R1

Getting started

Covered in R1

- Installing R and RStudio
- Working with R and RStudio

1 Installing R

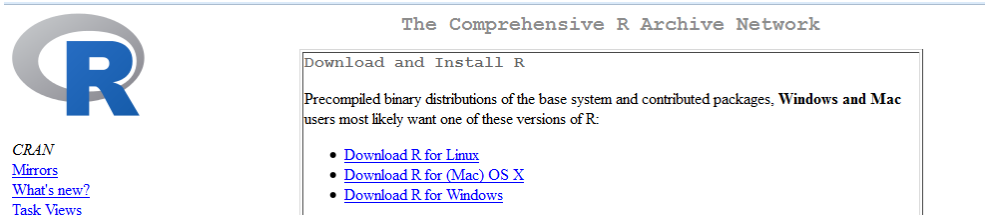
R is an open-source programming language that is increasingly being used in the actuarial profession with many applications in the world of statistics. If you haven't used R before then your first job is probably to install it on your computer or device. This section gives you a rough guide on how to download and install R, although you may find that the process is slightly different depending on the device you are using. You may also need to ask someone with administrative privileges for help (*eg* your *IT* Service Desk) if you are installing R on a work computer.

If you encounter any problems, then please do not contact ActEd for help. You will probably find a solution much more quickly if you search the internet. Many people have published installation guides as well as numerous problem solving tips in discussion forums.

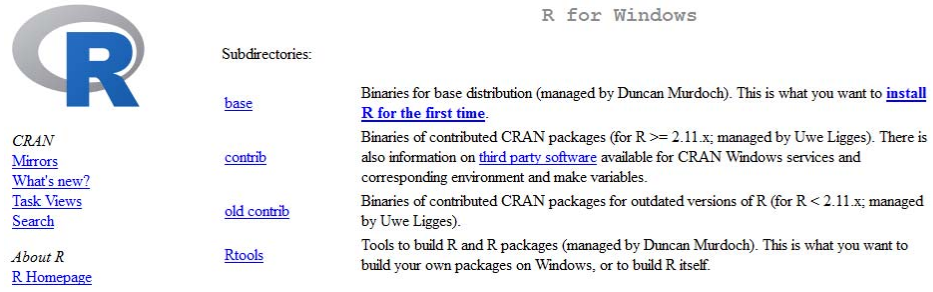
But here's our guide:

1. Visit **http://www.stats.bris.ac.uk/R/.** (If you are IT savvy then you can probably find the relevant file to download and install R without following the instructions below.)

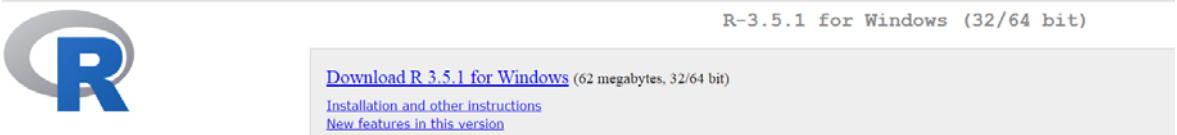
2. Click on "Download R for Windows" (assuming you are using a Windows-based system).



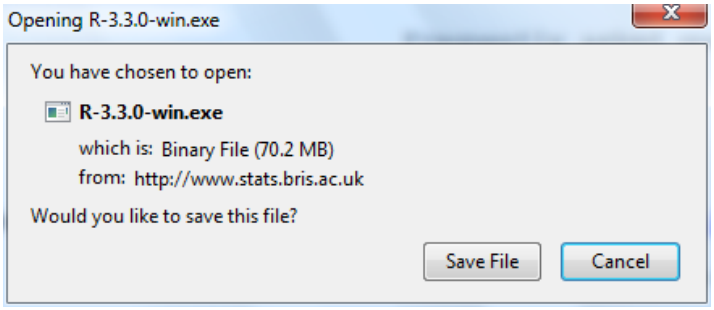
3. Click on "base".



