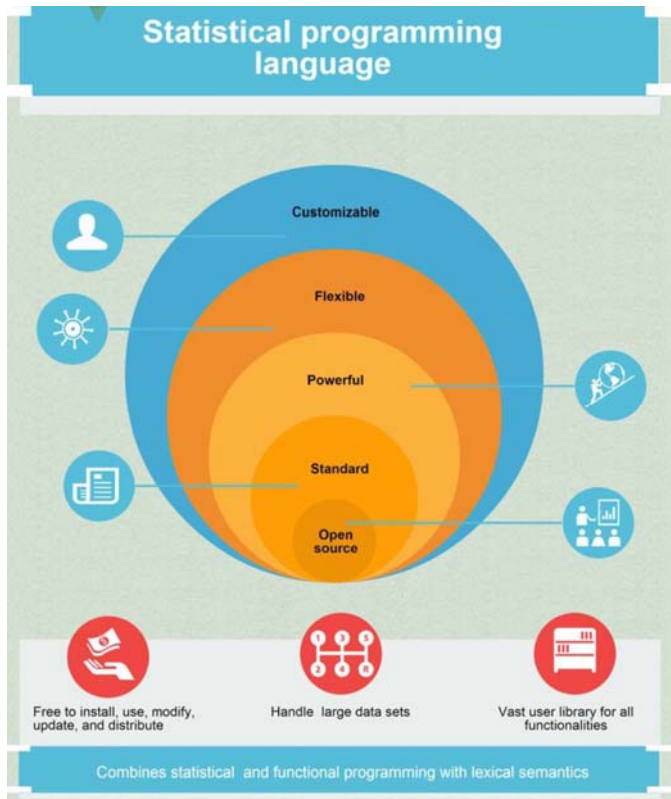


What is R?



- Statistical programming language S developed at Bell Labs since 1976 (at the same time as UNIX)
- Intended to interactively support research and data analysis projects
- Exclusively licensed to Insightful (“S-Plus”)
- R: Open source platform similar to S developed by R. Gentleman and R. Ihaka (U of Auckland, NZ) during the 1990s
- Since 1997: international “R-core” developing team
- Updated versions available every couple months

Why use R?

- Reproducible
- Saves time, especially when repeating tasks
- Large user base (get help!)
- Valued skill (get a job!)

R is a calculator

- R has many mathematical operators
 - `+` Addition
 - `-` Subtraction
 - `*` Multiplication
 - `/` Division
 - `^` Exponentiation
 - `%%` Modulus
 - `%/%` Integer division

R is logical

- R has many logical operators
 - `<` Less than
 - `<=` Less than or equal to
 - `>` Greater than
 - `>=` Greater than or equal to
 - `==` Exactly equal to
 - `!=` not equal to
 - `!` NOT
 - `|` OR
 - `&` AND

R is iterative and functional

- R can use *for* loops to repeat tasks
- R programmers can develop custom functions for performing tasks
- R contains many libraries of functions for programmers to use

Objects in R

- Objects are the fundamental units in R
- Main object classes
 - **Character (string)**: “Hovsgol grayling”
 - **Numeric**: 3.14159
 - **Integer**: 17
 - **Complex**: imaginary value i , `sqrt(-1)`
 - **Logical**: T/F or true/false
- To create an object, use the assignment operator `<-`

Objects in R

- Main object types

1. **Vectors:**

- a. All **elements** must be of the same type
- b. e.g., [13.5, 7.7, 18.3] or ["taimen", "lenok", "grayling"]

2. **Matrices:**

- a. All elements must be integer/numeric

$$\begin{pmatrix} 1, & 2, & 3, & 4, \\ 5, & 6, & 7, & 8, \\ 9, & 10, & 11, & 12 \end{pmatrix}$$

3 x 4 matrix
3 rows x 4 columns

3. **Arrays**

- a. Like matrices, but can have more than 2 dimensions

4. **Lists:**

- a. Like vectors, but can contain elements of different types
- b. e.g., [2.3, "taimen", c(3, 4, 10, 11), 2016-06-16]

