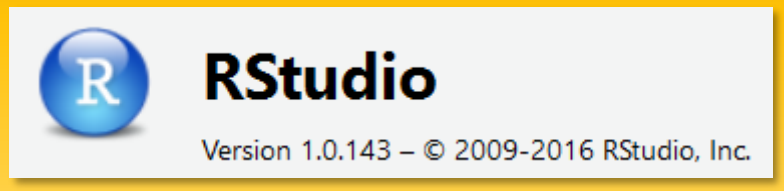
R Script Introduction

R SCRIPT INTRODUCTION



R Script Introduction

In this session

- What is R?
- R current popularity rank
- Why use R language in Machine Learning?
- R Script interpreter installation
- R Studio installation
- Hello world
- Basic calculation
- Variable assignment
- Basic Operator
- Data Structure (Array, Matrix, List, Data Frame)
- If Statement
- For Loop
- Basic plotting

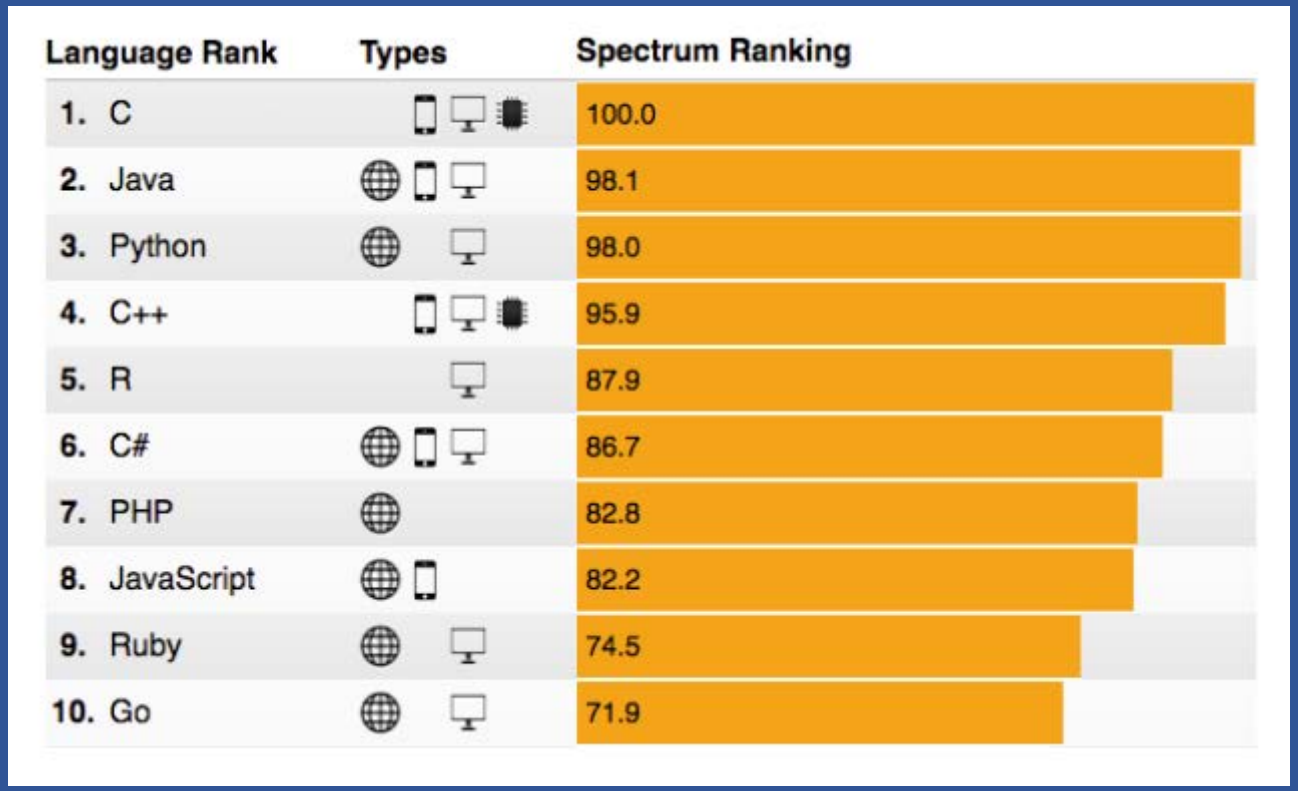
R Script Introduction

What is R?

- Computer language
- Interpreter
- Multi-paradigm: (OOP, imperative, functional, procedural)
- Typing: dynamic
- Good for: Statistical and graphics
- Origin: New Zealand
- Age: 23 (C# 17)
- Free Software (GNU project)
- Linux, Windows and MacOS
- One of the most powerful ML language
- Tool for ML exploration
- NOT for building a production model
- Supported in Azure ML Studio

R Script Introduction

R current popularity rank



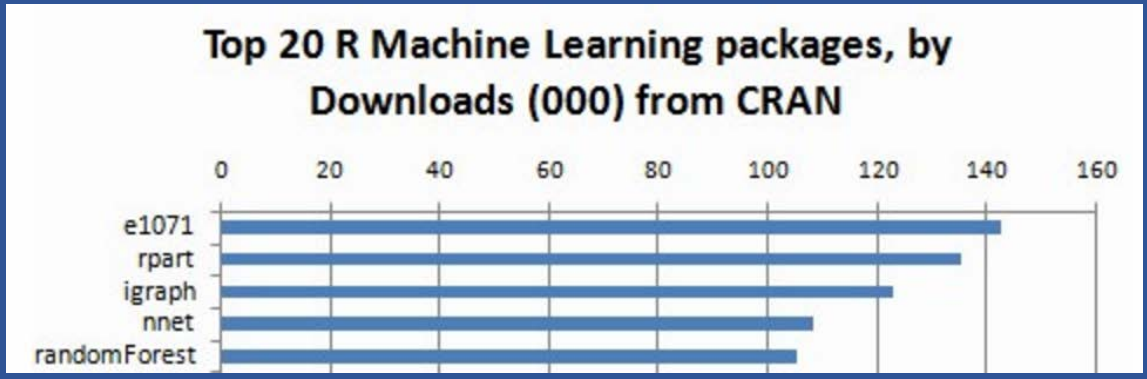
Language Rank	Types	Spectrum Ranking
1. C		100.0
2. Java		98.1
3. Python		98.0
4. C++		95.9
5. R		87.9
6. C#		86.7
7. PHP		82.8
8. JavaScript		82.2
9. Ruby		74.5
10. Go		71.9

Source: The 2016 Top Programming Languages
http://spectrum.ieee.org/static/interactive-the-top-programming-languages-2016

IEEE SPECTRUM

R Script Introduction

Why use R language in Machine Learning?