4. Click on "Download R 3.5.1 for Windows" or whatever the latest version is.

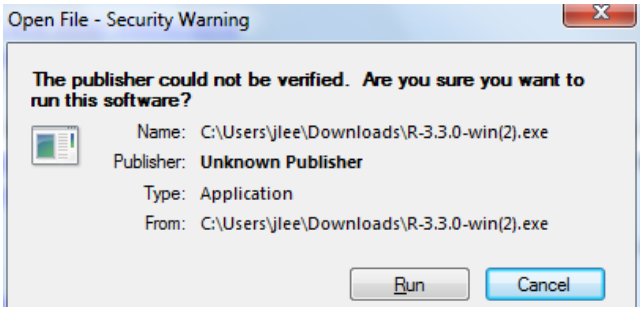


5. Next you will probably need to “Save File”:

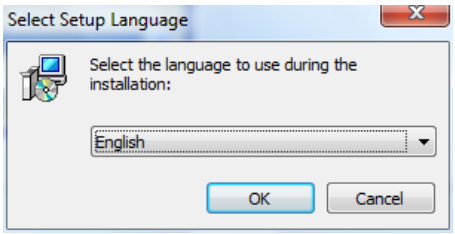


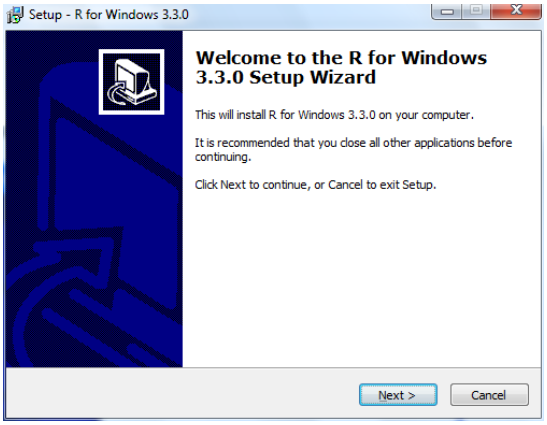
6. Find the downloaded file (*eg* R-3.3.0-win.exe) where it was saved and double click on it.

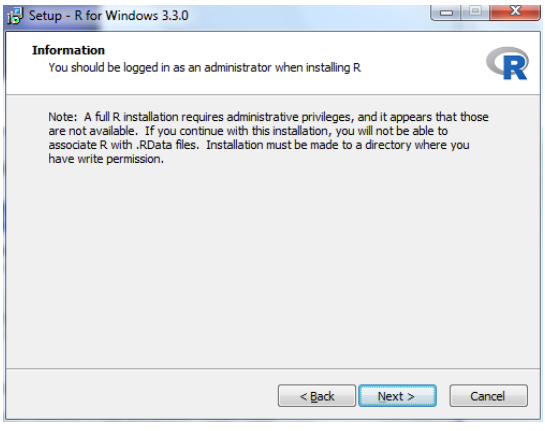
7. You may then have a security warning which you’ll need to dismiss with “Run”.

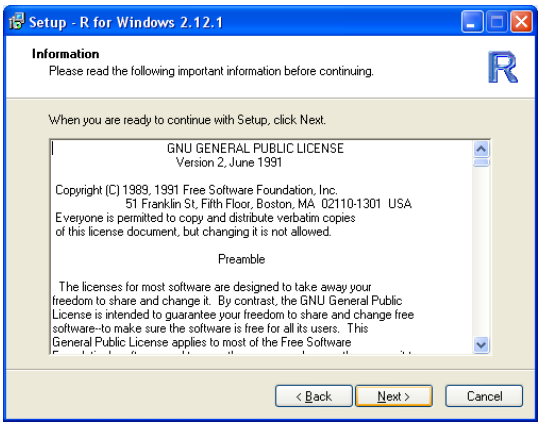


8. You can quickly progress through the next four pop-ups with one click of *OK* and three clicks of *Next*. However, please note the information in the third popup about administrator rights.