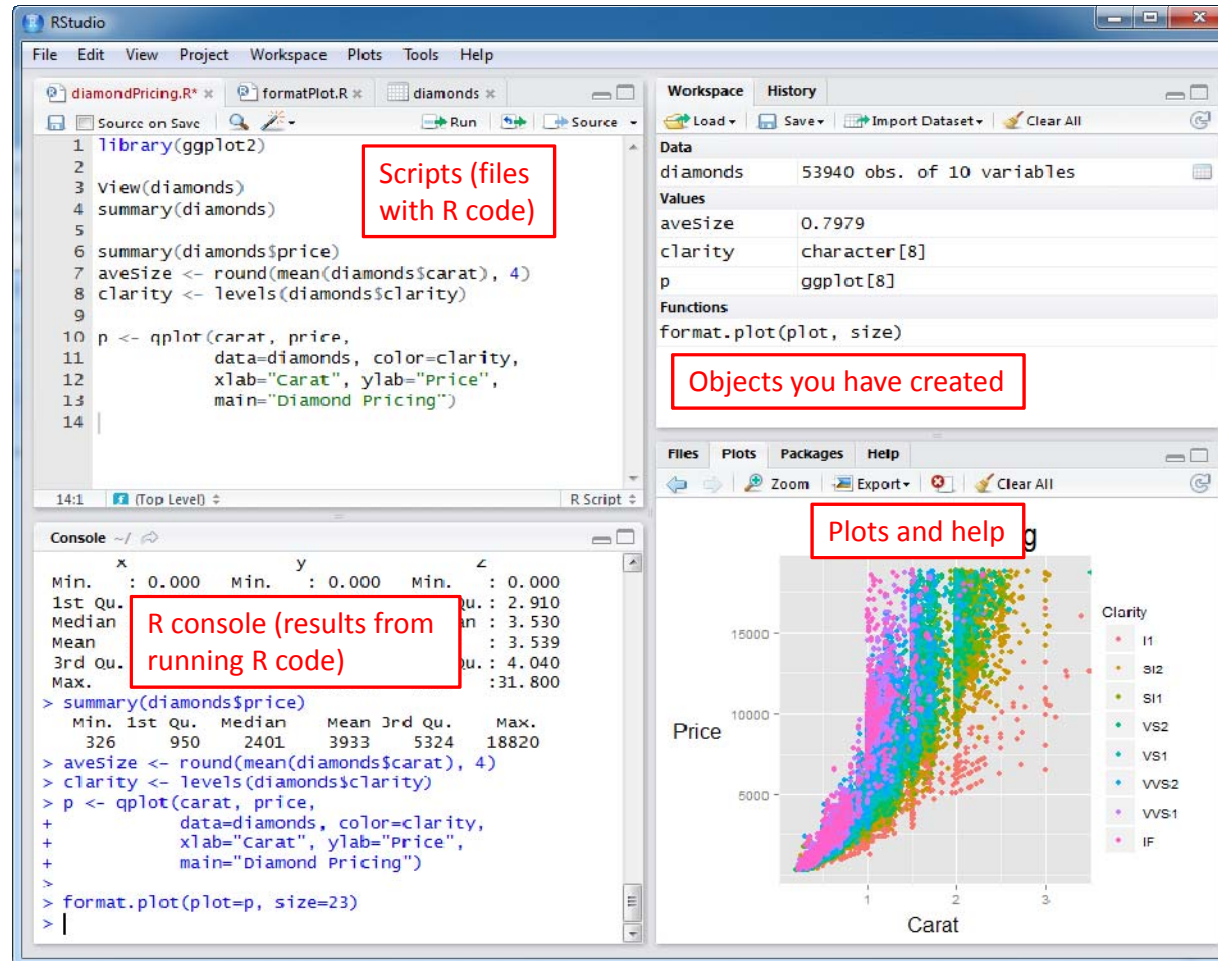
5. **Data frames:**

1. Like an Excel spreadsheet, each column gets a name and each columns holds a common data type

Running R with RStudio

- Four sections in Rstudio:
 1. **Console:** Where commands are run
 2. **Scripts:** Where commands are written & saved
 3. **Environments:** Where objects are stored
 4. **Plots & Help:** Where graphs are plotted and where functions can be looked up

Running R with RStudio



RStudio review

- Multiple files
- View variable values, color coding
- Built-in help
- Quick running of code
- Easy file handling
- Easy package installation
- Using projects, always use projects

Always use projects

- Click on top-right option
- Choose "Create Project" -> "Existing Directory" (or "New Project" if a directory does not exist)
- Select a directory, e.g. "Lectures" for me
- The project will be saved as a file in that directory called "Lectures.Rproj"
- Opening that will open the RStudio project
- Automatically sets the R working directory to that directory

