

# R Exercise Guide

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24 September 2024

## 1. Program Conventions

In this section, we'll familiarize ourselves with the basic conventions of R programming.

### 1.1 Panes

RStudio is organized into four main panes: the Source pane, Console pane, Environment/History pane, and Files/Plots/Packages/Help/Viewer pane. Understanding how to navigate these panes will improve your workflow.

### 1.2 Working Directory

The working directory is the folder where R reads and saves files. To check your current working directory, use:

```
1 getwd()
```

To set a new working directory:

```
1 setwd("path/to/your/directory")
```

### 1.3 Packages

Packages are collections of R functions, data, and compiled code. To install a package:

```
1 install.packages("tidyverse")
```

We need to install packages only once.

However, we need to load a package into your R session every time you open R Studio:

```
1 library(tidyverse)
```

## 1.4 Objects

Objects store data in R. You can create an object using the assignment operator:

```
1 x <- 10
2 y <- c(1, 2, 3, 4, 5)
```

You can view the contents of an object by simply typing its name.

## 1.5 Assignment Operator

The assignment operator `<-` is used to assign values to objects. For example:

```
1 z <- x + y
```

Now, 'z' holds the sum of 'x' and 'y'.

## 1.6 Vectors

Vectors are the simplest data structure in R. You can create a vector using the 'c()' function:

```
1 numbers <- c(1, 2, 3, 4, 5)
2 letters <- c("a", "b", "c", "d", "e")
```

## 1.7 Data Frames

Data frames are used for storing tabular data. Here's how to create a simple data frame:

```
1 df <- data.frame(
2   id = 1:5,
3   name = c("John", "Paul", "George", "Ringo", "Pete"),
4   age = c(22, 23, 24, 25, 26)
5 )
```

You can view the data frame using:

```
1 print(df)
```

## 2. Importing and Exporting Data

R can import and export data from/to various formats. For example, to read a CSV file:

```
1 data <- read.csv("path/to/your/file.csv")
```

To write data to a CSV file:

```
1 write.csv(df, "path/to/save/your/file.csv")
```

## 3. Data Manipulation

Data manipulation is a critical skill in R, enabling you to prepare your data for analysis.

### 3.1 Creating a new variable

To create a new variable in a data frame:

```
1 df$new_var <- df$age * 2
```

### 3.2 Variable name change

To rename a variable in a data frame:

```
1 names(df)[names(df) == "name"] <- "first_name"
```

### 3.3 Filtering

To filter data based on a condition:

```
1 new_df <- subset(df, age > 23)
```

## 4. Summary Statistics

Summary statistics provide a quick overview of your data.

### 4.1 summary() function

To get summary statistics of a data frame:

```
1 summary(df)
```

## 5. Linear Regression

Linear regression models the relationship between a dependent variable and one or more independent variables.

### 5.1 lm() function

To perform a linear regression analysis:

```
1 model <- lm(age ~ new_var, data = df)
2 summary(model)
```