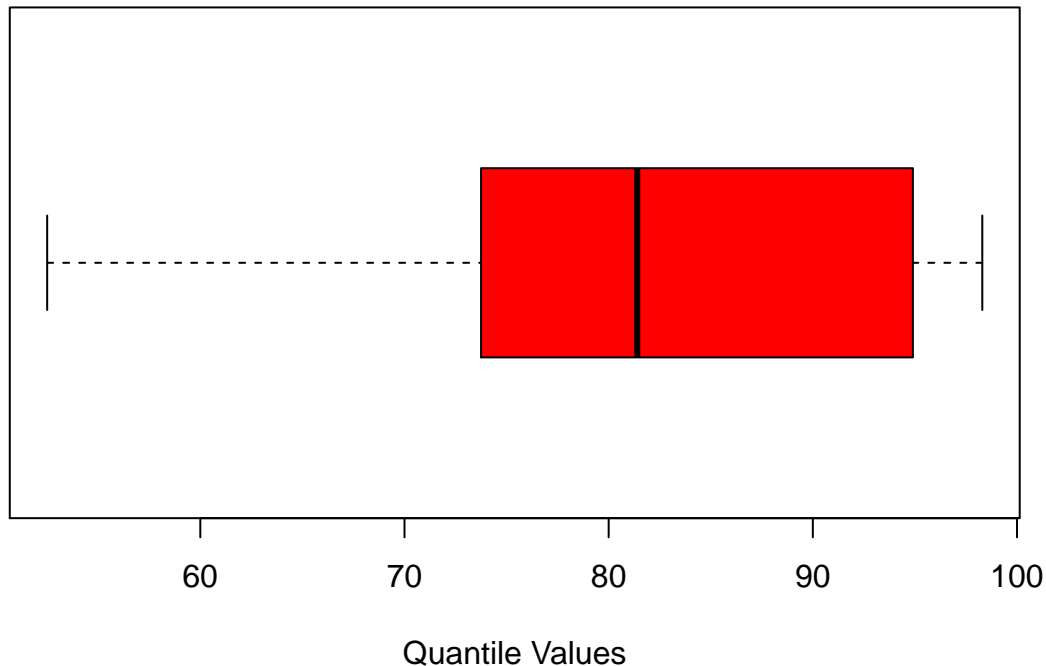
#
#We can also specify the Quantile buckets or Percentiles as an argument to the Quantile function :-
#
nmv_q <- c(10,15,20,25,30,35,40,45,50,55,60,65,70,75,80,85,90,100)
percent_1 <- quantile(nmv_q, c(.50,.75,.84, .97, .99))
percent_1

##    50%   75%   84%   97%   99%
##  52.50  73.75  81.40  94.90  98.30

boxplot(percent_1,col = "red",horizontal = TRUE,
        main = "Box and Whisker Plot of Quantiles",
        xlab = "Quantile Values")

```

Box and Whisker Plot of Quantiles



```
# Kindly note how the ARGUMENTs to boxplot()  
# have been bumped to the next row - keeping in mind  
# the Horizontal space of our PDF knit of the .Rmd file  
  
# Seen above we have the MEDIAN quartile - 50% and the UPPER  
# Quartile - 75% along with THREE more percentiles.
```

Wiki reference – Percentile Rank - “https://en.wikipedia.org/wiki/Percentile_rank” #

Intro to ANOVA and BOXPLOTS

We also carry out ONE Way ANOVA or ANALYSIS of VARIANCE test with the BOX and WHISKERS plots as seen below :-

```
# Code Section -9  
library(graphics)  
  
nmv_q <- c(10,15,20,25,30,35,40,45,50,55,60,65,70,75,80,85,90,100)  
percent_1 <- quantile(nmv_q, c(.50,.75,.84, .97, .99))  
percent_1  
  
## 50% 75% 84% 97% 99%  
## 52.50 73.75 81.40 94.90 98.30  
  
percent_2 <- quantile(nmv_q, c(.1, .3, .16, .40, .50))  
percent_2  
  
## 10% 30% 16% 40% 50%  
## 18.5 35.5 23.6 44.0 52.5
```

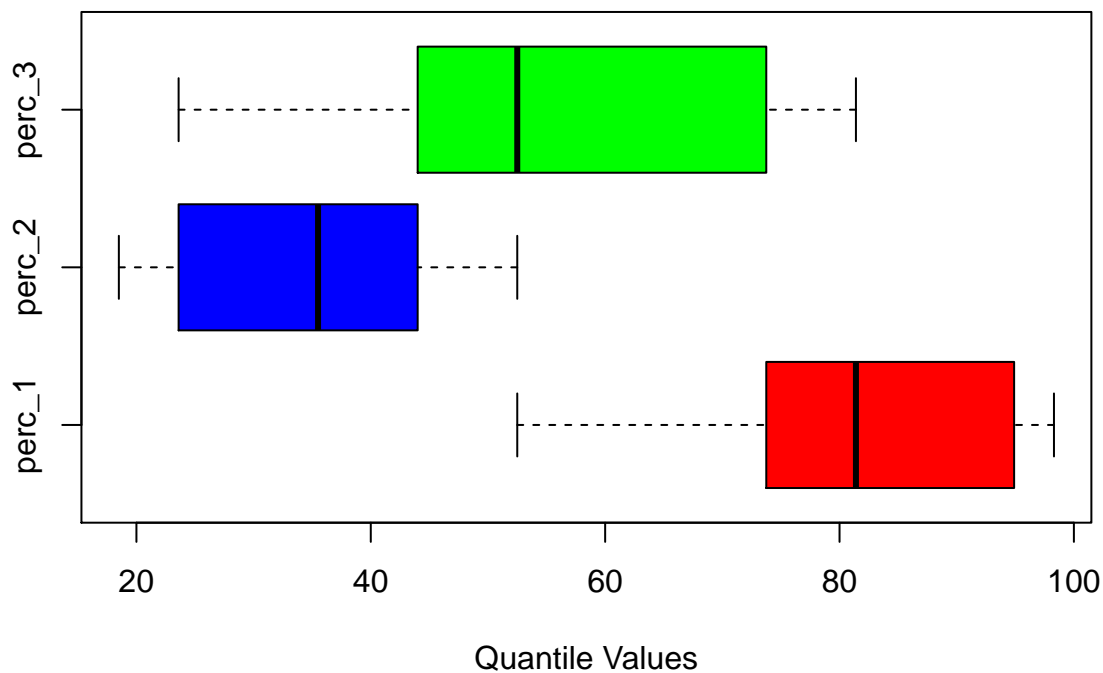
```
percent_3 <- quantile(nmv_q, c(.16, .40, .50,.75,.84))
percent_3

##    16%   40%   50%   75%   84%
## 23.60 44.00 52.50 73.75 81.40

col_boxes = (c("red","blue","green"))

boxplot(percent_1,percent_2,percent_3,col = col_boxes,
        names = c("perc_1","perc_2","perc_3"),horizontal = TRUE,
        main = "Box and Whisker Plot of Quantiles",
        xlab = "Quantile Values")
```

Box and Whisker Plot of Quantiles



*# Kindly note the Quantiles are randomly chosen here
 # this is not the best way to choose quantiles
 # we shall come back for details later in this text*

rainbow() for Coloring Boxplots -

```
# Code Section -10

percent_4 <- quantile(nmv_q, c(.16, .40, .50,.95,.99))
percent_4

##    16%   40%   50%   95%   99%
## 23.6 44.0 52.5 91.5 98.3

percent_5 <- quantile(nmv_q, c(.16, .24,.32 ,.40,.75))
percent_5
```



```
## 16% 24% 32% 40% 75%
## 23.60 30.40 37.20 44.00 73.75

percent_6 <- quantile(nmv_q, c(.1, .5, .26, .45, .60))
percent_6

## 10% 50% 26% 45% 60%
## 18.50 52.50 32.10 48.25 61.00

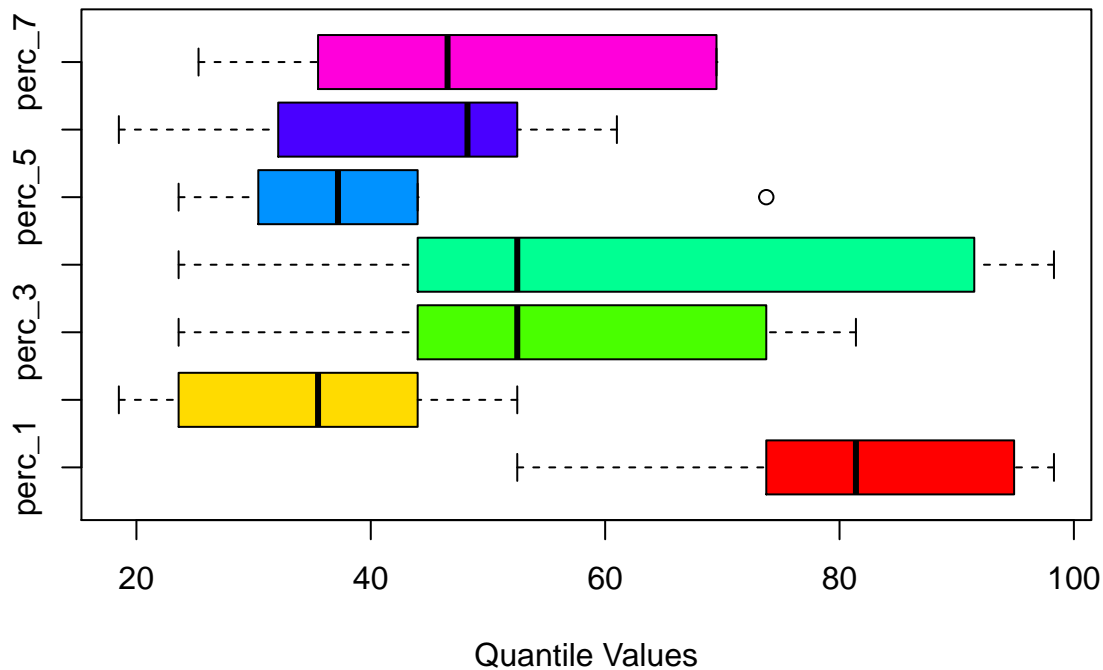
percent_7 <- quantile(nmv_q, c(.3, .7, .18, .43, .70))
percent_7

## 30% 70% 18% 43% 70%
## 35.50 69.50 25.30 46.55 69.50

col_rainbow <- rainbow(7)

boxplot(percent_1,percent_2,percent_3,percent_4,percent_5,percent_6,percent_7,col = col_rainbow,
        names = c("perc_1","perc_2","perc_3","perc_4","perc_5","perc_6","perc_7"),horizontal = TRUE,
        main = "Box and Whisker Plot of Quantiles",
        xlab = "Quantile Values")
```

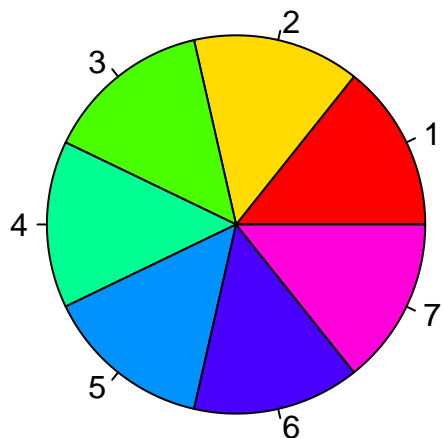
Box and Whisker Plot of Quantiles



```
# Code Section -11

# Just for Fun a PIE Graph --- you always ...
# need to avoid PIE Graphs for "DESCRIPTIVE STATS"
# I personally love to use them for MARKETING
# They are usually excellent EYE CANDY :P

pie(rep(1, 7), col = rainbow(7))
```



MATRICE Operations - TRANSPOSE of a MATRIX

Coming back to MATRICES lets further look at some MATRIX Operations :-

Code Section -12

```
m1 <- matrix(data=66:69,nrow=2,ncol=2)
m1
```

```
##      [,1] [,2]
## [1,]   66   68
## [2,]   67   69
```

*# Lets now TRANSPOSE this MATRIX - for more on TRANSPOSE of MATRICES
kindly refer this Wiki Link -- <https://en.wikipedia.org/wiki/Transpose>*

```
t(m1)
```

```
##      [,1] [,2]
## [1,]   66   67
## [2,]   68   69
```

*# As seen below - the DIAGONAL Elements remain as -is .
66 and 69 do not move .
67 and 68 switch places , thus giving us a Transpose Matrix.*

Lets look at another example of TRANSPOSE

```
m2 <- matrix(data=10:25,nrow=4,ncol=4)
m2
```

```
##      [,1] [,2] [,3] [,4]
## [1,]   10   14   18   22
## [2,]   11   15   19   23
## [3,]   12   16   20   24
## [4,]   13   17   21   25
```

```
class(m2)
```

```
## [1] "matrix"
```

```
## Note in the above sequence - 10:25 - both 10 and 25 are included.
# Lets now TRANSPOSE this MATRIX - for more on TRANSPOSE of MATRICES
# kindly refer this Wiki Link -- https://en.wikipedia.org/wiki/Transpose
```

```
t(m2)
```

```
##      [,1] [,2] [,3] [,4]
## [1,]  10  11  12  13
## [2,]  14  15  16  17
## [3,]  18  19  20  21
## [4,]  22  23  24  25
```

```
# As seen below - the DIAGONAL Elements remain as-is.
# 10, 15 , 20 , 25 -- do not move .
# Non Diagonal elements are Transposed ,giving the Transpose Matrix.
```

The Semicolon Notation - RANGE or SEQUENCE

```
# Code Section -13
```

```
# Quick recap of the SEQUENCE
```

```
a_seq <- 66:69
a_seq
```

```
## [1] 66 67 68 69
```

```
# In the earlier section we create a MATRIX by using a sequence within
# the COMBINE function
```

```
# We can also use the - seq - sequence function as seen below
```

```
b_seq <- seq(from=66, to=69, by=1)
b_seq
```

```
## [1] 66 67 68 69
```

```
#
```

```
b_seq <- seq(from=66, to=69, by=2)
b_seq
```

```
## [1] 66 68
```

```
#
```

```
c_seq <- seq(from=1, to=10, by=2)
c_seq
```

```
## [1] 1 3 5 7 9
```

```
class(c_seq)
```

```
## [1] "numeric"
```

The CBIND and RBIND Functions

We can COLUMN Bind and ROW Bind more than one data structures as seen below -