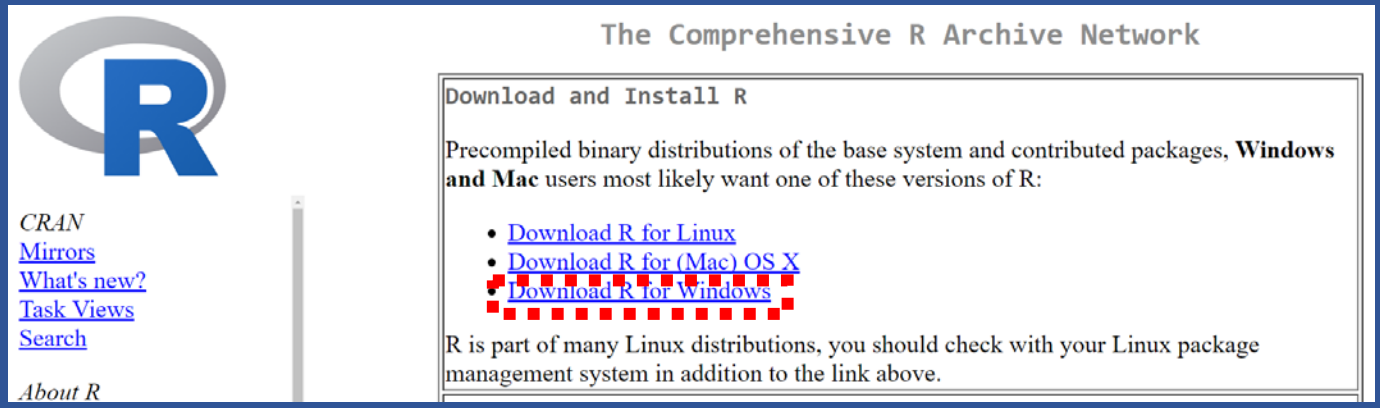


- Microsoft Azure ML support
- Free and open source
- Data Scientist's tools of trade
- Simple syntax
- Large community
- Over 7,800 package listed on CRAN
- Good ML packages (e1071, caret, etc.)
- Visualizations
- Full-set tools