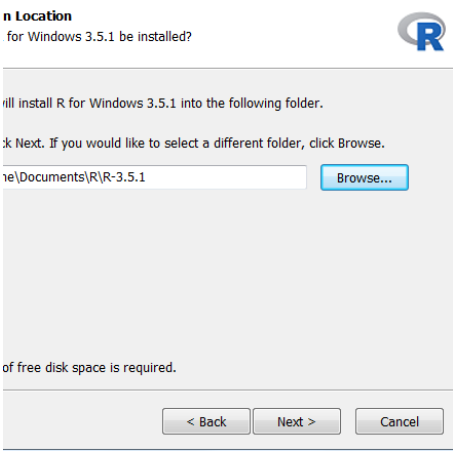




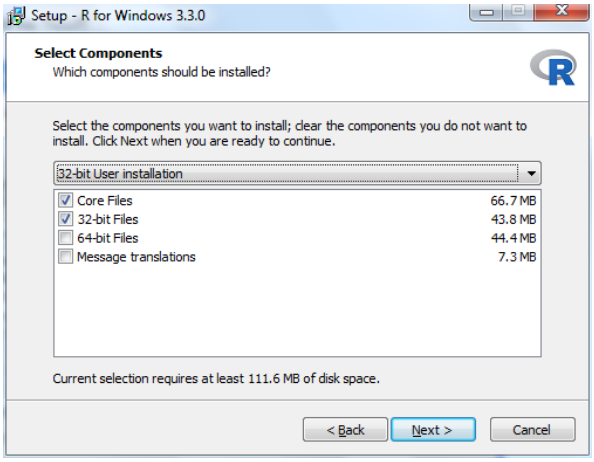




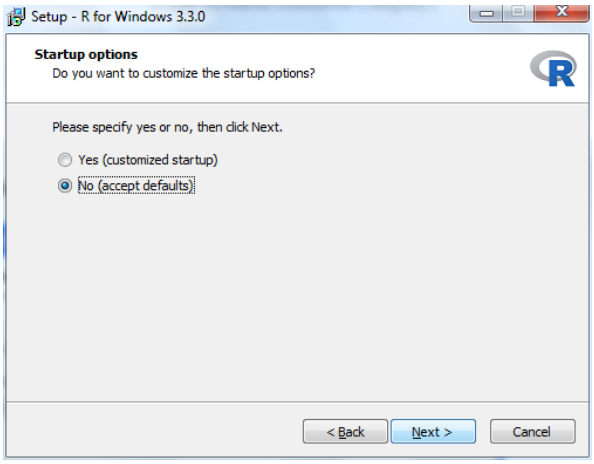
9. Choose where you want to install R (or use the default location) and click Next. If you are using a work computer, it may be easiest to use a folder in your personal area, for example in *My Documents*.



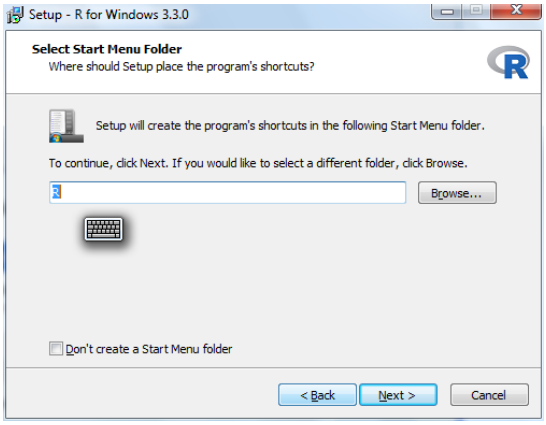
10. Select the installation type appropriate for your device.

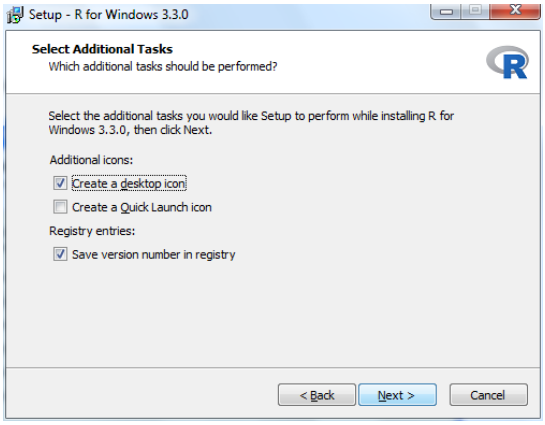


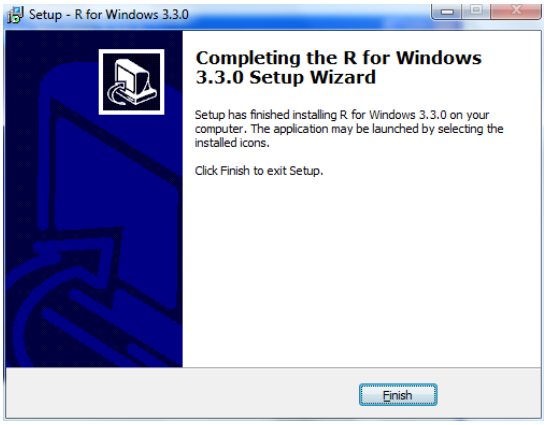
11. Click No and then Next to select the defaults.