```
# Code Section -14
```

```
ma1 <- matrix(data=10:15,nrow=3,ncol=2)
ma1
```

```
##      [,1] [,2]
## [1,]   10   13
## [2,]   11   14
## [3,]   12   15
```

```
#
class(ma1)
```

```
## [1] "matrix"
```

```
#
ma2 <- matrix(data=20:25,nrow=3,ncol=2)
ma2
```

```
##      [,1] [,2]
## [1,]   20   23
## [2,]   21   24
## [3,]   22   25
```

```
#
class(ma2)
```

```
## [1] "matrix"
```

```
# ROW Bind the Matrices
```

```
ma3 <- rbind(ma1,ma2)
ma3
```

```
##      [,1] [,2]
## [1,]   10   13
## [2,]   11   14
## [3,]   12   15
## [4,]   20   23
## [5,]   21   24
## [6,]   22   25
```

```
#
# COLUMN Bind the Matrices
```

```
ma4 <- cbind(ma1,ma2)
ma4
```

```
##      [,1] [,2] [,3] [,4]
## [1,]   10   13   20   23
## [2,]   11   14   21   24
## [3,]   12   15   22   25
```

```
# As seen below we need to have same COLUMN Numbers to do a RBIND
```

```
#m3 <- rbind(m1,m2)
```

```
# # As seen below we need to have same ROW Numbers to do a RBIND
```

```
#m3 <- cbind(m1,m2)
```

ROW BIND - Data Frames

Code Section -15

```
df_1 <- read.csv("~/Desktop/R_Own/R_1 - Sheet1.csv",header =TRUE , sep = "," )
df_1
```

##	X.	Product.Name	Prod.ID	Date.of.Invoice	Date.of.Shipping
## 1	1	OFF-LA-10002782	MX-2014-143658	01-01-2013	02-01-2013
## 2	2	FUR-FU-10004015	MX-2012-155047	01-01-2013	02-01-2013
## 3	3	FUR-B0-10002352	MX-2012-155047	01-01-2013	02-01-2013
## 4	4	OFF-BI-10004428	MX-2012-155047	01-01-2013	02-01-2013
## 5	5	OFF-AR-10004594	MX-2012-155047	01-01-2013	02-01-2013
## 6	6	OFF-EN-10001375	MX-2012-155047	01-01-2013	02-01-2013
## 7	7	OFF-EN-10001375	MX-2013-134096	01-01-2013	02-01-2013
## 8	8	TEC-MA-10004956	MX-2013-134096	01-01-2013	02-01-2013
## 9	9	OFF-SU-10003474	MX-2013-134096	01-01-2013	02-01-2013
## 10	10	TEC-AC-10001830	MX-2013-134096	01-01-2013	02-01-2013
## 11	11	OFF-BI-10002075	MX-2013-134096	01-01-2013	02-01-2013
## 12	12	OFF-FA-10002526	MX-2013-156335	01-01-2013	02-01-2013
## 13	13	FUR-CH-10002846	MX-2013-156335	01-01-2013	02-01-2013
## 14	14	OFF-EN-10004100	MX-2014-121923	02-01-2013	04-01-2013
## 15	15	OFF-AR-10003914	MX-2014-135706	02-01-2013	03-01-2013
## 16	16	OFF-FA-10000038	MX-2014-135706	02-01-2013	03-01-2013
## 17	17	OFF-EN-10000761	US-2013-126655	02-01-2013	03-01-2013
## 18	18	FUR-FU-10003066	US-2013-126655	02-01-2013	03-01-2013
## 19	19	OFF-EN-10000075	US-2013-126655	02-01-2013	03-01-2013
## 20	20	OFF-EN-10002226	US-2013-126655	02-01-2013	03-01-2013
## 21	21	FUR-CH-10002132	MX-2013-167759	02-01-2013	04-01-2013
## 22	22	TEC-AC-10002749	MX-2013-163139	02-01-2013	02-01-2013
## 23	23	OFF-SU-10000066	MX-2013-163139	02-01-2013	02-01-2013
## 24	24	OFF-BI-10003934	US-2014-119753	02-01-2013	03-01-2013
## 25	25	OFF-BI-10003932	US-2012-133970	02-01-2013	03-01-2013
##	Cost.Price	Quantity	Sales.Price	Shipping.Index	Shipping.Type
## 1	13.080	3	39.240	1	PRIORITY
## 2	252.160	8	2017.280	2	PRIORITY
## 3	193.280	2	386.560	3	PRIORITY
## 4	35.440	4	141.760	4	PRIORITY
## 5	71.600	2	143.200	5	PRIORITY
## 6	56.120	2	112.240	6	PRIORITY
## 7	56.120	2	112.240	7	STANDARD
## 8	344.640	3	1033.920	8	STANDARD
## 9	97.360	4	389.440	9	STANDARD
## 10	341.520	2	683.040	10	STANDARD
## 11	12.060	3	36.180	11	STANDARD
## 12	20.760	3	62.280	12	STANDARD
## 13	210.640	4	842.560	13	STANDARD
## 14	80.100	3	240.300	14	STANDARD
## 15	132.640	4	530.560	15	STANDARD
## 16	12.940	1	12.940	16	STANDARD
## 17	18.840	2	37.280	17	STANDARD
## 18	308.280	7	2157.560	18	STANDARD
## 19	40.176	2	79.952	19	STANDARD

## 20	8.784	3	25.952	20	PRIORITY
## 21	273.472	4	1093.688	21	PRIORITY
## 22	27.000	1	27.000	22	PRIORITY
## 23	207.000	9	1863.000	23	PRIORITY
## 24	60.660	3	181.580	24	PRIORITY
## 25	181.116	9	1629.644	25	PRIORITY

```
##      Category
## 1 Office Supplies
## 2      Furniture
## 3      Furniture
## 4 Office Supplies
## 5 Office Supplies
## 6 Office Supplies
## 7 Office Supplies
## 8      Technology
## 9 Office Supplies
## 10     Technology
## 11 Office Supplies
## 12 Office Supplies
## 13      Furniture
## 14 Office Supplies
## 15 Office Supplies
## 16 Office Supplies
## 17 Office Supplies
## 18      Furniture
## 19 Office Supplies
## 20 Office Supplies
## 21      Furniture
## 22      Technology
## 23 Office Supplies
## 24 Office Supplies
## 25 Office Supplies
```

Code Section -16

```
df_2 <- read.csv("~/Desktop/R_Own/R_2.csv",header =TRUE , sep = "," )
df_2
```

##	X.	Product.Name	Prod.ID	Date.of.Invoice	Date.of.Shipping
## 1	1	TEC-AC-10001830	MX-2013-134096	05-01-2013	06-01-2013
## 2	2	FUR-FU-10004015	MX-2012-155047	03-01-2013	03-01-2013
## 3	3	FUR-B0-10002352	MX-2012-155047	03-01-2013	03-01-2013
## 4	4	OFF-BI-10004428	MX-2012-155047	03-01-2013	03-01-2013
## 5	5	OFF-AR-10004594	MX-2012-155047	03-01-2013	03-01-2013
## 6	6	OFF-EN-10001375	MX-2012-155047	03-01-2013	03-01-2013
## 7	7	OFF-EN-10001375	MX-2013-134096	03-01-2013	04-01-2013
## 8	8	OFF-AR-10003914	MX-2014-135706	03-01-2013	04-01-2013
## 9	9	OFF-FA-10000038	MX-2014-135706	03-01-2013	04-01-2013
## 10	10	OFF-EN-10000761	US-2013-126655	03-01-2013	04-01-2013
## 11	11	FUR-FU-10003066	US-2013-126655	03-01-2013	04-01-2013
## 12	12	OFF-EN-10000075	US-2013-126655	03-01-2013	04-01-2013
## 13	13	OFF-EN-10002226	US-2013-126655	03-01-2013	03-01-2013
## 14	14	FUR-CH-10002132	MX-2013-167759	03-01-2013	03-01-2013
## 15	15	OFF-EN-10001375	MX-2013-134096	03-01-2013	04-01-2013
## 16	16	TEC-MA-10004956	MX-2013-134096	03-01-2013	04-01-2013

## 17	17	OFF-SU-10003474	MX-2013-134096	03-01-2013	04-01-2013	
## 18	18	TEC-AC-10001830	MX-2013-134096	03-01-2013	04-01-2013	
## 19	19	OFF-BI-10002075	MX-2013-134096	03-01-2013	04-01-2013	
## 20	20	OFF-FA-10002526	MX-2013-156335	03-01-2013	04-01-2013	
## 21	21	OFF-EN-10001375	MX-2013-134096	04-01-2013	05-01-2013	
## 22	22	TEC-MA-10004956	MX-2013-134096	04-01-2013	05-01-2013	
## 23	23	OFF-SU-10003474	MX-2013-134096	04-01-2013	05-01-2013	
## 24	24	TEC-AC-10001830	MX-2013-134096	04-01-2013	05-01-2013	
## 25	25	OFF-BI-10002075	MX-2013-134096	04-01-2013	05-01-2013	
## 26	26	OFF-EN-10001375	MX-2013-134096	04-01-2013	05-01-2013	
## 27	27	TEC-MA-10004956	MX-2013-134096	04-01-2013	05-01-2013	
## 28	28	OFF-SU-10003474	MX-2013-134096	04-01-2013	05-01-2013	
## 29	29	TEC-AC-10001830	MX-2013-134096	04-01-2013	05-01-2013	
## 30	30	OFF-BI-10002075	MX-2013-134096	04-01-2013	05-01-2013	
## 31	31	OFF-EN-10000761	US-2013-126655	04-01-2013	05-01-2013	
## 32	32	FUR-FU-10003066	US-2013-126655	04-01-2013	05-01-2013	
## 33	33	OFF-EN-10000075	US-2013-126655	04-01-2013	05-01-2013	
## 34	34	OFF-EN-10002226	US-2013-126655	04-01-2013	04-01-2013	
## 35	35	FUR-CH-10002132	MX-2013-167759	04-01-2013	04-01-2013	
## 36	36	OFF-EN-10001375	MX-2013-134096	04-01-2013	05-01-2013	
## 37	37	TEC-MA-10004956	MX-2013-134096	04-01-2013	05-01-2013	
## 38	38	OFF-SU-10003474	MX-2013-134096	04-01-2013	05-01-2013	
## 39	39	TEC-AC-10001830	MX-2013-134096	04-01-2013	05-01-2013	
## 40	40	OFF-BI-10002075	MX-2013-134096	04-01-2013	05-01-2013	
## 41	41	OFF-FA-10002526	MX-2013-156335	04-01-2013	05-01-2013	
## 42	42	OFF-EN-10001375	MX-2013-134096	04-01-2013	05-01-2013	
## 43	43	TEC-MA-10004956	MX-2013-134096	04-01-2013	05-01-2013	
## 44	44	OFF-SU-10003474	MX-2013-134096	05-01-2013	06-01-2013	
## 45	45	TEC-AC-10001830	MX-2013-134096	05-01-2013	06-01-2013	
## 46	46	OFF-BI-10002075	MX-2013-134096	05-01-2013	06-01-2013	
## 47	47	OFF-EN-10001375	MX-2013-134096	05-01-2013	06-01-2013	
## 48	48	TEC-MA-10004956	MX-2013-134096	05-01-2013	06-01-2013	
## 49	49	OFF-SU-10003474	MX-2013-134096	05-01-2013	06-01-2013	
## 50	50	OFF-LA-10002782	MX-2014-143658	03-01-2013	03-01-2013	
##		Cost.Price	Quantity	Sales.Price	Shipping.Index	Shipping.Type
## 1		341.520	2	683.040	10	STANDARD
## 2		252.160	8	2017.280	2	PRIORITY
## 3		193.280	2	386.560	3	PRIORITY
## 4		35.440	4	141.760	4	PRIORITY
## 5		71.600	2	143.200	5	PRIORITY
## 6		56.120	2	112.240	6	PRIORITY
## 7		56.120	2	112.240	7	STANDARD
## 8		132.640	4	530.560	15	STANDARD
## 9		12.940	1	12.940	16	STANDARD
## 10		18.840	2	37.280	17	STANDARD
## 11		308.280	7	2157.560	18	STANDARD
## 12		40.176	2	79.952	19	STANDARD
## 13		8.784	3	25.952	20	PRIORITY
## 14		273.472	4	1093.688	21	PRIORITY
## 15		56.120	2	112.240	7	STANDARD
## 16		344.640	3	1033.920	8	STANDARD
## 17		97.360	4	389.440	9	STANDARD
## 18		341.520	2	683.040	10	STANDARD
## 19		12.060	3	36.180	11	STANDARD

## 20	20.760	3	62.280	12	STANDARD
## 21	56.120	2	112.240	7	STANDARD
## 22	344.640	3	1033.920	8	STANDARD
## 23	97.360	4	389.440	9	STANDARD
## 24	341.520	2	683.040	10	STANDARD
## 25	12.060	3	36.180	11	STANDARD
## 26	56.120	2	112.240	7	STANDARD
## 27	344.640	3	1033.920	8	STANDARD
## 28	97.360	4	389.440	9	STANDARD
## 29	341.520	2	683.040	10	STANDARD
## 30	12.060	3	36.180	11	STANDARD
## 31	18.840	2	37.280	17	STANDARD
## 32	308.280	7	2157.560	18	STANDARD
## 33	40.176	2	79.952	19	STANDARD
## 34	8.784	3	25.952	20	PRIORITY
## 35	273.472	4	1093.688	21	PRIORITY
## 36	56.120	2	112.240	7	STANDARD
## 37	344.640	3	1033.920	8	STANDARD
## 38	97.360	4	389.440	9	STANDARD
## 39	341.520	2	683.040	10	STANDARD
## 40	12.060	3	36.180	11	STANDARD
## 41	20.760	3	62.280	12	STANDARD
## 42	56.120	2	112.240	7	STANDARD
## 43	344.640	3	1033.920	8	STANDARD
## 44	97.360	4	389.440	9	STANDARD
## 45	341.520	2	683.040	10	STANDARD
## 46	12.060	3	36.180	11	STANDARD
## 47	56.120	2	112.240	7	STANDARD
## 48	344.640	3	1033.920	8	STANDARD
## 49	97.360	4	389.440	9	STANDARD
## 50	13.080	3	39.240	1	PRIORITY
##	Category				
## 1	Technology				
## 2	Furniture				
## 3	Furniture				
## 4	Office Supplies				
## 5	Office Supplies				
## 6	Office Supplies				
## 7	Office Supplies				
## 8	Office Supplies				
## 9	Office Supplies				
## 10	Office Supplies				
## 11	Furniture				
## 12	Office Supplies				
## 13	Office Supplies				
## 14	Furniture				
## 15	Office Supplies				
## 16	Technology				
## 17	Office Supplies				
## 18	Technology				
## 19	Office Supplies				
## 20	Office Supplies				
## 21	Office Supplies				
## 22	Technology				