R Script Introduction

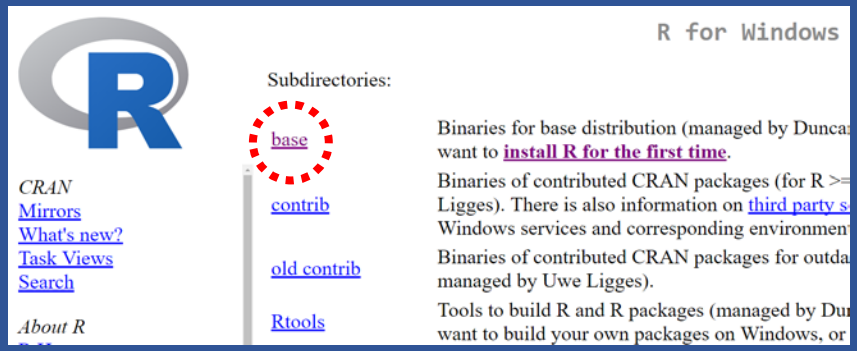
R Script interpreter installation

1. Go to CRAN website https://cran.rstudio.com



2. Click download R for Windows

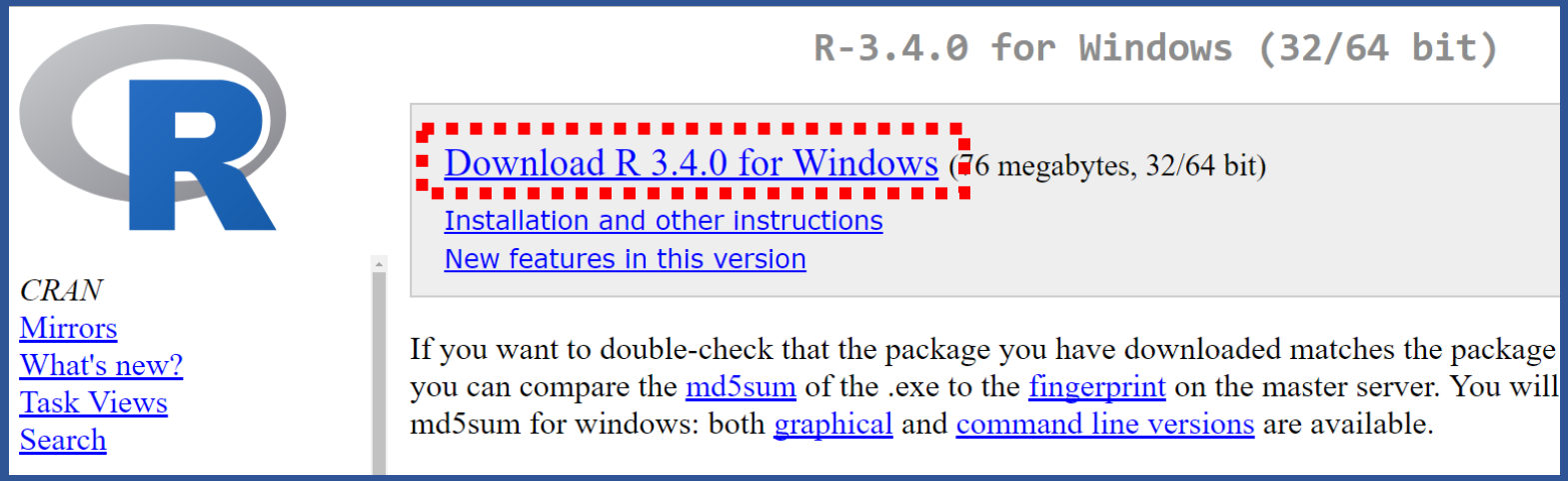
3. Click base



R Script Introduction

R Script interpreter installation

4. Click Download R 3.4.0 for Windows (76 megabytes, 32/64 bit)



When downloading done, open downloaded file to run setup

R Script Introduction

R Studio installation

Go to R Studio download page

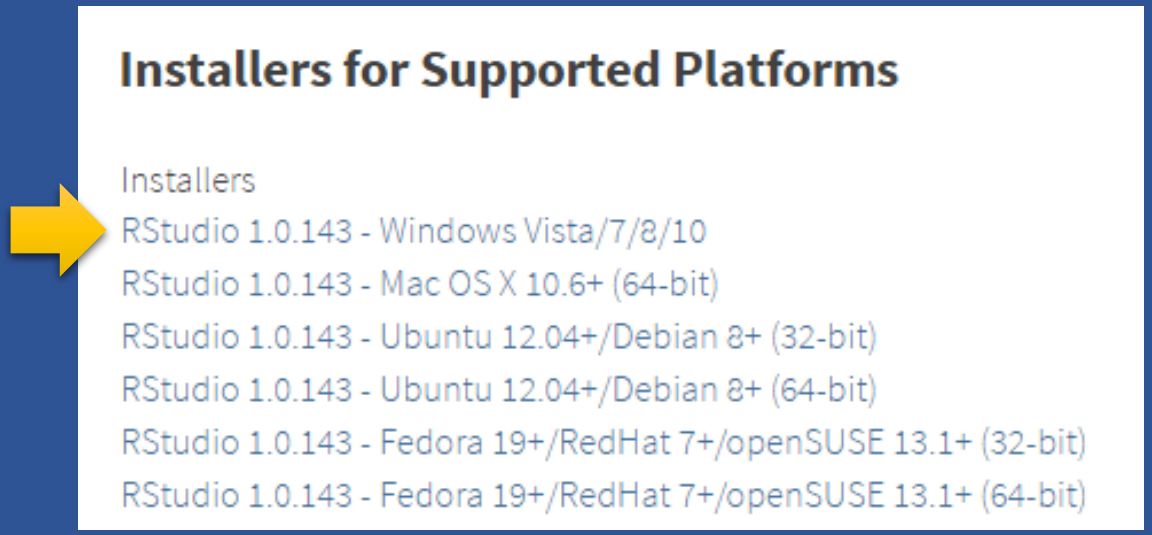
https://www.rstudio.com/products/rstudio/download/

Click RStudio Desktop FREE download

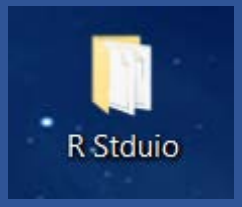
R Script Introduction

R Studio installation

1. Click RStudio 1.0.143 - Windows Vista/7/8/10



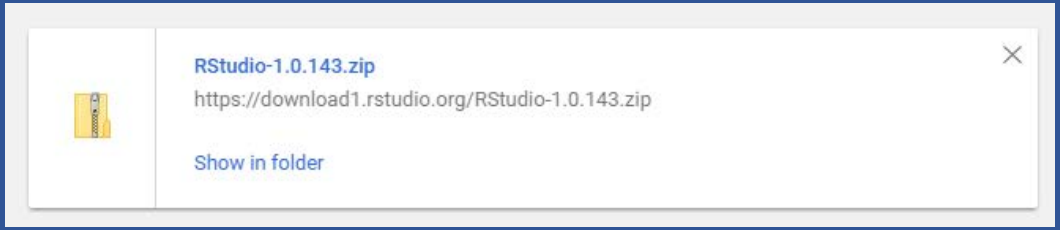
2. Create a folder R Studio on the desktop



R Script Introduction

R Studio installation

3. Open Zip file



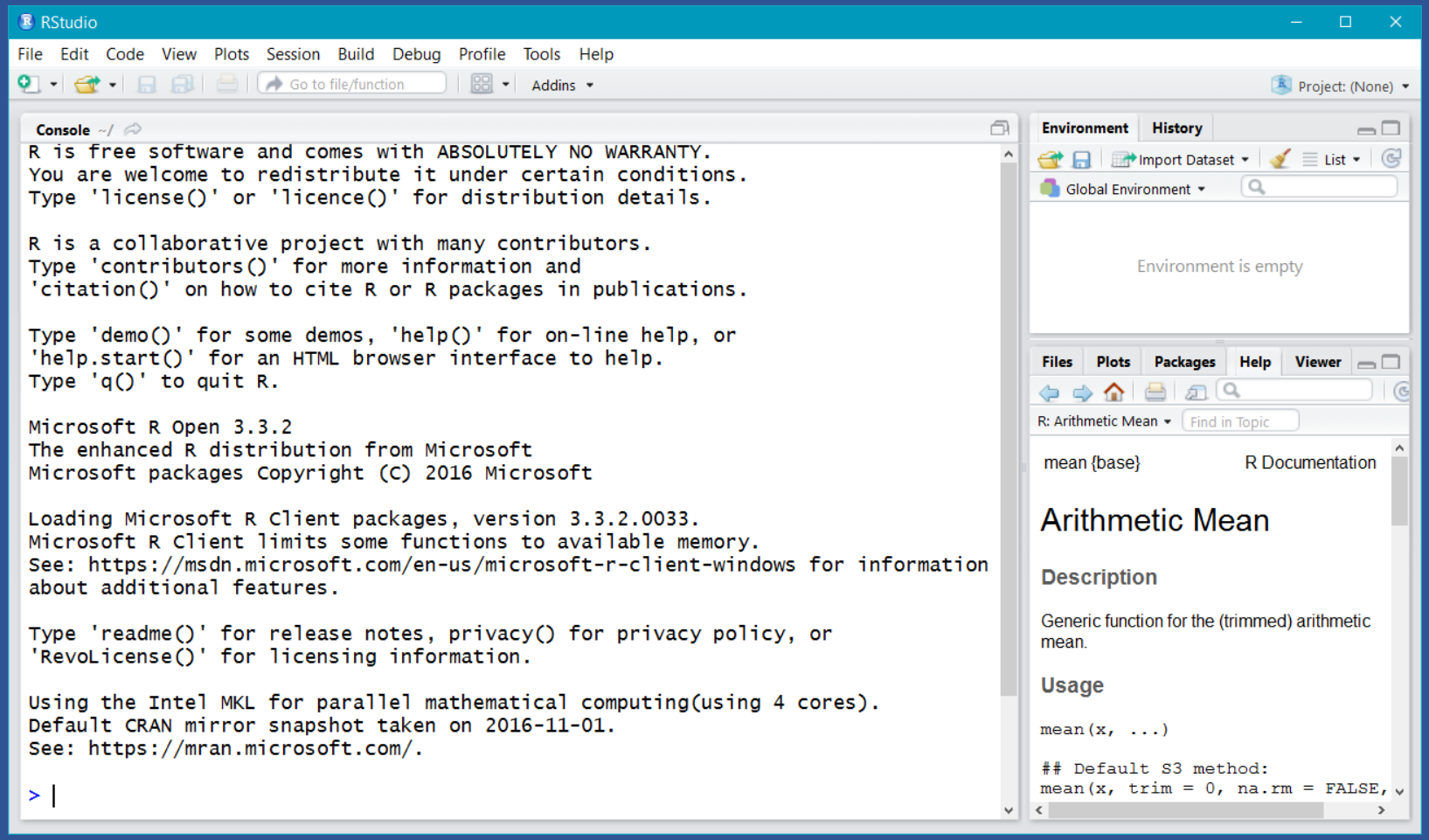
4. Drag & drop items from zip file to folder R Studio

Name	Type	Compressed size	Size
bin	File folder		
R	File folder		
resources	File folder		
www	File folder		
www-symbolmaps	File folder		
COPYING	File	12 KB	35 KB
INSTALL	File	3 KB	6 KB
NOTICE	File	47 KB	167 KB
README.md	MD File	1 KB	2 KB
SOURCE	File	1 KB	1 KB
VERSION	File	1 KB	1 KB