12. A couple more clicks of *Next* (after changing the options if you wish) and then *Finish* and you're done.







13. You should then be able to run R using the desktop icon or via the Start menu.

    We will look at how to use R later.

2 Installing RStudio

We will have a very brief look at working directly in R in the next section, but most of the time we will instead be working in RStudio. This is a more user-friendly interface which you will probably find easier to use. So you now need to install this as well:

1. Visit https://www.rstudio.com/products/rstudio/download/#download and download the relevant open source RStudio Desktop for your operating system.

2. Run the .exe file and follow the installation instructions. (You may need to ask your IT service desk for help if you need administrator privileges.)

3. If you run into any difficulties then we recommend that you browse the internet for help.

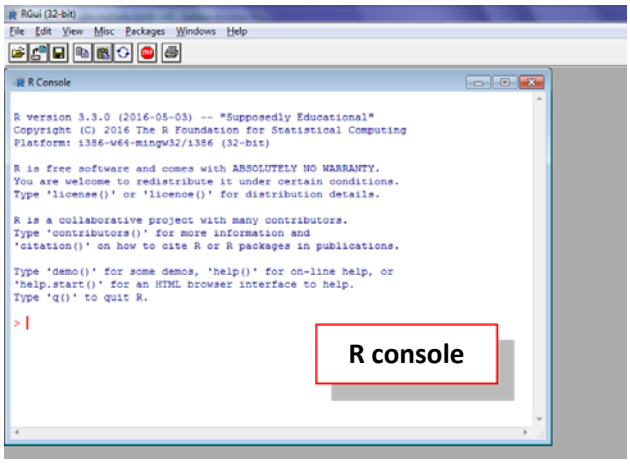
3 Working directly in R

Although we will be working most of the time in RStudio, it might be useful to have a quick look at R itself.

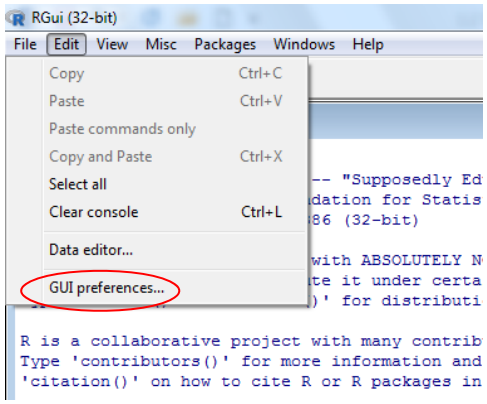
When you load up R you'll be greeted with R's **graphical user interface** (or GUI for short).

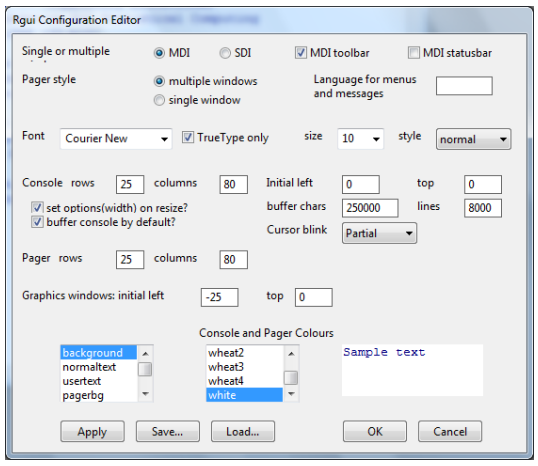
Inside this you'll see one open window which is called the **R console**.

Everything interesting happens in this window.