```
## 23 Office Supplies
## 24      Technology
## 25 Office Supplies
## 26 Office Supplies
## 27      Technology
## 28 Office Supplies
## 29      Technology
## 30 Office Supplies
## 31 Office Supplies
## 32      Furniture
## 33 Office Supplies
## 34 Office Supplies
## 35      Furniture
## 36 Office Supplies
## 37      Technology
## 38 Office Supplies
## 39      Technology
## 40 Office Supplies
## 41 Office Supplies
## 42 Office Supplies
## 43      Technology
## 44 Office Supplies
## 45      Technology
## 46 Office Supplies
## 47 Office Supplies
## 48      Technology
## 49 Office Supplies
## 50 Office Supplies
```

COLUMN BIND- Data Frame

Code Section -17

```
df_3_C <- cbind(df_1,df_2)
df_3_C
```

##	X.	Product.Name	Prod.ID	Date.of.Invoice	Date.of.Shipping
## 1	1	OFF-LA-10002782	MX-2014-143658	01-01-2013	02-01-2013
## 2	2	FUR-FU-10004015	MX-2012-155047	01-01-2013	02-01-2013
## 3	3	FUR-BO-10002352	MX-2012-155047	01-01-2013	02-01-2013
## 4	4	OFF-BI-10004428	MX-2012-155047	01-01-2013	02-01-2013
## 5	5	OFF-AR-10004594	MX-2012-155047	01-01-2013	02-01-2013
## 6	6	OFF-EN-10001375	MX-2012-155047	01-01-2013	02-01-2013
## 7	7	OFF-EN-10001375	MX-2013-134096	01-01-2013	02-01-2013
## 8	8	TEC-MA-10004956	MX-2013-134096	01-01-2013	02-01-2013
## 9	9	OFF-SU-10003474	MX-2013-134096	01-01-2013	02-01-2013
## 10	10	TEC-AC-10001830	MX-2013-134096	01-01-2013	02-01-2013
## 11	11	OFF-BI-10002075	MX-2013-134096	01-01-2013	02-01-2013
## 12	12	OFF-FA-10002526	MX-2013-156335	01-01-2013	02-01-2013
## 13	13	FUR-CH-10002846	MX-2013-156335	01-01-2013	02-01-2013
## 14	14	OFF-EN-10004100	MX-2014-121923	02-01-2013	04-01-2013
## 15	15	OFF-AR-10003914	MX-2014-135706	02-01-2013	03-01-2013

## 16	16	OFF-FA-10000038	MX-2014-135706	02-01-2013	03-01-2013	
## 17	17	OFF-EN-10000761	US-2013-126655	02-01-2013	03-01-2013	
## 18	18	FUR-FU-10003066	US-2013-126655	02-01-2013	03-01-2013	
## 19	19	OFF-EN-10000075	US-2013-126655	02-01-2013	03-01-2013	
## 20	20	OFF-EN-10002226	US-2013-126655	02-01-2013	03-01-2013	
## 21	21	FUR-CH-10002132	MX-2013-167759	02-01-2013	04-01-2013	
## 22	22	TEC-AC-10002749	MX-2013-163139	02-01-2013	02-01-2013	
## 23	23	OFF-SU-10000066	MX-2013-163139	02-01-2013	02-01-2013	
## 24	24	OFF-BI-10003934	US-2014-119753	02-01-2013	03-01-2013	
## 25	25	OFF-BI-10003932	US-2012-133970	02-01-2013	03-01-2013	
## 26	1	OFF-LA-10002782	MX-2014-143658	01-01-2013	02-01-2013	
## 27	2	FUR-FU-10004015	MX-2012-155047	01-01-2013	02-01-2013	
## 28	3	FUR-BO-10002352	MX-2012-155047	01-01-2013	02-01-2013	
## 29	4	OFF-BI-10004428	MX-2012-155047	01-01-2013	02-01-2013	
## 30	5	OFF-AR-10004594	MX-2012-155047	01-01-2013	02-01-2013	
## 31	6	OFF-EN-10001375	MX-2012-155047	01-01-2013	02-01-2013	
## 32	7	OFF-EN-10001375	MX-2013-134096	01-01-2013	02-01-2013	
## 33	8	TEC-MA-10004956	MX-2013-134096	01-01-2013	02-01-2013	
## 34	9	OFF-SU-10003474	MX-2013-134096	01-01-2013	02-01-2013	
## 35	10	TEC-AC-10001830	MX-2013-134096	01-01-2013	02-01-2013	
## 36	11	OFF-BI-10002075	MX-2013-134096	01-01-2013	02-01-2013	
## 37	12	OFF-FA-10002526	MX-2013-156335	01-01-2013	02-01-2013	
## 38	13	FUR-CH-10002846	MX-2013-156335	01-01-2013	02-01-2013	
## 39	14	OFF-EN-10004100	MX-2014-121923	02-01-2013	04-01-2013	
## 40	15	OFF-AR-10003914	MX-2014-135706	02-01-2013	03-01-2013	
## 41	16	OFF-FA-10000038	MX-2014-135706	02-01-2013	03-01-2013	
## 42	17	OFF-EN-10000761	US-2013-126655	02-01-2013	03-01-2013	
## 43	18	FUR-FU-10003066	US-2013-126655	02-01-2013	03-01-2013	
## 44	19	OFF-EN-10000075	US-2013-126655	02-01-2013	03-01-2013	
## 45	20	OFF-EN-10002226	US-2013-126655	02-01-2013	03-01-2013	
## 46	21	FUR-CH-10002132	MX-2013-167759	02-01-2013	04-01-2013	
## 47	22	TEC-AC-10002749	MX-2013-163139	02-01-2013	02-01-2013	
## 48	23	OFF-SU-10000066	MX-2013-163139	02-01-2013	02-01-2013	
## 49	24	OFF-BI-10003934	US-2014-119753	02-01-2013	03-01-2013	
## 50	25	OFF-BI-10003932	US-2012-133970	02-01-2013	03-01-2013	
##		Cost.Price	Quantity	Sales.Price	Shipping.Index	Shipping.Type
## 1		13.080	3	39.240	1	PRIORITY
## 2		252.160	8	2017.280	2	PRIORITY
## 3		193.280	2	386.560	3	PRIORITY
## 4		35.440	4	141.760	4	PRIORITY
## 5		71.600	2	143.200	5	PRIORITY
## 6		56.120	2	112.240	6	PRIORITY
## 7		56.120	2	112.240	7	STANDARD
## 8		344.640	3	1033.920	8	STANDARD
## 9		97.360	4	389.440	9	STANDARD
## 10		341.520	2	683.040	10	STANDARD
## 11		12.060	3	36.180	11	STANDARD
## 12		20.760	3	62.280	12	STANDARD
## 13		210.640	4	842.560	13	STANDARD
## 14		80.100	3	240.300	14	STANDARD
## 15		132.640	4	530.560	15	STANDARD
## 16		12.940	1	12.940	16	STANDARD
## 17		18.840	2	37.280	17	STANDARD
## 18		308.280	7	2157.560	18	STANDARD

## 19	40.176	2	79.952	19	STANDARD
## 20	8.784	3	25.952	20	PRIORITY
## 21	273.472	4	1093.688	21	PRIORITY
## 22	27.000	1	27.000	22	PRIORITY
## 23	207.000	9	1863.000	23	PRIORITY
## 24	60.660	3	181.580	24	PRIORITY
## 25	181.116	9	1629.644	25	PRIORITY
## 26	13.080	3	39.240	1	PRIORITY
## 27	252.160	8	2017.280	2	PRIORITY
## 28	193.280	2	386.560	3	PRIORITY
## 29	35.440	4	141.760	4	PRIORITY
## 30	71.600	2	143.200	5	PRIORITY
## 31	56.120	2	112.240	6	PRIORITY
## 32	56.120	2	112.240	7	STANDARD
## 33	344.640	3	1033.920	8	STANDARD
## 34	97.360	4	389.440	9	STANDARD
## 35	341.520	2	683.040	10	STANDARD
## 36	12.060	3	36.180	11	STANDARD
## 37	20.760	3	62.280	12	STANDARD
## 38	210.640	4	842.560	13	STANDARD
## 39	80.100	3	240.300	14	STANDARD
## 40	132.640	4	530.560	15	STANDARD
## 41	12.940	1	12.940	16	STANDARD
## 42	18.840	2	37.280	17	STANDARD
## 43	308.280	7	2157.560	18	STANDARD
## 44	40.176	2	79.952	19	STANDARD
## 45	8.784	3	25.952	20	PRIORITY
## 46	273.472	4	1093.688	21	PRIORITY
## 47	27.000	1	27.000	22	PRIORITY
## 48	207.000	9	1863.000	23	PRIORITY
## 49	60.660	3	181.580	24	PRIORITY
## 50	181.116	9	1629.644	25	PRIORITY
##	Category X.	Product.Name	Prod.ID	Date.of.Invoice	
## 1	Office Supplies	1 TEC-AC-10001830	MX-2013-134096	05-01-2013	
## 2	Furniture	2 FUR-FU-10004015	MX-2012-155047	03-01-2013	
## 3	Furniture	3 FUR-BO-10002352	MX-2012-155047	03-01-2013	
## 4	Office Supplies	4 OFF-BI-10004428	MX-2012-155047	03-01-2013	
## 5	Office Supplies	5 OFF-AR-10004594	MX-2012-155047	03-01-2013	
## 6	Office Supplies	6 OFF-EN-10001375	MX-2012-155047	03-01-2013	
## 7	Office Supplies	7 OFF-EN-10001375	MX-2013-134096	03-01-2013	
## 8	Technology	8 OFF-AR-10003914	MX-2014-135706	03-01-2013	
## 9	Office Supplies	9 OFF-FA-10000038	MX-2014-135706	03-01-2013	
## 10	Technology	10 OFF-EN-10000761	US-2013-126655	03-01-2013	
## 11	Office Supplies	11 FUR-FU-10003066	US-2013-126655	03-01-2013	
## 12	Office Supplies	12 OFF-EN-10000075	US-2013-126655	03-01-2013	
## 13	Furniture	13 OFF-EN-10002226	US-2013-126655	03-01-2013	
## 14	Office Supplies	14 FUR-CH-10002132	MX-2013-167759	03-01-2013	
## 15	Office Supplies	15 OFF-EN-10001375	MX-2013-134096	03-01-2013	
## 16	Office Supplies	16 TEC-MA-10004956	MX-2013-134096	03-01-2013	
## 17	Office Supplies	17 OFF-SU-10003474	MX-2013-134096	03-01-2013	
## 18	Furniture	18 TEC-AC-10001830	MX-2013-134096	03-01-2013	
## 19	Office Supplies	19 OFF-BI-10002075	MX-2013-134096	03-01-2013	
## 20	Office Supplies	20 OFF-FA-10002526	MX-2013-156335	03-01-2013	
## 21	Furniture	21 OFF-EN-10001375	MX-2013-134096	04-01-2013	

## 22	Technology	22	TEC-MA-10004956	MX-2013-134096	04-01-2013
## 23	Office Supplies	23	OFF-SU-10003474	MX-2013-134096	04-01-2013
## 24	Office Supplies	24	TEC-AC-10001830	MX-2013-134096	04-01-2013
## 25	Office Supplies	25	OFF-BI-10002075	MX-2013-134096	04-01-2013
## 26	Office Supplies	26	OFF-EN-10001375	MX-2013-134096	04-01-2013
## 27	Furniture	27	TEC-MA-10004956	MX-2013-134096	04-01-2013
## 28	Furniture	28	OFF-SU-10003474	MX-2013-134096	04-01-2013
## 29	Office Supplies	29	TEC-AC-10001830	MX-2013-134096	04-01-2013
## 30	Office Supplies	30	OFF-BI-10002075	MX-2013-134096	04-01-2013
## 31	Office Supplies	31	OFF-EN-10000761	US-2013-126655	04-01-2013
## 32	Office Supplies	32	FUR-FU-10003066	US-2013-126655	04-01-2013
## 33	Technology	33	OFF-EN-10000075	US-2013-126655	04-01-2013
## 34	Office Supplies	34	OFF-EN-10002226	US-2013-126655	04-01-2013
## 35	Technology	35	FUR-CH-10002132	MX-2013-167759	04-01-2013
## 36	Office Supplies	36	OFF-EN-10001375	MX-2013-134096	04-01-2013
## 37	Office Supplies	37	TEC-MA-10004956	MX-2013-134096	04-01-2013
## 38	Furniture	38	OFF-SU-10003474	MX-2013-134096	04-01-2013
## 39	Office Supplies	39	TEC-AC-10001830	MX-2013-134096	04-01-2013
## 40	Office Supplies	40	OFF-BI-10002075	MX-2013-134096	04-01-2013
## 41	Office Supplies	41	OFF-FA-10002526	MX-2013-156335	04-01-2013
## 42	Office Supplies	42	OFF-EN-10001375	MX-2013-134096	04-01-2013
## 43	Furniture	43	TEC-MA-10004956	MX-2013-134096	04-01-2013
## 44	Office Supplies	44	OFF-SU-10003474	MX-2013-134096	05-01-2013
## 45	Office Supplies	45	TEC-AC-10001830	MX-2013-134096	05-01-2013
## 46	Furniture	46	OFF-BI-10002075	MX-2013-134096	05-01-2013
## 47	Technology	47	OFF-EN-10001375	MX-2013-134096	05-01-2013
## 48	Office Supplies	48	TEC-MA-10004956	MX-2013-134096	05-01-2013
## 49	Office Supplies	49	OFF-SU-10003474	MX-2013-134096	05-01-2013
## 50	Office Supplies	50	OFF-LA-10002782	MX-2014-143658	03-01-2013
##	Date.of.Shipping	Cost.Price	Quantity	Sales.Price	Shipping.Index
## 1	06-01-2013	341.520	2	683.040	10
## 2	03-01-2013	252.160	8	2017.280	2
## 3	03-01-2013	193.280	2	386.560	3
## 4	03-01-2013	35.440	4	141.760	4
## 5	03-01-2013	71.600	2	143.200	5
## 6	03-01-2013	56.120	2	112.240	6
## 7	04-01-2013	56.120	2	112.240	7
## 8	04-01-2013	132.640	4	530.560	15
## 9	04-01-2013	12.940	1	12.940	16
## 10	04-01-2013	18.840	2	37.280	17
## 11	04-01-2013	308.280	7	2157.560	18
## 12	04-01-2013	40.176	2	79.952	19
## 13	03-01-2013	8.784	3	25.952	20
## 14	03-01-2013	273.472	4	1093.688	21
## 15	04-01-2013	56.120	2	112.240	7
## 16	04-01-2013	344.640	3	1033.920	8
## 17	04-01-2013	97.360	4	389.440	9
## 18	04-01-2013	341.520	2	683.040	10
## 19	04-01-2013	12.060	3	36.180	11
## 20	04-01-2013	20.760	3	62.280	12
## 21	05-01-2013	56.120	2	112.240	7
## 22	05-01-2013	344.640	3	1033.920	8
## 23	05-01-2013	97.360	4	389.440	9
## 24	05-01-2013	341.520	2	683.040	10

## 25	05-01-2013	12.060	3	36.180	11
## 26	05-01-2013	56.120	2	112.240	7
## 27	05-01-2013	344.640	3	1033.920	8
## 28	05-01-2013	97.360	4	389.440	9
## 29	05-01-2013	341.520	2	683.040	10
## 30	05-01-2013	12.060	3	36.180	11
## 31	05-01-2013	18.840	2	37.280	17
## 32	05-01-2013	308.280	7	2157.560	18
## 33	05-01-2013	40.176	2	79.952	19
## 34	04-01-2013	8.784	3	25.952	20
## 35	04-01-2013	273.472	4	1093.688	21
## 36	05-01-2013	56.120	2	112.240	7
## 37	05-01-2013	344.640	3	1033.920	8
## 38	05-01-2013	97.360	4	389.440	9
## 39	05-01-2013	341.520	2	683.040	10
## 40	05-01-2013	12.060	3	36.180	11
## 41	05-01-2013	20.760	3	62.280	12
## 42	05-01-2013	56.120	2	112.240	7
## 43	05-01-2013	344.640	3	1033.920	8
## 44	06-01-2013	97.360	4	389.440	9
## 45	06-01-2013	341.520	2	683.040	10
## 46	06-01-2013	12.060	3	36.180	11
## 47	06-01-2013	56.120	2	112.240	7
## 48	06-01-2013	344.640	3	1033.920	8
## 49	06-01-2013	97.360	4	389.440	9
## 50	03-01-2013	13.080	3	39.240	1
##	Shipping.Type	Category			
## 1	STANDARD	Technology			
## 2	PRIORITY	Furniture			
## 3	PRIORITY	Furniture			
## 4	PRIORITY	Office Supplies			
## 5	PRIORITY	Office Supplies			
## 6	PRIORITY	Office Supplies			
## 7	STANDARD	Office Supplies			
## 8	STANDARD	Office Supplies			
## 9	STANDARD	Office Supplies			
## 10	STANDARD	Office Supplies			
## 11	STANDARD	Furniture			
## 12	STANDARD	Office Supplies			
## 13	PRIORITY	Office Supplies			
## 14	PRIORITY	Furniture			
## 15	STANDARD	Office Supplies			
## 16	STANDARD	Technology			
## 17	STANDARD	Office Supplies			
## 18	STANDARD	Technology			
## 19	STANDARD	Office Supplies			
## 20	STANDARD	Office Supplies			
## 21	STANDARD	Office Supplies			
## 22	STANDARD	Technology			
## 23	STANDARD	Office Supplies			
## 24	STANDARD	Technology			
## 25	STANDARD	Office Supplies			
## 26	STANDARD	Office Supplies			
## 27	STANDARD	Technology			