R Script Introduction

R Studio installation

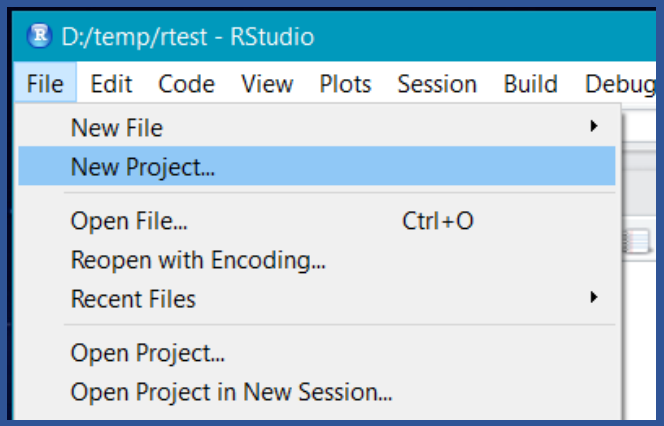
5. Click icon C:\Desktop\R Studio\bin\rstudio.exe



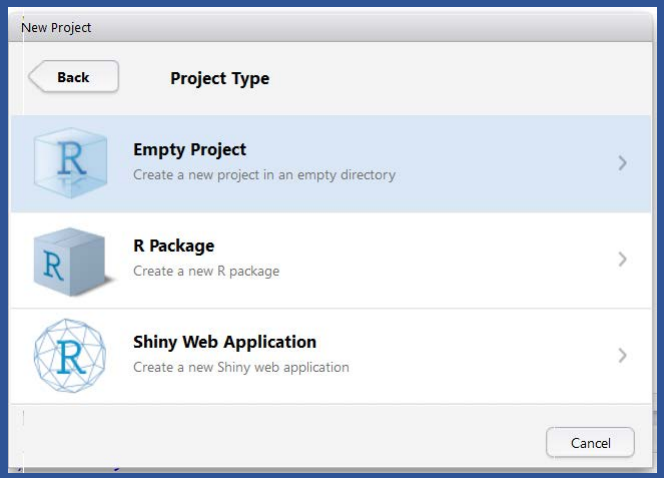
R Script Introduction

Hello world

Create project



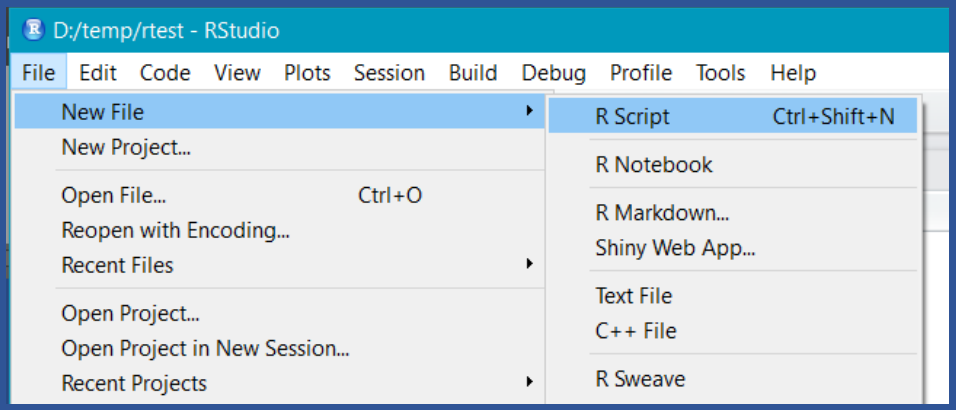
Click empty Project



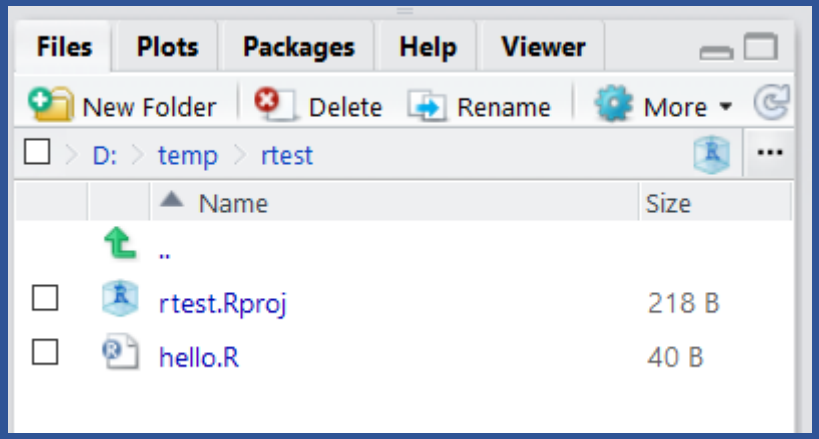
R Script Introduction

Hello world

Add R Script file to project



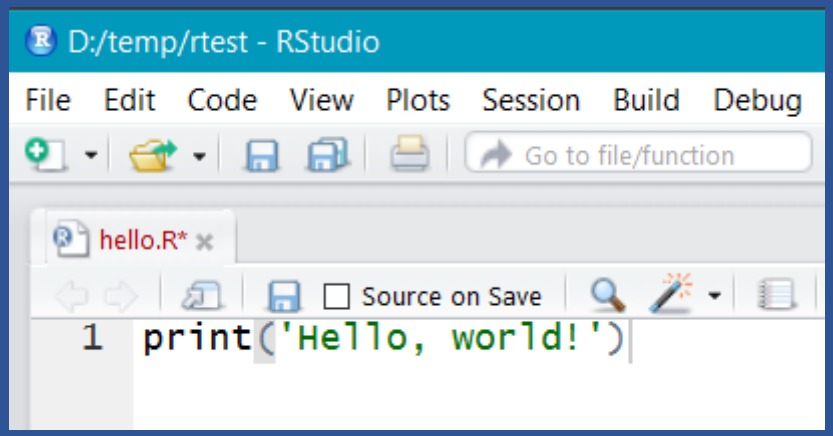
Save as hello.R



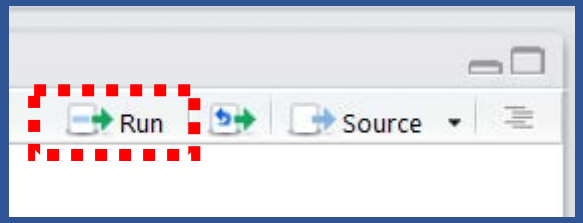
R Script Introduction

Hello world

Enter code

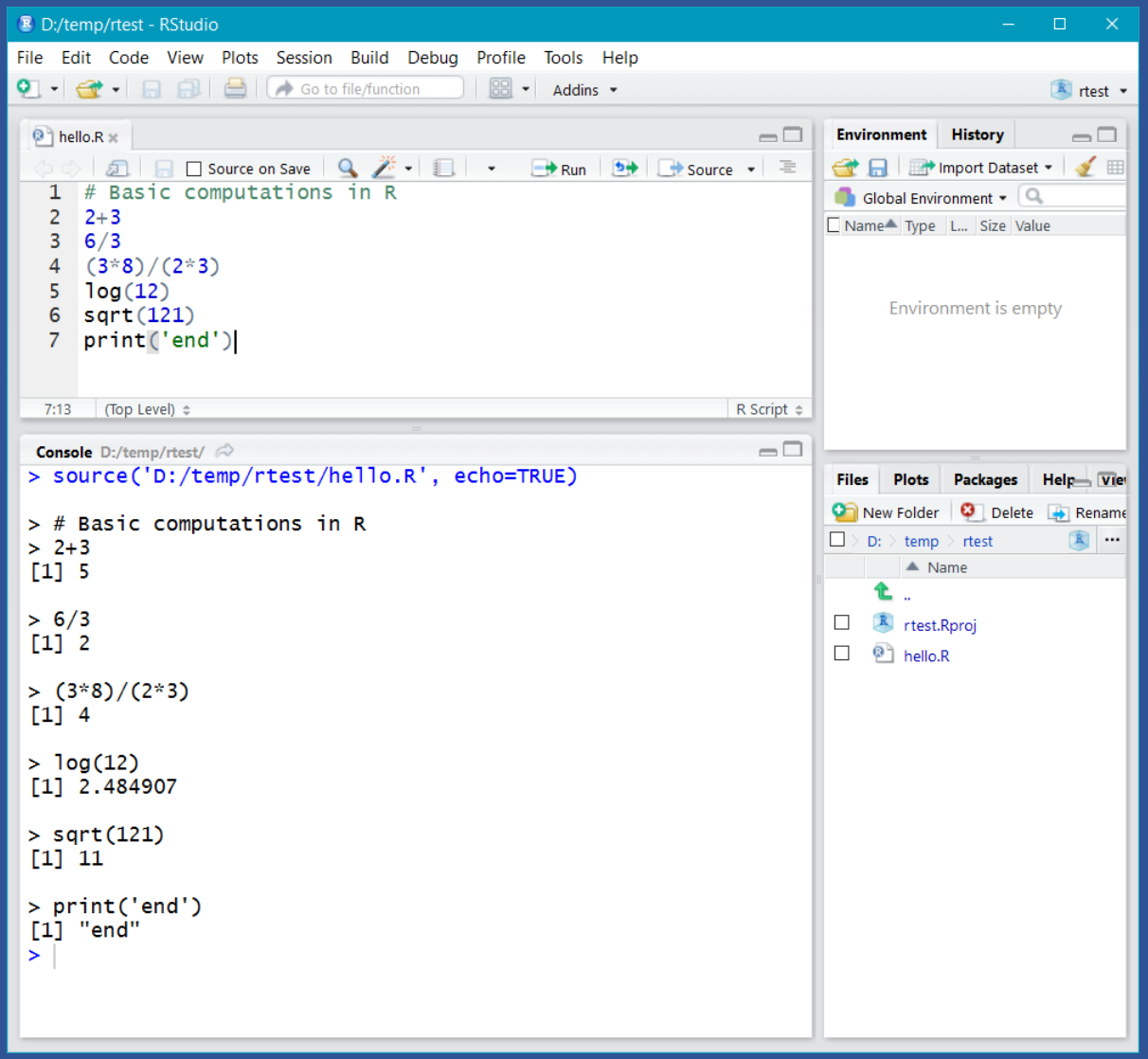


Click Run button to run Script



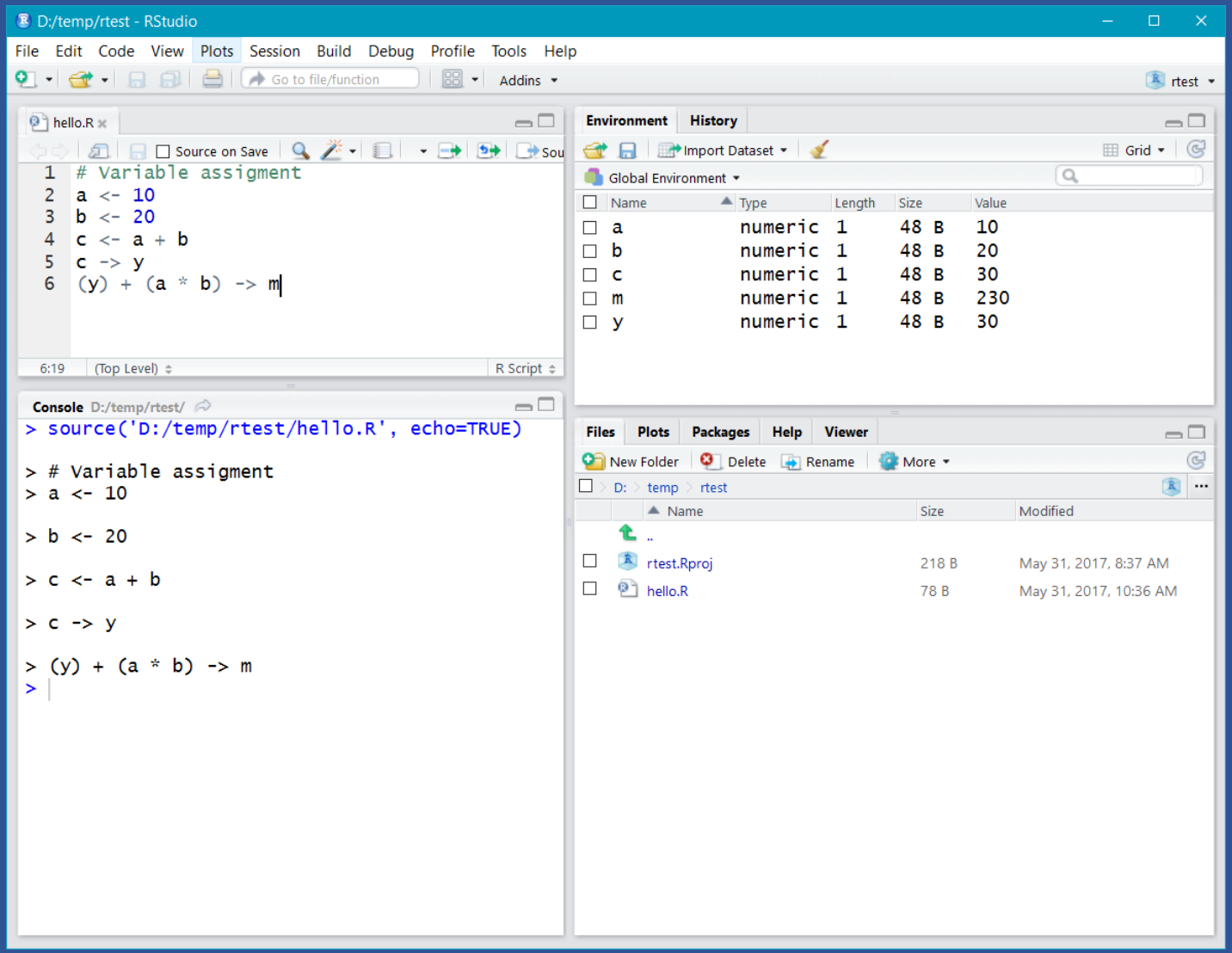
R Script Introduction

Basic calculation



R Script Introduction

Variable assignment



