```r
# Why R

# 1. Variables (Assigment)
X=35
Y<-"Statistic"
TRUE -> Z
W<<-5.2

# Arithmatic Operations

5+6  # Addition
5-6  # Substraction
5/6  # division
5*6 # multiplication
5^3 # power
5**4 # power
5 %% 2 # modulo
3.2 %/% 2 # Integer division


# Relational operators

5==5 # is equal to
5!=4 # not equal to
5>4  # Greater than
5<6  # less than
5>=4 # greater than equal to
4<=5 # less than equal to

# Logical operators

TRUE & TRUE             # And operration
FALSE | TRUE            # Or operator
!TRUE               # Not operation
c(TRUE,FALSE) && c(FALSE,TRUE)  # Logical And (Examines only first elements)
c(TRUE,FALSE) || c(FALSE,TRUE)  # Logical Or (Examines only first elements)

# Other operators

Y=1:5  # Range operators
2 %in% Y  # is 2 in Y (returns TRUE if yes else FALSE)

 # %*% for matrix multiplication
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# operator process
(6+2)^2
6+2^2

# Priority top to bottom
#        ^          Exponent
#        -x, +x            Unary minus, Unary plus
#        %%                    Modulus
#        *, /              Multiplication, Division
#        +, â€"            Addition, Subtraction
# <, >, <=, >=, ==, !=    Comparisions
#        !          Logical NOT
#        &, &&             Logical AND
#        |, ||             Logical OR
#        ->, ->>           Rightward assignment
#        <-, <<-           Leftward assignment
#        =                 Leftward assignment


##################################################################################
###########
#                       Data Type
##################################################################################
###########
X= TRUE        # Logical
Y= "Hello"     # Character or string
Z= 'A'         # Character
W= 5L          # Integer
V= 5.2         # Numeric
Vi=5           # Numaric
U= 3+2i        # complex
T=charToRaw(Z) # Raw
print(class(T))

# 1. Vector

vtr=c(1,2,3,4,5,6,7)    # Define vector
vtr[1]          # print(element 1)
vtr[2:5]        # print 2 to 5 elements
vtr[-1]         # print all the ements except element 1
vtr[-3]         # print all the ements except element 3
vtr[3]=8                # assign 8 to element 3
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vtr[4:5]=c(9,10)          # assign (8,10) to element 4 and 5
vtr[9]=15                 # Add 9th elements with value 15

vtr2=c(1,2,3L,5+3i,'a') # What is the class of the vtr2
class(vtr2)               # ?

# how to delete?

# 2. List

lst=list(1,TRUE,'Hello',5L,3+2i)  # Definition
vec1=c(1,2,3)
vec2=c('a','b')
lst1=list(vec1,vec2)



# 3. Array

vec1=c(1,2,3)
vec2=c(4,5,6,7,8,9)
Arr=array(vec1)                    # 1d array
Arr2=array(c(vec1,vec2),dim=c(4,5)) # 2d array
Arr3=array(c(vec1,vec2),dim=c(4,5,3))  # 3d array

# 4. Matrix

vec1=c(1,2,3)
vec2=c(4,5,6,7,8,9)

mtrx=matrix(c(vec1,vec2),3,3)  # define matrix (row*column) should be multiple or
                          # sub multiple to sum of length of vec1 and vec2
mtrx2=matrix(c(vec1,vec2vec),4,3) # ?
mtrx2=matrix(c(vec1,vec2),3,1) # ?

# 5. Factor

vec1=c(1,2,1,5,7,5,8)
fct=factor(vec1)          # Define factor
fct[2]          # Access element 1
fct[8]=1          # Assigning values to factor
fct[9]=4          # Does it works ?
levels(fct)       # Access levels
```

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# 6. Data Frame

num=c(1,2,1,5,7,5,8)
nm=c('a','b','c','d','e','f','g')
perc=c(100,95,35,85,75,60,50)
df=data.frame(num,nm,perc)          # Defining data frame
df[1,1:3]                           # Accessing first index and all three columns
df[1]                    # gives first columns and all indecies
df[1,3]=95                          # Changing elements of 1st index and 3rd column

# can access the element of column using pervisous columns?
```

```
###############################################################################
#########
#                 Flow Control
###############################################################################
#########

# 1. if .... else if .... else  statement

# x=5
# if(x>=2) {print("x greater than 2")
# }else if(x<=1) {
#   print("x is less than and equal to 1")
# }else {
#   print("x is between 1 to 2")
# }

# 2. Switch case

# vec=c(5,6,7,8)
# opt="5"
# switch(opt,
#       "1"=print(vec[1]),
#       "2"=print(vec[2]),
#       "3"=print(vec[3]),
#       "4"=print(vec[4]),
#       print("check your options")
#       )

# 3. Repeate statements

# x=0
# repeat{
#   print(x)
#   x=x+1
#   if (x>0){
#   break
#   }
# }

# 4. While loop

# x=0
# while (x<0){
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#   print(x)
#   x=x+1
# }

# 5. for loop

# vec=c("MSC", "IT","Data","Science")
#
# for (i in vec){
#   print(i)
# }


# 6. break

# vec=c("MSC", "IT","Data","Science")
# rng=seq(1,length(vec),1)
# for (i in rng){
#       print(vec[i])
#   if (vec[i]=="Science"){
#   break
#       }
# }

# 7. next

vec=c("MSC", "IT","Data","Science")
for (i in vec){
 if (i=="MSC"){
       next
 }
  print(i)
  x=1
  Y=2
}
```