```
## 28      STANDARD Office Supplies
## 29      STANDARD      Technology
## 30      STANDARD Office Supplies
## 31      STANDARD Office Supplies
## 32      STANDARD      Furniture
## 33      STANDARD Office Supplies
## 34      PRIORITY Office Supplies
## 35      PRIORITY      Furniture
## 36      STANDARD Office Supplies
## 37      STANDARD      Technology
## 38      STANDARD Office Supplies
## 39      STANDARD      Technology
## 40      STANDARD Office Supplies
## 41      STANDARD Office Supplies
## 42      STANDARD Office Supplies
## 43      STANDARD      Technology
## 44      STANDARD Office Supplies
## 45      STANDARD      Technology
## 46      STANDARD Office Supplies
## 47      STANDARD Office Supplies
## 48      STANDARD      Technology
## 49      STANDARD Office Supplies
## 50      PRIORITY Office Supplies
```

ROW BIND - Data Frame

Code Section -18

```
df_3_R <- rbind(df_2,df_1)
df_3_R
```

##	X.	Product.Name	Prod.ID	Date.of.Invoice	Date.of.Shipping
## 1	1	TEC-AC-10001830	MX-2013-134096	05-01-2013	06-01-2013
## 2	2	FUR-FU-10004015	MX-2012-155047	03-01-2013	03-01-2013
## 3	3	FUR-BO-10002352	MX-2012-155047	03-01-2013	03-01-2013
## 4	4	OFF-BI-10004428	MX-2012-155047	03-01-2013	03-01-2013
## 5	5	OFF-AR-10004594	MX-2012-155047	03-01-2013	03-01-2013
## 6	6	OFF-EN-10001375	MX-2012-155047	03-01-2013	03-01-2013
## 7	7	OFF-EN-10001375	MX-2013-134096	03-01-2013	04-01-2013
## 8	8	OFF-AR-10003914	MX-2014-135706	03-01-2013	04-01-2013
## 9	9	OFF-FA-10000038	MX-2014-135706	03-01-2013	04-01-2013
## 10	10	OFF-EN-10000761	US-2013-126655	03-01-2013	04-01-2013
## 11	11	FUR-FU-10003066	US-2013-126655	03-01-2013	04-01-2013
## 12	12	OFF-EN-10000075	US-2013-126655	03-01-2013	04-01-2013
## 13	13	OFF-EN-10002226	US-2013-126655	03-01-2013	03-01-2013
## 14	14	FUR-CH-10002132	MX-2013-167759	03-01-2013	03-01-2013
## 15	15	OFF-EN-10001375	MX-2013-134096	03-01-2013	04-01-2013
## 16	16	TEC-MA-10004956	MX-2013-134096	03-01-2013	04-01-2013
## 17	17	OFF-SU-10003474	MX-2013-134096	03-01-2013	04-01-2013
## 18	18	TEC-AC-10001830	MX-2013-134096	03-01-2013	04-01-2013
## 19	19	OFF-BI-10002075	MX-2013-134096	03-01-2013	04-01-2013
## 20	20	OFF-FA-10002526	MX-2013-156335	03-01-2013	04-01-2013

## 21	21	OFF-EN-10001375	MX-2013-134096	04-01-2013	05-01-2013
## 22	22	TEC-MA-10004956	MX-2013-134096	04-01-2013	05-01-2013
## 23	23	OFF-SU-10003474	MX-2013-134096	04-01-2013	05-01-2013
## 24	24	TEC-AC-10001830	MX-2013-134096	04-01-2013	05-01-2013
## 25	25	OFF-BI-10002075	MX-2013-134096	04-01-2013	05-01-2013
## 26	26	OFF-EN-10001375	MX-2013-134096	04-01-2013	05-01-2013
## 27	27	TEC-MA-10004956	MX-2013-134096	04-01-2013	05-01-2013
## 28	28	OFF-SU-10003474	MX-2013-134096	04-01-2013	05-01-2013
## 29	29	TEC-AC-10001830	MX-2013-134096	04-01-2013	05-01-2013
## 30	30	OFF-BI-10002075	MX-2013-134096	04-01-2013	05-01-2013
## 31	31	OFF-EN-10000761	US-2013-126655	04-01-2013	05-01-2013
## 32	32	FUR-FU-10003066	US-2013-126655	04-01-2013	05-01-2013
## 33	33	OFF-EN-10000075	US-2013-126655	04-01-2013	05-01-2013
## 34	34	OFF-EN-10002226	US-2013-126655	04-01-2013	04-01-2013
## 35	35	FUR-CH-10002132	MX-2013-167759	04-01-2013	04-01-2013
## 36	36	OFF-EN-10001375	MX-2013-134096	04-01-2013	05-01-2013
## 37	37	TEC-MA-10004956	MX-2013-134096	04-01-2013	05-01-2013
## 38	38	OFF-SU-10003474	MX-2013-134096	04-01-2013	05-01-2013
## 39	39	TEC-AC-10001830	MX-2013-134096	04-01-2013	05-01-2013
## 40	40	OFF-BI-10002075	MX-2013-134096	04-01-2013	05-01-2013
## 41	41	OFF-FA-10002526	MX-2013-156335	04-01-2013	05-01-2013
## 42	42	OFF-EN-10001375	MX-2013-134096	04-01-2013	05-01-2013
## 43	43	TEC-MA-10004956	MX-2013-134096	04-01-2013	05-01-2013
## 44	44	OFF-SU-10003474	MX-2013-134096	05-01-2013	06-01-2013
## 45	45	TEC-AC-10001830	MX-2013-134096	05-01-2013	06-01-2013
## 46	46	OFF-BI-10002075	MX-2013-134096	05-01-2013	06-01-2013
## 47	47	OFF-EN-10001375	MX-2013-134096	05-01-2013	06-01-2013
## 48	48	TEC-MA-10004956	MX-2013-134096	05-01-2013	06-01-2013
## 49	49	OFF-SU-10003474	MX-2013-134096	05-01-2013	06-01-2013
## 50	50	OFF-LA-10002782	MX-2014-143658	03-01-2013	03-01-2013
## 51	1	OFF-LA-10002782	MX-2014-143658	01-01-2013	02-01-2013
## 52	2	FUR-FU-10004015	MX-2012-155047	01-01-2013	02-01-2013
## 53	3	FUR-BO-10002352	MX-2012-155047	01-01-2013	02-01-2013
## 54	4	OFF-BI-10004428	MX-2012-155047	01-01-2013	02-01-2013
## 55	5	OFF-AR-10004594	MX-2012-155047	01-01-2013	02-01-2013
## 56	6	OFF-EN-10001375	MX-2012-155047	01-01-2013	02-01-2013
## 57	7	OFF-EN-10001375	MX-2013-134096	01-01-2013	02-01-2013
## 58	8	TEC-MA-10004956	MX-2013-134096	01-01-2013	02-01-2013
## 59	9	OFF-SU-10003474	MX-2013-134096	01-01-2013	02-01-2013
## 60	10	TEC-AC-10001830	MX-2013-134096	01-01-2013	02-01-2013
## 61	11	OFF-BI-10002075	MX-2013-134096	01-01-2013	02-01-2013
## 62	12	OFF-FA-10002526	MX-2013-156335	01-01-2013	02-01-2013
## 63	13	FUR-CH-10002846	MX-2013-156335	01-01-2013	02-01-2013
## 64	14	OFF-EN-10004100	MX-2014-121923	02-01-2013	04-01-2013
## 65	15	OFF-AR-10003914	MX-2014-135706	02-01-2013	03-01-2013
## 66	16	OFF-FA-10000038	MX-2014-135706	02-01-2013	03-01-2013
## 67	17	OFF-EN-10000761	US-2013-126655	02-01-2013	03-01-2013
## 68	18	FUR-FU-10003066	US-2013-126655	02-01-2013	03-01-2013
## 69	19	OFF-EN-10000075	US-2013-126655	02-01-2013	03-01-2013
## 70	20	OFF-EN-10002226	US-2013-126655	02-01-2013	03-01-2013
## 71	21	FUR-CH-10002132	MX-2013-167759	02-01-2013	04-01-2013
## 72	22	TEC-AC-10002749	MX-2013-163139	02-01-2013	02-01-2013
## 73	23	OFF-SU-10000066	MX-2013-163139	02-01-2013	02-01-2013
## 74	24	OFF-BI-10003934	US-2014-119753	02-01-2013	03-01-2013

## 75	25	OFF-BI-10003932	US-2012-133970	02-01-2013	03-01-2013	
##		Cost.Price	Quantity	Sales.Price	Shipping.Index	Shipping.Type
## 1		341.520	2	683.040	10	STANDARD
## 2		252.160	8	2017.280	2	PRIORITY
## 3		193.280	2	386.560	3	PRIORITY
## 4		35.440	4	141.760	4	PRIORITY
## 5		71.600	2	143.200	5	PRIORITY
## 6		56.120	2	112.240	6	PRIORITY
## 7		56.120	2	112.240	7	STANDARD
## 8		132.640	4	530.560	15	STANDARD
## 9		12.940	1	12.940	16	STANDARD
## 10		18.840	2	37.280	17	STANDARD
## 11		308.280	7	2157.560	18	STANDARD
## 12		40.176	2	79.952	19	STANDARD
## 13		8.784	3	25.952	20	PRIORITY
## 14		273.472	4	1093.688	21	PRIORITY
## 15		56.120	2	112.240	7	STANDARD
## 16		344.640	3	1033.920	8	STANDARD
## 17		97.360	4	389.440	9	STANDARD
## 18		341.520	2	683.040	10	STANDARD
## 19		12.060	3	36.180	11	STANDARD
## 20		20.760	3	62.280	12	STANDARD
## 21		56.120	2	112.240	7	STANDARD
## 22		344.640	3	1033.920	8	STANDARD
## 23		97.360	4	389.440	9	STANDARD
## 24		341.520	2	683.040	10	STANDARD
## 25		12.060	3	36.180	11	STANDARD
## 26		56.120	2	112.240	7	STANDARD
## 27		344.640	3	1033.920	8	STANDARD
## 28		97.360	4	389.440	9	STANDARD
## 29		341.520	2	683.040	10	STANDARD
## 30		12.060	3	36.180	11	STANDARD
## 31		18.840	2	37.280	17	STANDARD
## 32		308.280	7	2157.560	18	STANDARD
## 33		40.176	2	79.952	19	STANDARD
## 34		8.784	3	25.952	20	PRIORITY
## 35		273.472	4	1093.688	21	PRIORITY
## 36		56.120	2	112.240	7	STANDARD
## 37		344.640	3	1033.920	8	STANDARD
## 38		97.360	4	389.440	9	STANDARD
## 39		341.520	2	683.040	10	STANDARD
## 40		12.060	3	36.180	11	STANDARD
## 41		20.760	3	62.280	12	STANDARD
## 42		56.120	2	112.240	7	STANDARD
## 43		344.640	3	1033.920	8	STANDARD
## 44		97.360	4	389.440	9	STANDARD
## 45		341.520	2	683.040	10	STANDARD
## 46		12.060	3	36.180	11	STANDARD
## 47		56.120	2	112.240	7	STANDARD
## 48		344.640	3	1033.920	8	STANDARD
## 49		97.360	4	389.440	9	STANDARD
## 50		13.080	3	39.240	1	PRIORITY
## 51		13.080	3	39.240	1	PRIORITY
## 52		252.160	8	2017.280	2	PRIORITY

## 53	193.280	2	386.560	3	PRIORITY
## 54	35.440	4	141.760	4	PRIORITY
## 55	71.600	2	143.200	5	PRIORITY
## 56	56.120	2	112.240	6	PRIORITY
## 57	56.120	2	112.240	7	STANDARD
## 58	344.640	3	1033.920	8	STANDARD
## 59	97.360	4	389.440	9	STANDARD
## 60	341.520	2	683.040	10	STANDARD
## 61	12.060	3	36.180	11	STANDARD
## 62	20.760	3	62.280	12	STANDARD
## 63	210.640	4	842.560	13	STANDARD
## 64	80.100	3	240.300	14	STANDARD
## 65	132.640	4	530.560	15	STANDARD
## 66	12.940	1	12.940	16	STANDARD
## 67	18.840	2	37.280	17	STANDARD
## 68	308.280	7	2157.560	18	STANDARD
## 69	40.176	2	79.952	19	STANDARD
## 70	8.784	3	25.952	20	PRIORITY
## 71	273.472	4	1093.688	21	PRIORITY
## 72	27.000	1	27.000	22	PRIORITY
## 73	207.000	9	1863.000	23	PRIORITY
## 74	60.660	3	181.580	24	PRIORITY
## 75	181.116	9	1629.644	25	PRIORITY

Category

## 1	Technology
## 2	Furniture
## 3	Furniture
## 4	Office Supplies
## 5	Office Supplies
## 6	Office Supplies
## 7	Office Supplies
## 8	Office Supplies
## 9	Office Supplies
## 10	Office Supplies
## 11	Furniture
## 12	Office Supplies
## 13	Office Supplies
## 14	Furniture
## 15	Office Supplies
## 16	Technology
## 17	Office Supplies
## 18	Technology
## 19	Office Supplies
## 20	Office Supplies
## 21	Office Supplies
## 22	Technology
## 23	Office Supplies
## 24	Technology
## 25	Office Supplies
## 26	Office Supplies
## 27	Technology
## 28	Office Supplies
## 29	Technology
## 30	Office Supplies

