R and RStudio Programming Basics

Understanding R code

Object assignment

```
my_var <- 4
my_var
[1] 4
```

```
b <- "banana"
b
 [1] "banana"
```

Object_name <- value(s)

Objects of single values, data structures, or function results are assigned to a name by the assignment operator (<-).

Variable names may contain letters, numbers, periods, and underscores but must begin with a letter.

Commenting

```
n_st <- 100 #Number of students
n_st
[1] 100
```

Comments follow a # and are not evaluated by R.

Getting help

args(function)
Display the argument names and default values of a function

?function or **??function**
Get help for a particular function

example(function)
Show example of how to use a function

Data Structures

Vector

One-dimensional data of the same data type

```
> c("A", "Z", "H")
[1] "A" "Z" "H"
```
Join elements into a vector

```
> seq(from=2, to=3,
+ by=0.5)
[1] 2 2.5 3
```
Sequence

```
> rep(1, times=3)
[1] 1 1 1
```
Repeat a vector

Data Frame

Two-dimensional of the same or different data type

```
> df<-data.frame(Var1=c("a","b","c"),
+                Var2=seq(5,15,by=5))
> df
  Var1  Var2
1    a     5
2    b    10
3    c    15
```

df$Var1
Vectorize a column with $

summary(df)
Summary of each column

nrow(df)
Number of rows

ncol(df)
Number of columns

rename(df, New_name = Old_name)
Change name of individual columns (dplyr)

Keyboard shortcuts

Ctrl + R — Run selected line(s), R

Ctrl + Enter — Run selected line(s), RStudio

Ctrl + Shift + C — (Un)Comment line

Alt + - — Insert <- (macOS: Option + -)

For macOS, replace Ctrl with Cmd

Matrix

Two-dimensional data of the same data type

```
> matrix(seq(0,9,by=3),
+        nrow=2,ncol=2)
     [,1] [,2]
[1,]    0    6
[2,]    3    9
```

Array

```
> array(c(m1, m2, m3),dim=c(2,2,3))
,,1
     [,1] [,2]
[1,]    0    6
[2,]    3    9

,,2
     [,1] [,2]
[1,]    1    7
[2,]    4   10

,,3
     [,1] [,2]
[1,]    3    9
[2,]    6   12
```

Three-dimensional matrix (rows, columns, and depth)

List

Lists can be composed of different data types and structures

```
> list(1:10, matrix(c("a","b",
+       "c","d"), nrow=2, ncol=2))
[[1]]
[1] 1 2 3 4 5 6 7 8 9 10

[[2]]
     [,1] [,2]
[1,] "a"  "c"
[2,] "b"  "d"
```

Maps, Data and Government Information Centre

Major Data Types

Numeric — Numbers with decimal values, also known as Double.
- Integer: numbers without decimal values

Character — Text values defined within ' or ""
- Factor: text categories for statistical analysis
- Date: calendar values

Logical — Boolean values (TRUE or FALSE)

Missing — Not available / missing values. Can be present in all data types

Determine data type/structure

class(x)
Get the class of an object

```
var1 <- "pizza"
class(var1)
[1] "character"
```

Check if data is a specific type
is.<data type>(x)

```
is.character(var1)
[1] TRUE
```

Or data structure
is.<structure>(x)

```
is.data.frame(var1)
[1] FALSE
```

Assign data type/structure

Data types may be specified with
as.<data type>(x)

```
var2 <- "8"
as.numeric(var2)
[1] 8
```

Change data structure with
as.<structure>(x)

```
as.data.frame(var2)
 var2
1 8
```

Contact:
madgichelp@trentu.ca

TRENT UNIVERSITY
LIBRARY & ARCHIVES

Math functions

`x + y`	Addition
`x - y`	Subtraction
`x/y`	Division
`x^y`	Exponentiation
`x %% y`	Modulo (division remainder)
abs(x)	Absolute value of x
sqrt(x)	Square root of x
log(x)	Natural logarithm of x
exp(x)	Exponential (e^x) of x
max(x)	Largest element in x
min(x)	Smallest element in x
mean(x)	Average value of x
median(x)	Median value of x
sum(x)	Sum of all elements in x
sd(x)	Standard deviation of x
var(x)	Variance of x
round(x, n)	Round x to n decimal places
sin(x)	Sine of x
cos(x)	Cosine of x
tan(x)	Tangent of x

R environment

ls()
List all variables in the environment

rm(x)
Remove *x* from the environment

`rm(list=ls())`
Remove all variables from the environment

`rm(list=setdiff(ls(),c("x","y")))`
Remove all variables from the environment except variables *x* and *y*

Using Packages

install.packages('package')
Download and install a package

library(package)
Load the package, making all its functions available to use

help(package = 'package')
View R help documentation for the package

browseVignettes('package')
Package tutorials or workflows

package::function()
Use a function from a specific package

Character functions

toupper(x)	Convert to uppercase
tolower(x)	Convert to lowercase
nchar(x)	Number of characters in a string

substr(x, start, finish)
Subset a string from start to finish character number

Also see the **stringr** library

See the data

head(x)
Show the first six values

tail(x)
Show the last six values

View(x)
Show all data

str(x)
Compact display of data types and values