R Script Introduction

Basic data type

hello.R*

Source on Save | Run | Source

```
1  # Basic data type
2  rm(list = ls())      # clear objects
3  name <- 'laploy'     # character
4  who <- paste(name, 'v.') # string concat
5  price <- 1500        # numberic
6  x <- 1; y <- 2; z <- 3
7  # c() = combind function
8  v <- c(x,y,z)        # double vector
9  bar <- 6:11          # integer vactor
10 e <- exp(1)          # double form function
11
12
```

12:1 (Top Level) R Script

Environment | History

Import Dataset | Grid

Global Environment

Name	Type	Length	Size	Value
bar	integer	6	72 B	int [1:6] 6 7 8 9 10 …
e	numeric	1	48 B	2.71828182845905
name	character	1	96 B	"laploy"
price	numeric	1	48 B	1500
v	numeric	3	72 B	num [1:3] 1 2 3
who	character	1	104 B	"laploy v."
x	numeric	1	48 B	1
y	numeric	1	48 B	2
z	numeric	1	48 B	3

R Script Introduction

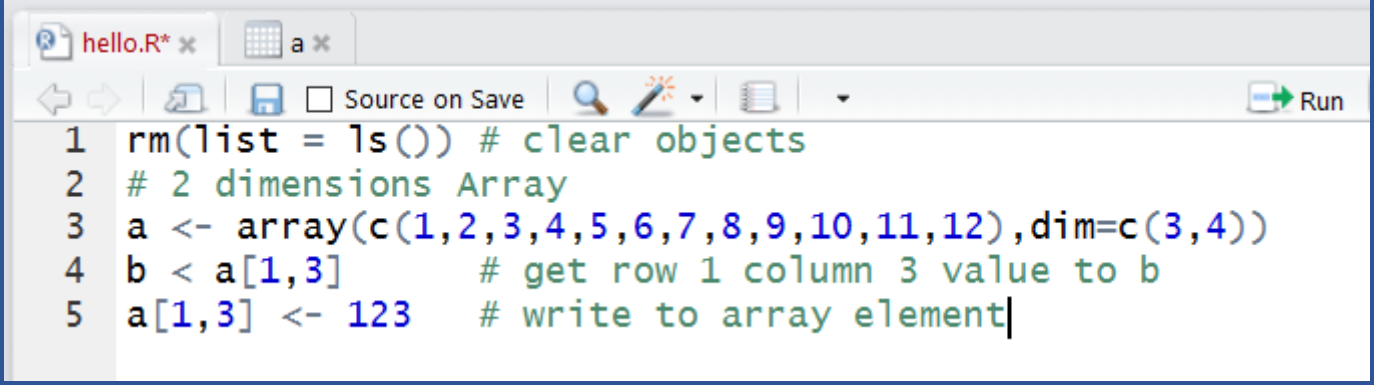
Basic Operator

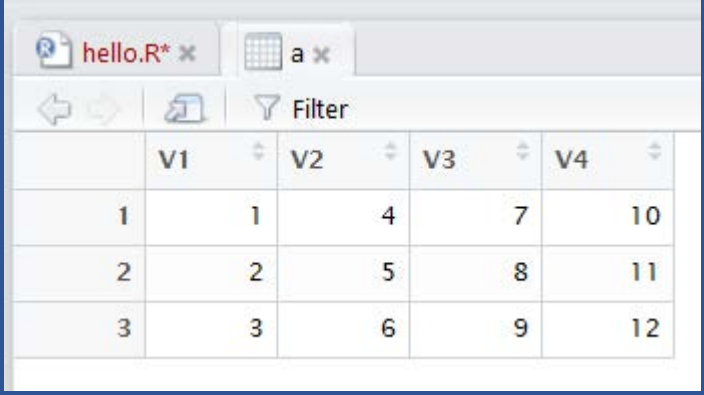
```
rm(list = ls()) # clear objects
# Arithmetic Operators
v <- c(1,2,3)
t <- c(2,2,1)
a <- v + t      # Add two vectors
s <- v - t      # substracts
m <- v * t      # multiply
d <- v / t      # divide
r <- v %% t     # remainder
e <- v ^ t      # exponent
# Relation operators
g <- v > t      # is greater?
b <- v < t      # is less?
b <- v == t     # is equal?
f <- v != t     # is NOT equal?
```

R Script Introduction

Data Structure

Array



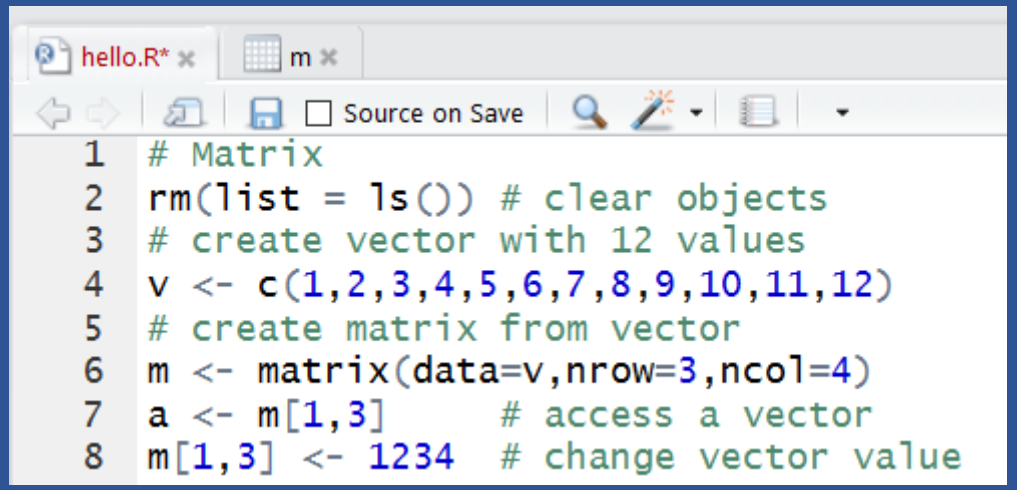


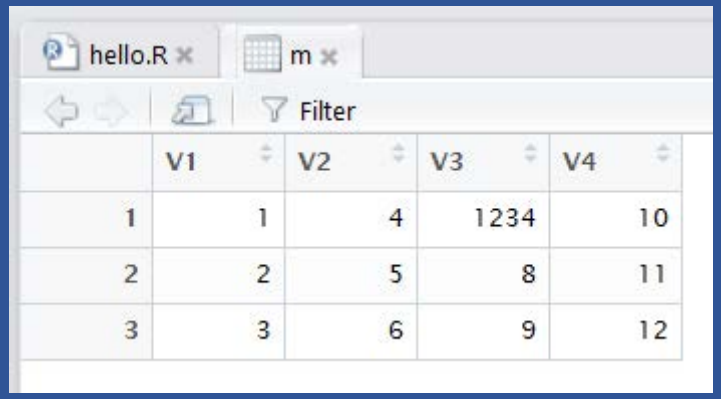
	V1	V2	V3	V4
1	1	4	7	10
2	2	5	8	11
3	3	6	9	12