```

## 31 Office Supplies
## 32      Furniture
## 33 Office Supplies
## 34 Office Supplies
## 35      Furniture
## 36 Office Supplies
## 37      Technology
## 38 Office Supplies
## 39      Technology
## 40 Office Supplies
## 41 Office Supplies
## 42 Office Supplies
## 43      Technology
## 44 Office Supplies
## 45      Technology
## 46 Office Supplies
## 47 Office Supplies
## 48      Technology
## 49 Office Supplies
## 50 Office Supplies
## 51 Office Supplies
## 52      Furniture
## 53      Furniture
## 54 Office Supplies
## 55 Office Supplies
## 56 Office Supplies
## 57 Office Supplies
## 58      Technology
## 59 Office Supplies
## 60      Technology
## 61 Office Supplies
## 62 Office Supplies
## 63      Furniture
## 64 Office Supplies
## 65 Office Supplies
## 66 Office Supplies
## 67 Office Supplies
## 68      Furniture
## 69 Office Supplies
## 70 Office Supplies
## 71      Furniture
## 72      Technology
## 73 Office Supplies
## 74 Office Supplies
## 75 Office Supplies

# We can SUBSET Data within R Data Structures with custom and inbuilt functions
#
summary(df_3_R$Cost.Price)

##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##      8.784  23.880   71.600 137.600 273.500 344.600

```

```
#
sub_df_1 <- subset(df_3_R, Cost.Price > 300)
#
summary(sub_df_1$Cost.Price) # As seen from the SUMMARY

##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   308.3   341.5   341.5   336.9   344.6   344.6

# All ROWS or OBSERVATIONS with Cost.Price Values LESS THAN - 300
# have been dropped from the Sub-Set Data Frame.

# To SUBSET a Vector - we may simply-
#
summary(num_vector3)

##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   11.00   13.25   18.50   21.90   30.25   44.00

#
sub_num_vector3 <- num_vector3[-(1:3)]
# Creates a SUBSET of all ELEMENTS
# of num_vector3 - besides the FIRST THREE
#
summary(sub_num_vector3)

##      Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   11.00   12.50   14.00   20.29   24.00   44.00
```

describeBy() with Grouping variables

```
# Code Section -19

library("psych", lib.loc=~ /R/x86_64-pc-linux-gnu-library/3.3")
library(psych)

#?describeBy() # Seek HELP for the function - Uncomment this line.

describeBy(df_3_C, df_3_C$Date.of.Invoice)

##
## Descriptive statistics by group
## group: 01-01-2013
##      vars  n   mean    sd median trimmed   mad   min    max   range  skew
## 1      1  26    7.00   3.82    7.00    7.00   4.45  1.00   13.00   12.00  0.00
## 2      2  26   12.85   7.49   14.00   12.91  10.38  1.00   24.00   23.00 -0.06
## 3      3  26    2.23   1.84    2.00    1.82   1.48  1.00    8.00    7.00  2.27
## 4      4  26    1.00   0.00    1.00    1.00   0.00  1.00    1.00    0.00  NaN
## 5      5  26    1.00   0.00    1.00    1.00   0.00  1.00    1.00    0.00  NaN
## 6      6  26  131.14 120.02   71.60  122.55  86.76 12.06  344.64  332.58  0.66
## 7      7  26    3.23   1.61    3.00    2.91   1.48  2.00    8.00    6.00  1.86
## 8      8  26  461.53 559.95  143.20  358.77 158.67 36.18 2017.28 1981.10  1.60
## 9      9  26    7.00   3.82    7.00    7.00   4.45  1.00   13.00   12.00  0.00
## 10     10  26    1.54   0.51    2.00    1.55   0.00  1.00    2.00    1.00 -0.15
## 11     11  26    1.92   0.63    2.00    1.91   0.00  1.00    3.00    2.00  0.04
```

```
## 12 12 26 19.50 13.31 19.50 19.50 18.53 1.00 38.00 37.00 0.00
## 13 13 26 10.00 5.11 10.50 10.05 5.93 1.00 18.00 17.00 -0.05
## 14 14 26 3.65 2.50 2.00 3.59 1.48 1.00 7.00 6.00 0.41
## 15 15 26 1.58 0.58 2.00 1.55 0.74 1.00 3.00 2.00 0.31
## 16 16 26 2.27 0.87 2.00 2.27 1.48 1.00 4.00 3.00 -0.17
## 17 17 26 135.66 129.31 63.86 128.20 76.15 8.78 344.64 335.86 0.61
## 18 18 26 3.15 1.76 2.50 2.91 0.74 1.00 8.00 7.00 1.43
## 19 19 26 524.05 673.79 142.48 421.43 182.41 12.94 2157.56 2144.62 1.41
## 20 20 26 11.77 6.06 10.00 11.82 8.15 2.00 21.00 19.00 0.08
## 21 21 26 1.69 0.47 2.00 1.73 0.00 1.00 2.00 1.00 -0.79
## 22 22 26 1.96 0.60 2.00 1.95 0.00 1.00 3.00 2.00 0.01
```

```
##      kurtosis      se
```

```
## 1      -1.35      0.75
## 2      -1.45      1.47
## 3       4.52      0.36
## 4       NaN      0.00
## 5       NaN      0.00
## 6      -1.14     23.54
## 7       3.10      0.32
## 8       1.80    109.82
## 9      -1.35      0.75
## 10     -2.05      0.10
## 11     -0.59      0.12
## 12     -1.79      2.61
## 13     -1.12      1.00
## 14     -1.68      0.49
## 15     -0.98      0.11
## 16     -1.18      0.17
## 17     -1.41     25.36
## 18      1.15      0.35
## 19      0.74    132.14
## 20     -1.55      1.19
## 21     -1.43      0.09
## 22     -0.33      0.12
```

```
## -----
```

```
## group: 02-01-2013
```

```
##      vars  n   mean      sd median trimmed      mad   min      max   range  skew
## 1       1 24 19.50   3.53  19.50   19.50   4.45 14.00   25.00   11.00  0.00
## 2       2 24 12.25   6.24  12.50   12.20   5.93  2.00   23.00   21.00 -0.01
## 3       3 24  7.75   2.51   8.00    7.80   2.97  4.00   11.00    7.00 -0.27
## 4       4 24  2.00   0.00   2.00    2.00   0.00  2.00    2.00    0.00  NaN
## 5       5 24  2.00   0.59   2.00    2.00   0.00  1.00    3.00    2.00  0.00
## 6       6 24 112.58 103.84  70.38  103.39  88.24  8.78  308.28  299.50  0.65
## 7       7 24  4.00   2.77   3.00    3.80   1.48  1.00    9.00    8.00  0.80
## 8       8 24 656.62 790.46 210.94  570.90 283.91 12.94 2157.56 2144.62 0.80
## 9       9 24 19.50   3.53  19.50   19.50   4.45 14.00   25.00   11.00  0.00
## 10      10 24  1.50   0.51   1.50    1.50   0.74  1.00    2.00    1.00  0.00
## 11      11 24  1.92   0.50   2.00    1.90   0.00  1.00    3.00    2.00 -0.17
## 12      12 24 32.00  13.25  32.00   32.00  18.53 14.00   50.00   36.00  0.00
## 13      13 24 13.38   4.59  15.50   13.80   3.71  2.00   18.00   16.00 -0.82
## 14      14 24  2.33   0.92   2.00    2.10   0.00  2.00    6.00    4.00  2.91
## 15      15 24  1.92   0.78   2.00    1.90   1.48  1.00    3.00    2.00  0.13
## 16      16 24  2.83   0.92   3.00    2.90   1.48  1.00    4.00    3.00 -0.34
## 17      17 24 155.62 145.56  97.36  151.07 126.47 12.06  344.64  332.58  0.41
```

```
## 18  18 24  2.88  0.74  3.00    2.85  1.48  2.00    4.00    2.00  0.18
## 19  19 24 428.20 396.14 389.44  403.84 460.17 36.18 1093.69 1057.51  0.49
## 20  20 24  9.42  3.37  9.00    9.25  2.22  1.00    21.00   20.00  1.02
## 21  21 24  1.92  0.28  2.00    2.00  0.00  1.00    2.00    1.00 -2.83
## 22  22 24  2.29  0.55  2.00    2.30  0.00  1.00    3.00    2.00  0.08
##      kurtosis      se
## 1      -1.36    0.72
## 2      -1.08    1.27
## 3      -1.57    0.51
## 4         NaN    0.00
## 5      -0.24    0.12
## 6      -1.12   21.20
## 7      -0.83    0.56
## 8      -1.09  161.35
## 9      -1.36    0.72
## 10     -2.08    0.10
## 11      0.61    0.10
## 12     -1.84    2.70
## 13     -0.53    0.94
## 14      8.15    0.19
## 15     -1.40    0.16
## 16     -0.84    0.19
## 17     -1.77   29.71
## 18     -1.24    0.15
## 19     -1.40   80.86
## 20      4.49    0.69
## 21      6.27    0.06
## 22     -0.77    0.11
```

```
# In this case - Grouping Variable is - Date of Invoice .
# This Grouping variable has two Values here - 01-01-2013 and 02-01-2013

# IMPORTANT NOTE --- The DOLLAR SIGN in df_3_C$Date.of.Invoice , is used
# to access a certain variable within the DATA FRAME.

