

```
### Module 1: Understanding Data for Cybersecurity Informatics
###
```

```
# Basic mathematical operations
```

```
2 + 4
```

```
7 * 5
```

```
13 / 4
```

```
5^6
```

```
5 %% 3
```

```
# R objects
```

```
# Vector
```

```
## Most basic object in R
```

```
## Contains elements of the same class
```

```
## Can be: character, numeric, integer, complex,  
logical(True/False)
```

```
# Create a vector to store numbers of
```

```
# cyber attacks in the first quarter
```

```
q1<-c(595,461,515)
```

```
q1
```

```
# List
```

```
## (R vector can have different class of objects)
```

```
## e.g., attribute values of a cyber attack suspect
```

```
john<-c("John", 24, 1.73, "Brown")
```

```
john
```

```
# Create a matrix
```

```
yr<-matrix(1:12,4,3)
```

```
yr
```

```
## Matrix creation is column-wise
```

```
# Create a matrix from a vector
```

```
m2=matrix(1:6)
```

```
# Then add dimensionality
```

```
dim(m2)=c(2,3)
```

```
m2
```

```
# Create a matrix by binding columns or rows
```

```
x=1:6
```

```
y=5:10
```

```
cbind(x,y) # by column
```

```
rbind(x,y) # by row
```

```
# Check the attributes
```

```

attributes(m)

# Call a particular cell in a matrix
m
m[1,2]

# Dataframes
## Different than matrices => can store different classes of
objects
## Usually called with read.table()

# Create a dataframe
attack<-data.frame(read.table("cyberattack15.txt", sep="\t",
header=TRUE))

# Number of rows
nrow(attack)
# Number of columns
ncol(attack)
# Check the attributes
attributes(attack)

# Call a particular cell or a range of cells in a dataframe
# attack[row, col]
attack[3,1]
attack[5,2]
attack[7:9,2]

# Display dataframe (capitalize V in View; open in new tab)
View(attack)
# Edit dataframe
edit(attack)

# Getting help on a function
#?functionname
?plot
?qnorm
?sd
## Compute mean and sample standard deviation of a dataset
a<-attack[,2]
m<-mean(a)
m
s<-sd(a, na.rm=FALSE)
s

```