R Script Introduction

Data Structure

Matrix



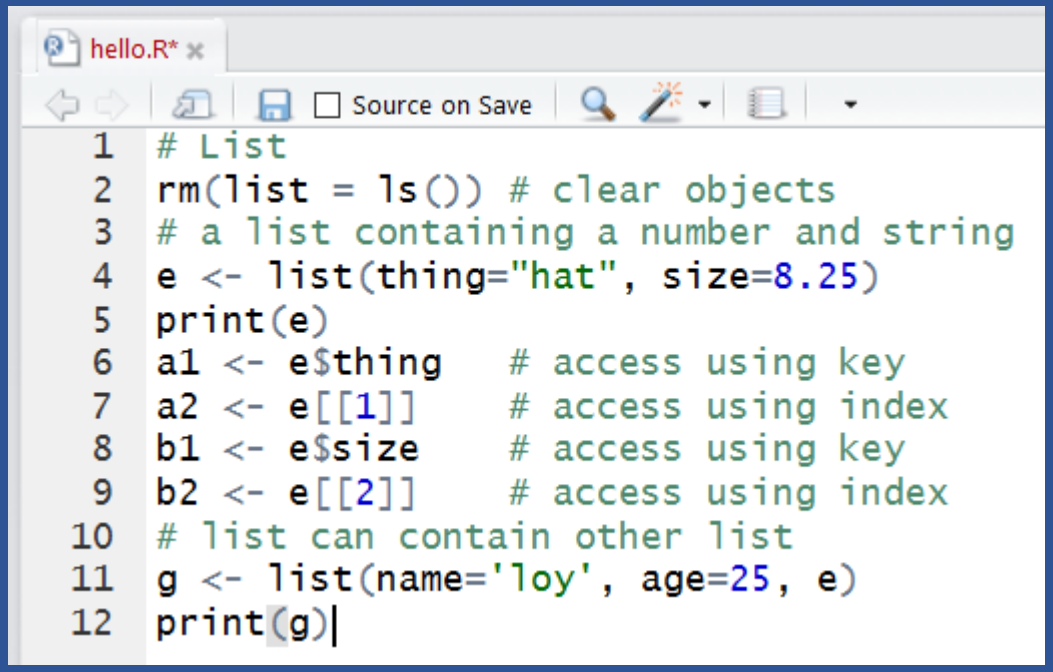


	V1	V2	V3	V4
1	1	4	1234	10
2	2	5	8	11
3	3	6	9	12

R Script Introduction

Data Structure

List



R Script Introduction

Data Structure

Data Frame

	name	age	gender
1	Loy	19	M
2	Jim	17	M
3	Bo	22	F
4	Alice	12	F
5	Tan	24	M

```
1  # Data frame
2  rm(list = ls()) # clear objects
3  # create name vector variable
4  name <- c('Loy', 'Jim', 'Bo', 'Alice', 'Tan')
5  # create age vector variable
6  age <- c(19, 17, 22, 12, 24)
7  # create gender vector variable
8  gender <- c('M', 'M', 'F', 'F', 'M')
9  # create data frome from vector
10 student <- data.frame(name,age,gender)
11 student$gender == 'F' # look for female student
12 student$age > 20      # look for student older than 20
```

R Script Introduction

If Statement

```
1  # If Statement
2  rm(list = ls()) # clear objects
3  x <- 1
4  if (x == 1){
5    print('same')
6  } else if (x > 1){
7    print('bigger')
8  } else {
9    print('smaller')
10 }
11 # ifelse function
12 a = c(5,7,2,9)
13 ifelse(a %% 2 == 0,"even","odd")
```

```
Console D:/temp/rtest/
> source('D:/temp/rtest/hello.R')
[1] "same"
>
>
> ifelse(a %% 2 == 0,"even","odd")
[1] "odd"  "odd"  "even" "odd"
>
```

R Script Introduction

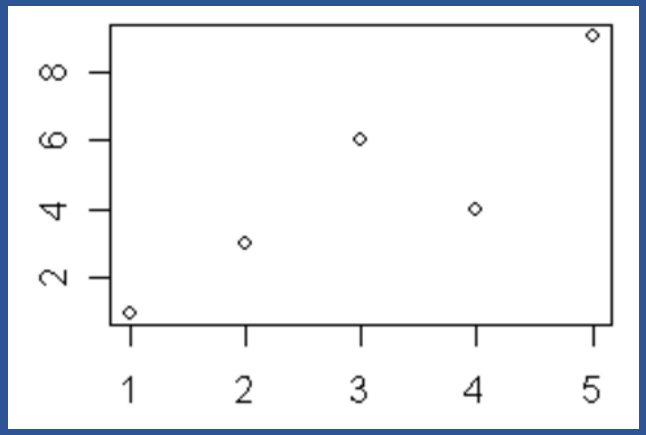
For Loop

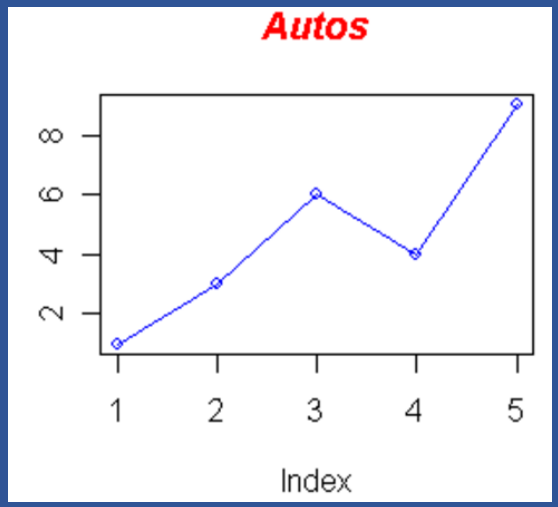
```
1  # For loop
2  x <- c(2,5,3,9,8,11,6)
3  # iterate through elements
4  for (v in x) {
5    print(v)
6  }
7  # count even element
8  count <- 0
9  for (val in x) {
10   if(val %% 2 == 0)  count = count+1
11 }
12 print(count)
```