# Also note that the variables within the DATA FRAME will not be stored with the Labels
# as - is
```

Built in DATA Sets

The default R environment - comes bundled with a number of packages and data sets.

A package called DATASETS - contains a number of inbuilt data sets as seen in sections below -

```
# Code Section -20

library(help = "datasets")

#
# Seen below are the DataSets available within my installed version of R -
# yours may slightly differ :-
#
# AirPassengers           Monthly Airline Passenger Numbers 1949-1960
```

# BJSales	Sales Data with Leading Indicator
# BOD	Biochemical Oxygen Demand
# CO2	Carbon Dioxide Uptake in Grass Plants
# ChickWeight	Weight versus age of chicks on different diets
# DNase	Elisa assay of DNase
# EuStockMarkets	Daily Closing Prices of Major European Stock
#	Indices, 1991-1998
# Formaldehyde	Determination of Formaldehyde
# HairEyeColor	Hair and Eye Color of Statistics Students
# Harman23.cor	Harman Example 2.3
# Harman74.cor	Harman Example 7.4
# Indometh	Pharmacokinetics of Indomethacin
# InsectSprays	Effectiveness of Insect Sprays
# JohnsonJohnson	Quarterly Earnings per Johnson & Johnson Share
# LakeHuron	Level of Lake Huron 1875-1972
# LifeCycleSavings	Intercountry Life-Cycle Savings Data
# Loblolly	Growth of Loblolly pine trees
# Nile	Flow of the River Nile
# Orange	Growth of Orange Trees
# OrchardSprays	Potency of Orchard Sprays
# PlantGrowth	Results from an Experiment on Plant Growth
# Puromycin	Reaction Velocity of an Enzymatic Reaction
# Theoph	Pharmacokinetics of Theophylline
# Titanic	Survival of passengers on the Titanic
# ToothGrowth	The Effect of Vitamin C on Tooth Growth in
#	Guinea Pigs
# UCBAAdmissions	Student Admissions at UC Berkeley
# UKDriverDeaths	Road Casualties in Great Britain 1969-84
# UKLungDeaths	Monthly Deaths from Lung Diseases in the UK
# UKGas	UK Quarterly Gas Consumption
# USAccDeaths	Accidental Deaths in the US 1973-1978
# USArrests	Violent Crime Rates by US State
# USJudgeRatings	Lawyers' Ratings of State Judges in the US
#	Superior Court
# USPersonalExpenditure	Personal Expenditure Data
# VADeaths	Death Rates in Virginia (1940)
# WWUsage	Internet Usage per Minute
# WorldPhones	The World's Telephones
# ability.cov	Ability and Intelligence Tests
# airmiles	Passenger Miles on Commercial US Airlines,
#	1937-1960
# airquality	New York Air Quality Measurements
# anscombe	Anscombe's Quartet of 'Identical' Simple Linear
#	Regressions
# attenu	The Joyner-Boore Attenuation Data
# attitude	The Chatterjee-Price Attitude Data
# austres	Quarterly Time Series of the Number of
#	Australian Residents
# beavers	Body Temperature Series of Two Beavers
# cars	Speed and Stopping Distances of Cars
# chickwts	Chicken Weights by Feed Type
# co2	Mauna Loa Atmospheric CO2 Concentration
# crimtab	Student's 3000 Criminals Data

# datasets-package	The R Datasets Package
# discoveries	Yearly Numbers of Important Discoveries
# esoph	Smoking, Alcohol and (O)esophageal Cancer
# euro	Conversion Rates of Euro Currencies
# eurodist	Distances Between European Cities and Between
#	US Cities
# faithful	Old Faithful Geyser Data
# freeny	Freeny's Revenue Data
# infert	Infertility after Spontaneous and Induced
#	Abortion
# iris	Edgar Anderson's Iris Data
# islands	Areas of the World's Major Landmasses
# lh	Luteinizing Hormone in Blood Samples
# longley	Longley's Economic Regression Data
# lynx	Annual Canadian Lynx trappings 1821-1934
# morley	Michelson Speed of Light Data
# mtcars	Motor Trend Car Road Tests
# nhtemp	Average Yearly Temperatures in New Haven
# nottem	Average Monthly Temperatures at Nottingham,
#	1920-1939
# npk	Classical N, P, K Factorial Experiment
# occupationalStatus	Occupational Status of Fathers and their Sons
# precip	Annual Precipitation in US Cities
# presidents	Quarterly Approval Ratings of US Presidents
# pressure	Vapor Pressure of Mercury as a Function of
#	Temperature
# quakes	Locations of Earthquakes off Fiji
# randu	Random Numbers from Congruential Generator
#	RANDU
# rivers	Lengths of Major North American Rivers
# rock	Measurements on Petroleum Rock Samples
# sleep	Student's Sleep Data
# stackloss	Brownlee's Stack Loss Plant Data
# state	US State Facts and Figures
# sunspot.month	Monthly Sunspot Data, from 1749 to "Present"
# sunspot.year	Yearly Sunspot Data, 1700-1988
# sunspots	Monthly Sunspot Numbers, 1749-1983
# swiss	Swiss Fertility and Socioeconomic Indicators
#	(1888) Data
# treering	Yearly Treering Data, -6000-1979
# trees	Girth, Height and Volume for Black Cherry Trees
# uspop	Populations Recorded by the US Census
# volcano	Topographic Information on Auckland's Maunga
#	Whau Volcano
# warpbreaks	The Number of Breaks in Yarn during Weaving
# women	Average Heights and Weights for American Women
#	

ATTACH and DETACH Datasets

To OPERATE upon an inbuilt DATASET we need to LOAD it into R .

In lay-man terms , we may equate this to our earlier - `read.csv()` , but there are subtle differences.

The ATTACH will pull in a Data Set from the DataSet Package into our R Search Path.

```
# Code Section -21
```

```
?attach()
```

```
# # Quoting below from inbuilt HELP -  
# # The database is attached to the R search path. This means that the database is  
# searched by R when evaluating a variable, so objects in the database can be accessed  
# by simply giving their names.
```

```
?detach()
```

```
# # Quoting below from inbuilt HELP -  
# # Detach a database, i.e., remove it from the search() path of available R objects.  
# Usually this is either a data.frame which has been attached or a  
# package which was attached by library.
```

```
# Another Function which will help automate is - zap()
```

```
# library(epicalc)  
# ?zap()  
# https://artax.karlin.mff.cuni.cz/r-help/library/epicalc/html/zap.html
```

```
# Code Section -22
```

```
search()
```

```
## [1] ".GlobalEnv"      "package:psych"     "package:stats"  
## [4] "package:graphics" "package:grDevices" "package:utils"  
## [7] "package:datasets" "package:methods"   "Autoloads"  
## [10] "package:base"
```

DATA_FRAME COLUMNS - The DF Column Vector

```
# Code Section -23
```

```
# Three basic methods to access a DF COLUMN - also called the  
# DF Column Vector
```

```
print(df_1[[2]]) # Will Print 2nd COLUMN of the DF
```

```
## [1] OFF-LA-10002782 FUR-FU-10004015 FUR-BO-10002352 OFF-BI-10004428  
## [5] OFF-AR-10004594 OFF-EN-10001375 OFF-EN-10001375 TEC-MA-10004956  
## [9] OFF-SU-10003474 TEC-AC-10001830 OFF-BI-10002075 OFF-FA-10002526  
## [13] FUR-CH-10002846 OFF-EN-10004100 OFF-AR-10003914 OFF-FA-10000038  
## [17] OFF-EN-10000761 FUR-FU-10003066 OFF-EN-10000075 OFF-EN-10002226  
## [21] FUR-CH-10002132 TEC-AC-10002749 OFF-SU-10000066 OFF-BI-10003934  
## [25] OFF-BI-10003932  
## 24 Levels: FUR-BO-10002352 FUR-CH-10002132 ... TEC-MA-10004956
```



```
#
print(df_1[["Product.Name"]]) # Will Print the "NAMED" COLUMN of the DF

## [1] OFF-LA-10002782 FUR-FU-10004015 FUR-BO-10002352 OFF-BI-10004428
## [5] OFF-AR-10004594 OFF-EN-10001375 OFF-EN-10001375 TEC-MA-10004956
## [9] OFF-SU-10003474 TEC-AC-10001830 OFF-BI-10002075 OFF-FA-10002526
## [13] FUR-CH-10002846 OFF-EN-10004100 OFF-AR-10003914 OFF-FA-10000038
## [17] OFF-EN-10000761 FUR-FU-10003066 OFF-EN-10000075 OFF-EN-10002226
## [21] FUR-CH-10002132 TEC-AC-10002749 OFF-SU-10000066 OFF-BI-10003934
## [25] OFF-BI-10003932
## 24 Levels: FUR-BO-10002352 FUR-CH-10002132 ... TEC-MA-10004956

#
print(df_1$Product.Name) # Will Print the "NAMED" COLUMN of the DF

## [1] OFF-LA-10002782 FUR-FU-10004015 FUR-BO-10002352 OFF-BI-10004428
## [5] OFF-AR-10004594 OFF-EN-10001375 OFF-EN-10001375 TEC-MA-10004956
## [9] OFF-SU-10003474 TEC-AC-10001830 OFF-BI-10002075 OFF-FA-10002526
## [13] FUR-CH-10002846 OFF-EN-10004100 OFF-AR-10003914 OFF-FA-10000038
## [17] OFF-EN-10000761 FUR-FU-10003066 OFF-EN-10000075 OFF-EN-10002226
## [21] FUR-CH-10002132 TEC-AC-10002749 OFF-SU-10000066 OFF-BI-10003934
## [25] OFF-BI-10003932
## 24 Levels: FUR-BO-10002352 FUR-CH-10002132 ... TEC-MA-10004956
```

DATA_FRAME - Row and Column Slices

```
# Code Section -24

# Slicing the DF COLUMNS and ROWS

print(df_1[2]) # Will Print 2nd COLUMN - ALL ROWS - of the DF as a SLICE.

##      Product.Name
## 1 OFF-LA-10002782
## 2 FUR-FU-10004015
## 3 FUR-BO-10002352
## 4 OFF-BI-10004428
## 5 OFF-AR-10004594
## 6 OFF-EN-10001375
## 7 OFF-EN-10001375
## 8 TEC-MA-10004956
## 9 OFF-SU-10003474
## 10 TEC-AC-10001830
## 11 OFF-BI-10002075
## 12 OFF-FA-10002526
## 13 FUR-CH-10002846
## 14 OFF-EN-10004100
## 15 OFF-AR-10003914
## 16 OFF-FA-10000038
## 17 OFF-EN-10000761
## 18 FUR-FU-10003066
## 19 OFF-EN-10000075
## 20 OFF-EN-10002226
```

```
## 21 FUR-CH-10002132
## 22 TEC-AC-10002749
## 23 OFF-SU-10000066
## 24 OFF-BI-10003934
## 25 OFF-BI-10003932
```

```
#
print(df_1[2,]) # Will Print 2nd ROW - ALL COLUMNS - of the DF as a SLICE.
```

```
## X.      Product.Name      Prod.ID Date.of.Invoice Date.of.Shipping
## 2  2 FUR-FU-10004015 MX-2012-155047      01-01-2013      02-01-2013
##      Cost.Price Quantity Sales.Price Shipping.Index Shipping.Type Category
## 2      252.16      8      2017.28      2      PRIORITY Furniture
```

```
#
print(df_1[c(2,4,6)]) # Using an INDEX VECTOR - created with COMBINE Function.
```

```
##      Product.Name Date.of.Invoice Cost.Price
## 1  OFF-LA-10002782      01-01-2013      13.080
## 2  FUR-FU-10004015      01-01-2013      252.160
## 3  FUR-BO-10002352      01-01-2013      193.280
## 4  OFF-BI-10004428      01-01-2013      35.440
## 5  OFF-AR-10004594      01-01-2013      71.600
## 6  OFF-EN-10001375      01-01-2013      56.120
## 7  OFF-EN-10001375      01-01-2013      56.120
## 8  TEC-MA-10004956      01-01-2013      344.640
## 9  OFF-SU-10003474      01-01-2013      97.360
## 10 TEC-AC-10001830      01-01-2013      341.520
## 11 OFF-BI-10002075      01-01-2013      12.060
## 12 OFF-FA-10002526      01-01-2013      20.760
## 13 FUR-CH-10002846      01-01-2013      210.640
## 14 OFF-EN-10004100      02-01-2013      80.100
## 15 OFF-AR-10003914      02-01-2013      132.640
## 16 OFF-FA-10000038      02-01-2013      12.940
## 17 OFF-EN-10000761      02-01-2013      18.840
## 18 FUR-FU-10003066      02-01-2013      308.280
## 19 OFF-EN-10000075      02-01-2013      40.176
## 20 OFF-EN-10002226      02-01-2013      8.784
## 21 FUR-CH-10002132      02-01-2013      273.472
## 22 TEC-AC-10002749      02-01-2013      27.000
## 23 OFF-SU-10000066      02-01-2013      207.000
## 24 OFF-BI-10003934      02-01-2013      60.660
## 25 OFF-BI-10003932      02-01-2013      181.116
```

```
# To access MULTIPLE COLUMNS - 2,4 and 6 of the DF.
```

Lets create a New Directory - Files Folder from within R and house our basic introductory graphs there - we use - `dir.create()`

```
# Code Section -25
```

```
#dir.create("/home/dhankar/Desktop/R_Own/Plots/Intro_1/", recursive=TRUE) # to be RUN only Once
```

Plots and Graphs - the Basics

Over the next couple of sections we shall preview the basics of Plots and Graphs.

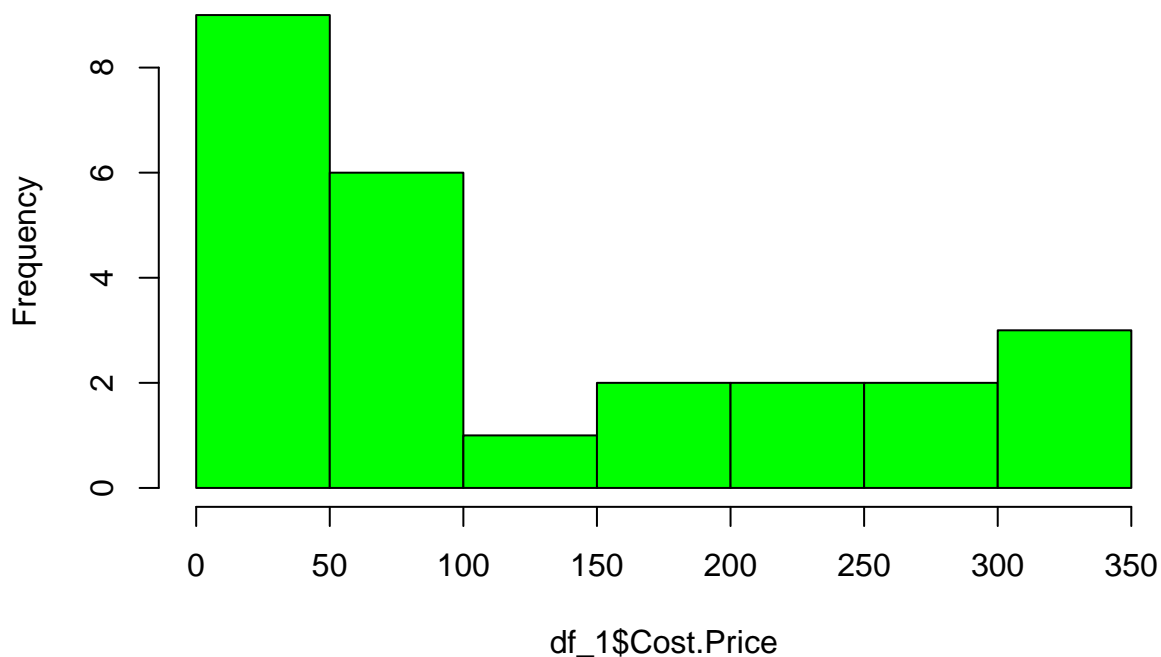
If we were to execute the code from the following sections , in the Console- the Graphs would not appear inline but would appear within the PLOTS pane of R Studio or in certain cases as POP Up's .

HISTOGRAM an Introduction

```
# Code Section -26  
# So what exactly is a HISTOGRAM -  
# " estimate of the probability distribution of a continuous variable (quantitative variable)"  
# Source -- Wiki -- https://en.wikipedia.org/wiki/Histogram
```

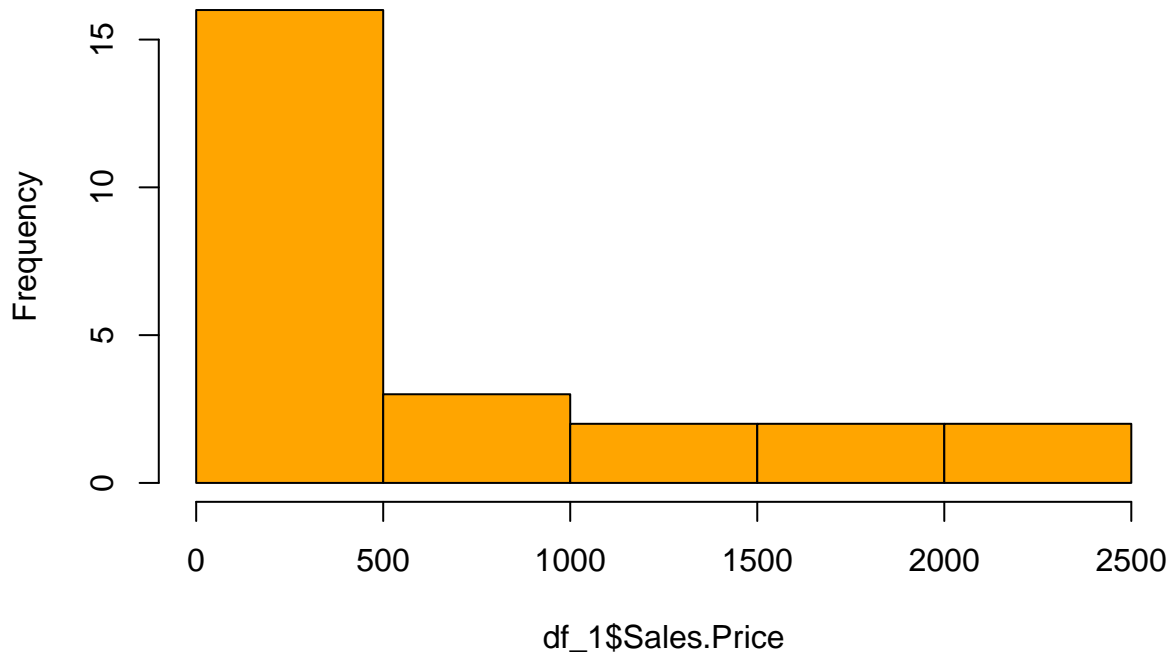
```
hist(df_1$Cost.Price,col.main="blue",col = "green")
```

Histogram of df_1\$Cost.Price



```
#  
hist(df_1$Sales.Price,col.main="blue",col = "orange")
```

Histogram of df_1\$Sales.Price



par() Function - Multiple adjacent plots

```
par{graphics}
```

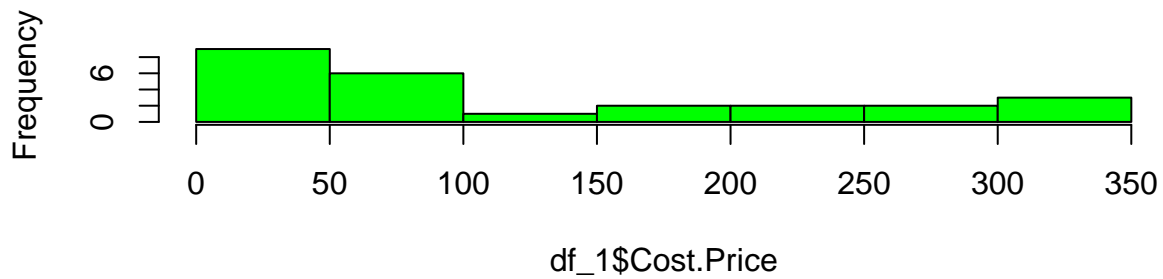
Next sections we look at some basic usage of the par() function , with it we can create a matrix of n rows X nc columns - of various plots and graphs

```
# Code Section -27
#?par() # Uncomment for Help

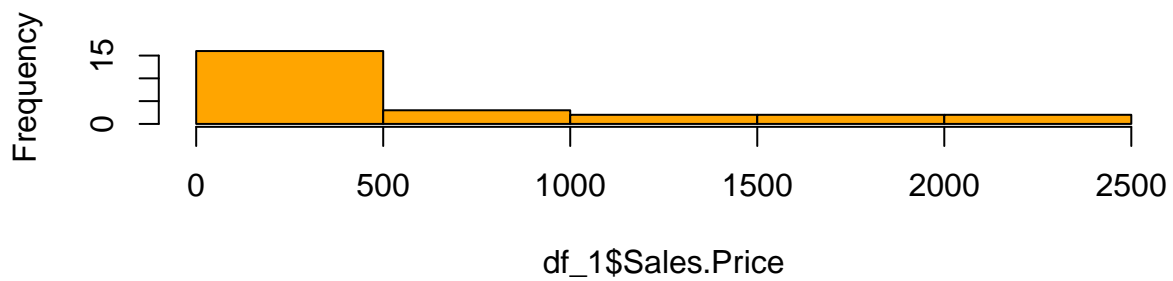
opar <- par(no.readonly=TRUE)
par(mfrow=c(2,1)) # 2 - ROWS , 1 - COLUMN - Filled in by ROWS
# or we may use - mfc col=c() , to fill by COLUMNS

hist(df_1$Cost.Price,col.main="blue",col = "green")
#
hist(df_1$Sales.Price,col.main="blue",col = "orange")
```

Histogram of df_1\$Cost.Price



Histogram of df_1\$Sales.Price

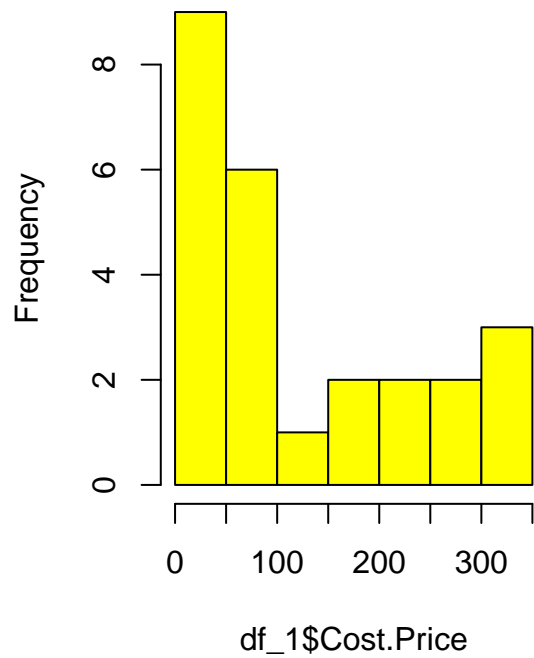


```
# Next lets try - sub-plot in 2 COLUMNS and 1 ROW

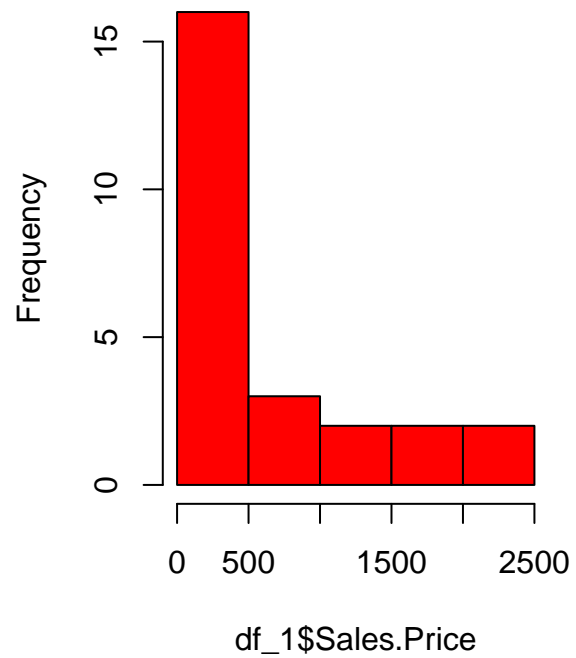
opar <- par(no.readonly=TRUE)
par(mfrow=c(1,2)) # 1 - ROW , 1 - COLUMNS

hist(df_1$Cost.Price,col.main="black",col = "yellow")
#
hist(df_1$Sales.Price,col.main="black",col = "red")
```

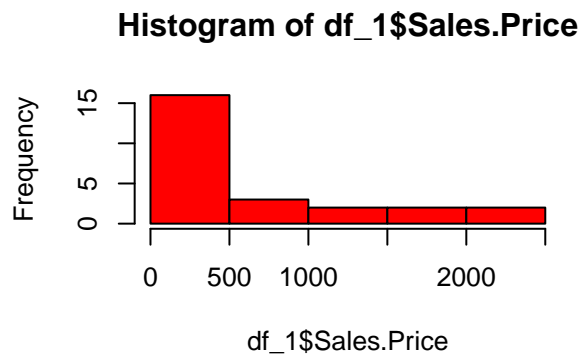
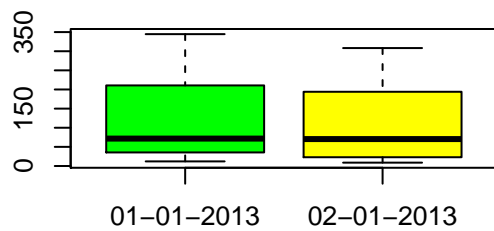
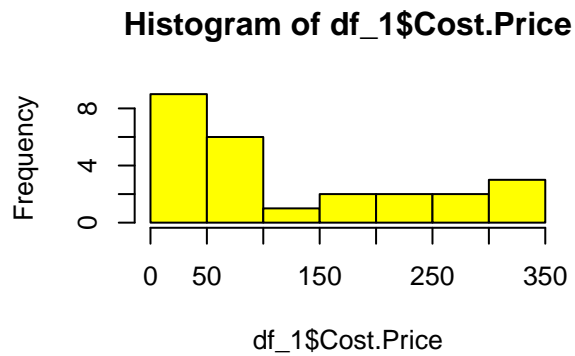
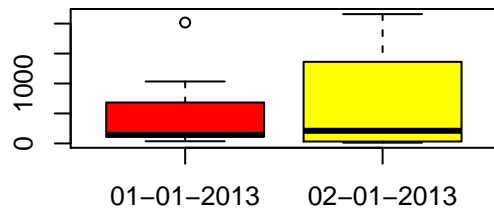
Histogram of df_1\$Cost.Price



Histogram of df_1\$Sales.Price



```
#
opar <- par(no.readonly=TRUE)
par(mfrow=c(2,2)) # 2 - ROWS , 2 - COLUMNS
#
plot(df_1$Date.of.Invoice,df_1$Sales.Price,col=c("red","yellow"))
#
hist(df_1$Cost.Price,col.main="black",col = "yellow")
#
plot(df_1$Date.of.Invoice,df_1$Cost.Price,col=c("green","yellow"))
#
hist(df_1$Sales.Price,col.main="black",col = "red")
```



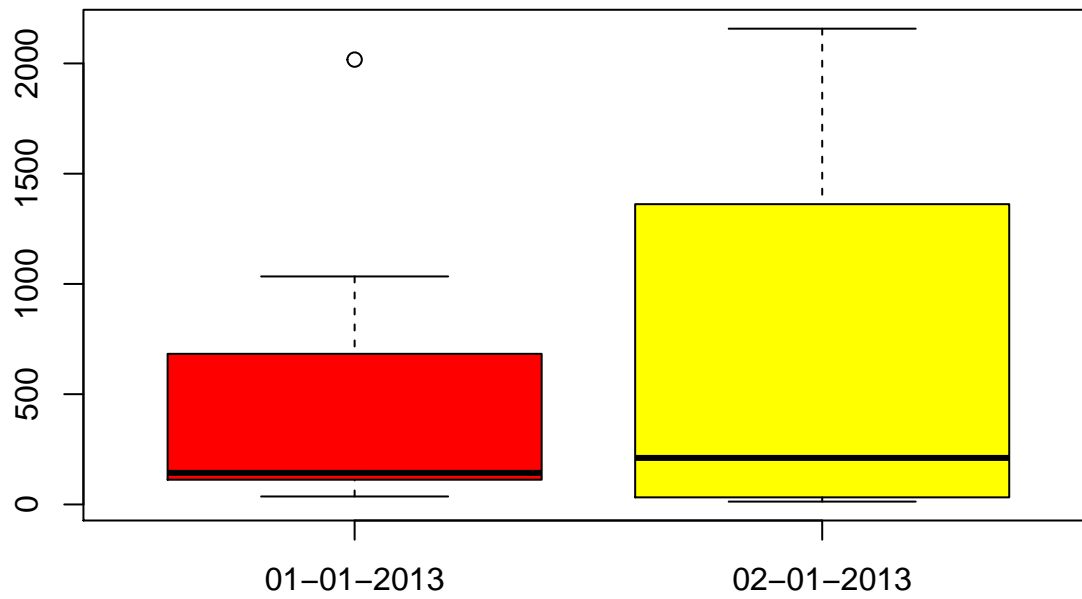
LAYOUT of Plots - beyond the par()

```
# Code Section -28
## The same set of PLOTS as earlier now formatted
# with Layout inplace of par()

##layout()