R Script Introduction

Basic plotting

```
1  # Line Charts
2  # Define the cars vector with 5 values
3  cars <- c(1, 3, 6, 4, 9)
4  # Graph the cars vector with all defaults
5  plot(cars)
6  #-----------------------------------------
7  # Graph cars using blue points overlayed by a line
8  plot(cars, type="o", col="blue")
9  # Create a title with a red, bold/italic font
10 title(main="Autos", col.main="red", font.main=4)
```





R Script Introduction

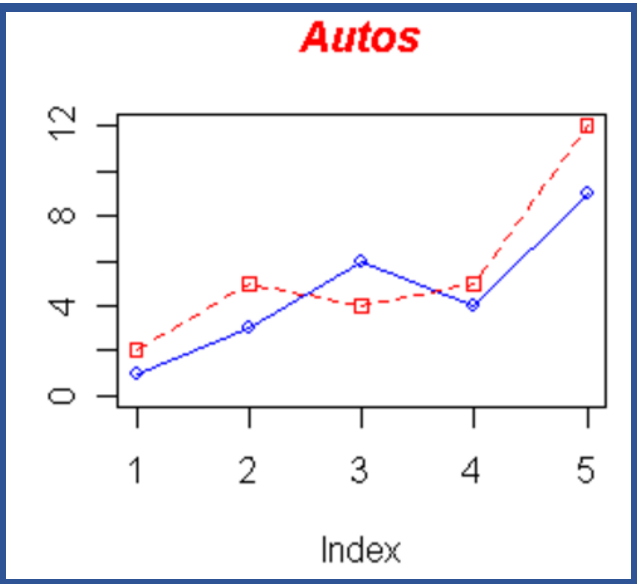
Basic plotting

```
# Define 2 vectors
cars <- c(1, 3, 6, 4, 9)
trucks <- c(2, 5, 4, 5, 12)

# Graph cars using a y axis that ranges from 0 to 12
plot(cars, type="o", col="blue", ylim=c(0,12))

# Graph trucks with red dashed line and square points
lines(trucks, type="o", pch=22, lty=2, col="red")

# Create a title with a red, bold/italic font
title(main="Autos", col.main="red", font.main=4)
```

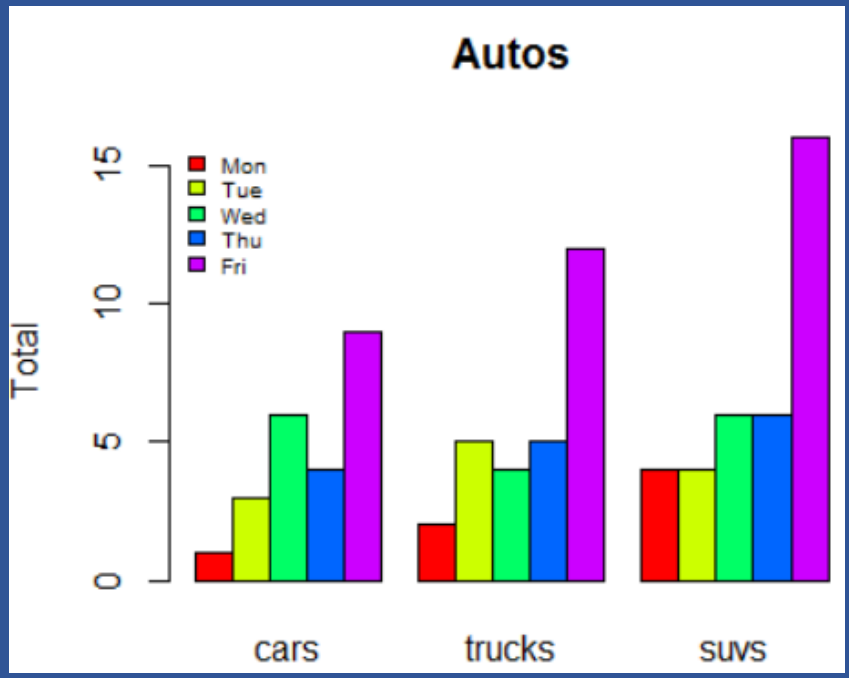


R Script Introduction

Basic plotting

```
# Read values from tab-delimited autos.dat
autos_data <- read.table("d:/temp/autos.dat", header=T, sep="\t")
# Graph autos with adjacent bars using rainbow colors
barplot(as.matrix(autos_data), main="Autos", ylab= "Total", beside=TRUE, col=rainbow(5))
# Place the legend at the top-left corner with no frame
# using rainbow colors
legend("topleft", c("Mon","Tue","Wed","Thu","Fri"), cex=0.6, bty="n", fill=rainbow(5))
```

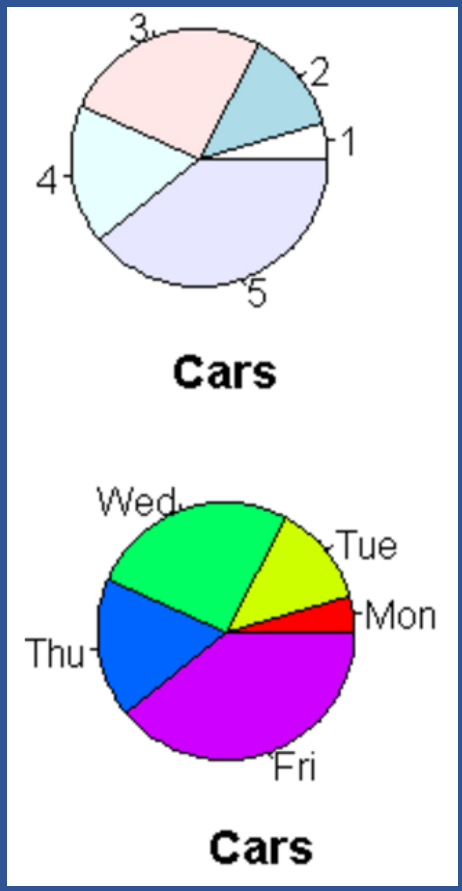
	cars	trucks	suvs
1	1	2	4
2	3	5	4
3	6	4	6
4	4	5	6
5	9	12	16



R Script Introduction

Basic plotting

```
1  # Define cars vector with 5 values
2  cars <- c(1, 3, 6, 4, 9)
3  # Create a pie chart for cars
4  pie(cars)
5  # ---------------------------
6  pie(cars, main="Cars", col=rainbow(length(cars)),
7      labels=c("Mon","Tue","Wed","Thu","Fri"))
```



R Script Introduction

More information

More information on R Script Basic

A Complete Tutorial to learn Data Science in R from Scratch

https://www.analyticsvidhya.com/blog/2016/02/complete-tutorial-learn-data-science-scratch/