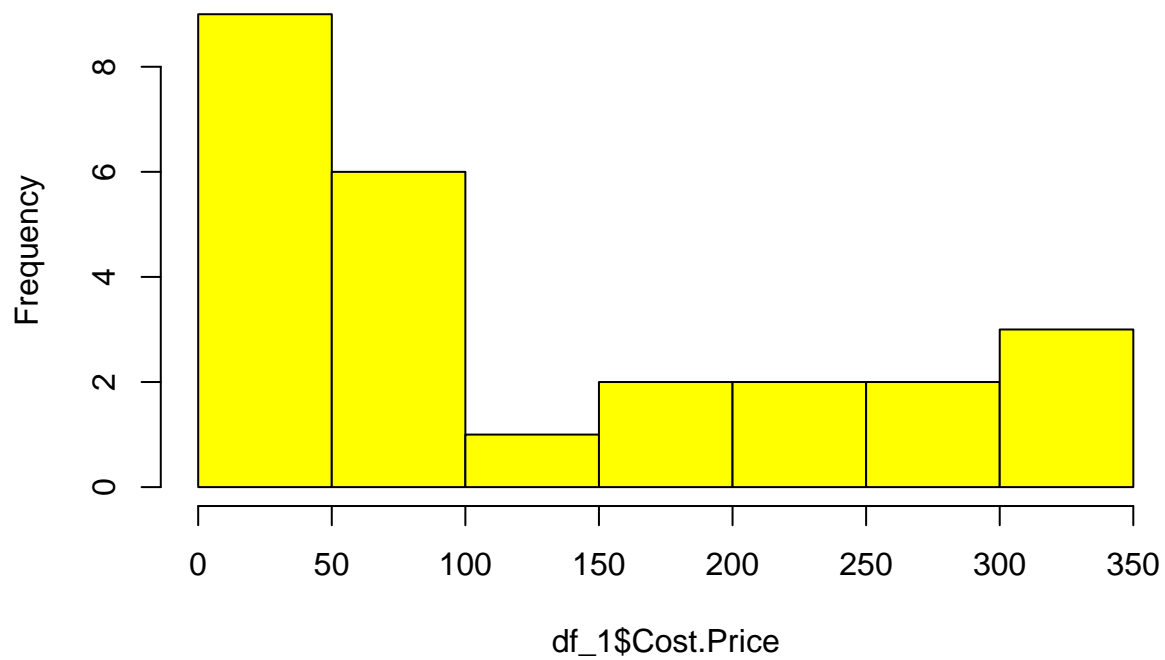
layout(matrix(1, 2, byrow = TRUE),widths = c(4,1),heights = c(4,1))

plot(df_1$Date.of.Invoice,df_1$Sales.Price,col=c("red","yellow"))
```

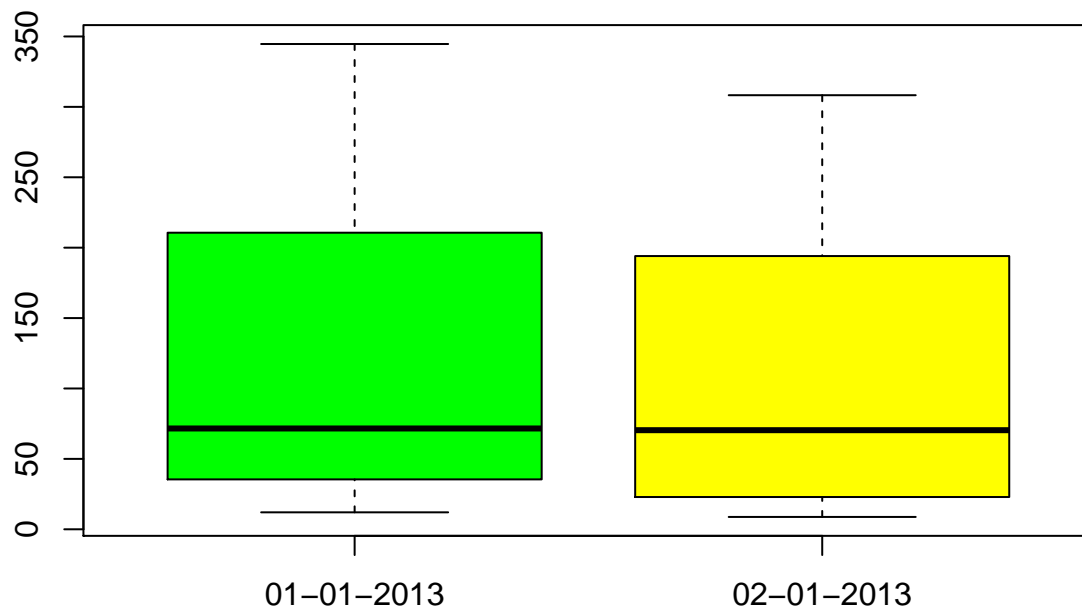


```
#
hist(df_1$Cost.Price,col.main="black",col = "yellow")
```

Histogram of df_1\$Cost.Price

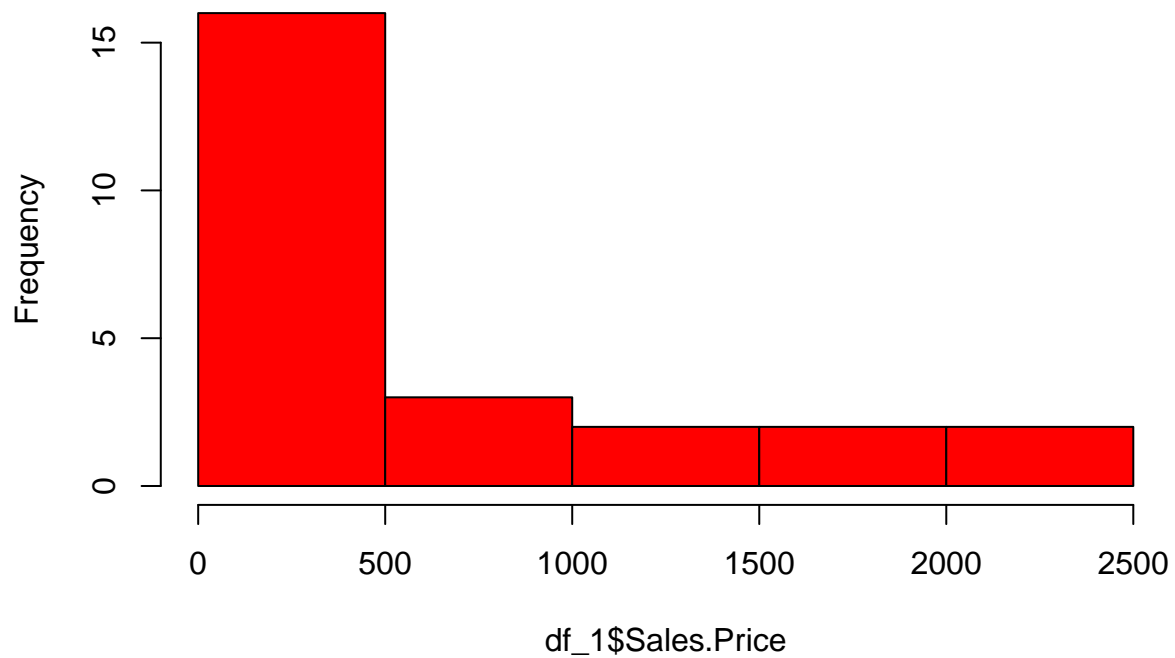


```
#
plot(df_1$Date.of.Invoice,df_1$Cost.Price,col=c("green","yellow"))
```

```
#
hist(df_1$Sales.Price,col.main="black",col = "red")
```

Histogram of df_1\$Sales.Price



SCATTER Plot - initial Intro

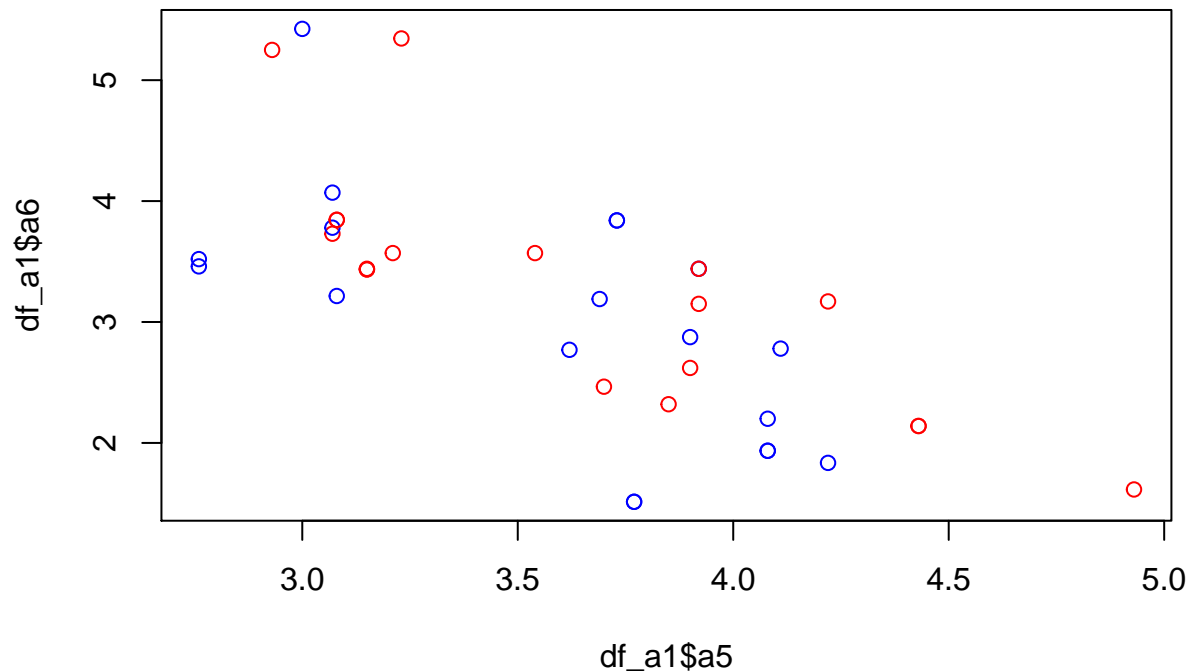
```
# Code Section -29

df_a1 <- read.csv("~/Desktop/R_Own/Data_Directory/mcprod.csv")
```

```
#
summary(df_a1)
```

```
##           X           a1           a2           a3
## Prod_1 : 1   Min.    :10.4   Min.    :4.000   Min.    : 71.1
## Prod_10: 1   1st Qu.:15.2   1st Qu.:4.000   1st Qu.:120.3
## Prod_11: 1   Median :19.2   Median :6.000   Median :196.3
## Prod_12: 1   Mean    :20.3   Mean    :6.158   Mean    :229.8
## Prod_13: 1   3rd Qu.:24.0   3rd Qu.:8.000   3rd Qu.:342.0
## Prod_14: 1   Max.    :33.9   Max.    :8.000   Max.    :472.0
## (Other):32
##           a4           a5           a6           a7
## Min.    : 52.0   Min.    :2.760   Min.    :1.513   Min.    :14.50
## 1st Qu.: 95.5   1st Qu.:3.098   1st Qu.:2.356   1st Qu.:16.88
## Median :123.0   Median :3.715   Median :3.325   Median :17.41
## Mean    :145.6   Mean    :3.614   Mean    :3.149   Mean    :17.72
## 3rd Qu.:180.0   3rd Qu.:3.920   3rd Qu.:3.690   3rd Qu.:18.83
## Max.    :335.0   Max.    :4.930   Max.    :5.424   Max.    :22.90
##
##           a8           a9           a10          a11
## Min.    :0.0000   Min.    :0.0000   Min.    :3.000   Min.    :1.000
## 1st Qu.:0.0000   1st Qu.:0.0000   1st Qu.:3.000   1st Qu.:2.000
## Median :0.0000   Median :0.0000   Median :3.500   Median :2.000
## Mean    :0.4211   Mean    :0.4211   Mean    :3.711   Mean    :2.684
## 3rd Qu.:1.0000   3rd Qu.:1.0000   3rd Qu.:4.000   3rd Qu.:4.000
## Max.    :1.0000   Max.    :1.0000   Max.    :5.000   Max.    :8.000
##
```

```
#
plot(df_a1$a5,df_a1$a6,col=c("red","blue"))
```



```
#
# Its a Synthetic Simulated Dataset for learning purposes ...
```

```

# As seen below - Variables a1,a3,a5-a7 == Double / Decimal
# (Double Precision Numeric Values)
# X1 == Var Char
# All others are Integers

# QUOTING Verbatim - WIKI-Scatter Diagram -- https://en.wikipedia.org/wiki/Scatter\_plot
#
# If no dependent variable exists, either type of variable can be plotted
# on either axis and a scatter plot will illustrate only the
# degree of correlation (not causation) between two variables.
#
# VERY VERY VERY Important - NOT CAUSATION ... so how do we
# ascertain CAUSATION , we shall see within this text soon.

# Code Section -30

# Code Section -32

# Code Section -33

# Code Section -34

# Code Section -35

# Code Section -36

sessionInfo()

## R version 3.3.2 (2016-10-31)
## Platform: x86_64-pc-linux-gnu (64-bit)
## Running under: Ubuntu 16.04.1 LTS
##
## locale:
##  [1] LC_CTYPE=en_IN.UTF-8      LC_NUMERIC=C
##  [3] LC_TIME=en_IN.UTF-8      LC_COLLATE=en_IN.UTF-8
##  [5] LC_MONETARY=en_IN.UTF-8  LC_MESSAGES=en_IN.UTF-8
##  [7] LC_PAPER=en_IN.UTF-8     LC_NAME=C
##  [9] LC_ADDRESS=C             LC_TELEPHONE=C
## [11] LC_MEASUREMENT=en_IN.UTF-8 LC_IDENTIFICATION=C
##
## attached base packages:
## [1] stats      graphics  grDevices  utils      datasets  methods   base
##
## other attached packages:
## [1] psych_1.7.5
##
## loaded via a namespace (and not attached):
##  [1] Rcpp_0.12.8      lattice_0.20-33 digest_0.6.10    rprojroot_1.1
##  [5] grid_3.3.2      nlme_3.1-124    backports_1.0.4 magrittr_1.5
##  [9] evaluate_0.10   stringi_1.1.2   rmarkdown_1.3    tools_3.3.2
## [13] foreign_0.8-66  stringr_1.1.0   yaml_2.1.14      parallel_3.3.2
## [17] mnormt_1.5-5    htmltools_0.3.5 knitr_1.15.1

```