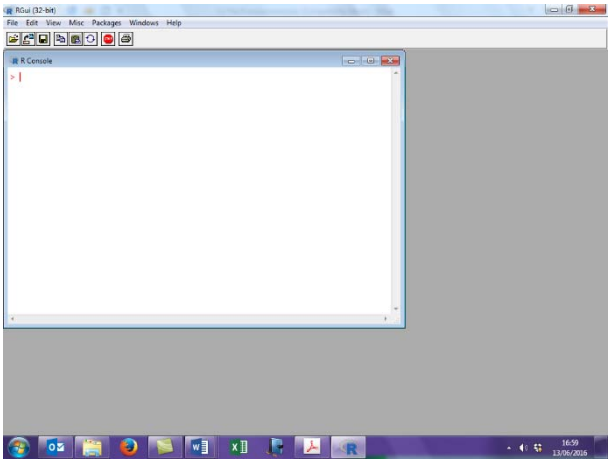
You can change the display preferences by **Edit/GUI preferences,** where you can change features like the **font**, **size** and **style** (normal, bold, italic) of the text:





Clearing the screen

We can clear the console window either by typing **CTRL+L (**or choosing clear console from the Edit menu):



Entering commands

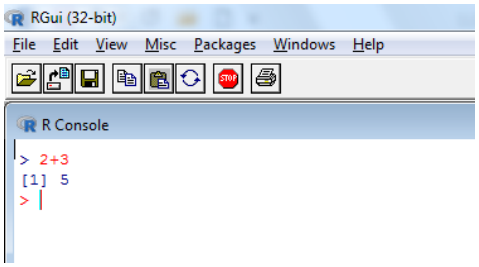
Unlike modern mouse driven programs, R is a **command based programming language**.

So rather than choosing options from menus or clicking on icons we'll be typing commands into the console window that tell R what we want it to do.

We'll then execute those commands by pressing enter.

R will return the results of our instruction in this console window.

For example if we type 2+3 and then press enter we'll get 5, as shown.



In this introduction, we will write the command you will enter in red and the results of executing that command in blue.

So for the above we would have written:

2+3

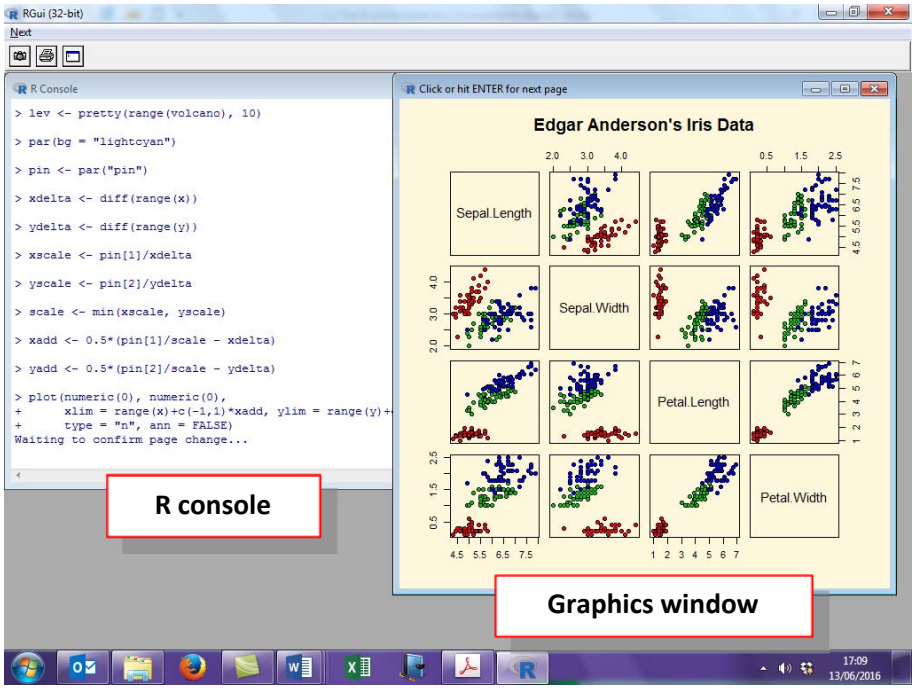
5

The trouble with R is going to be remembering the names of the commands, which is made harder by the fact that R is case sensitive…

We'll cover the essential commands later.

Graphics window

If we produce any graphics then they will appear in a separate window to the console, called the **graphics window**.



To see for yourself type:

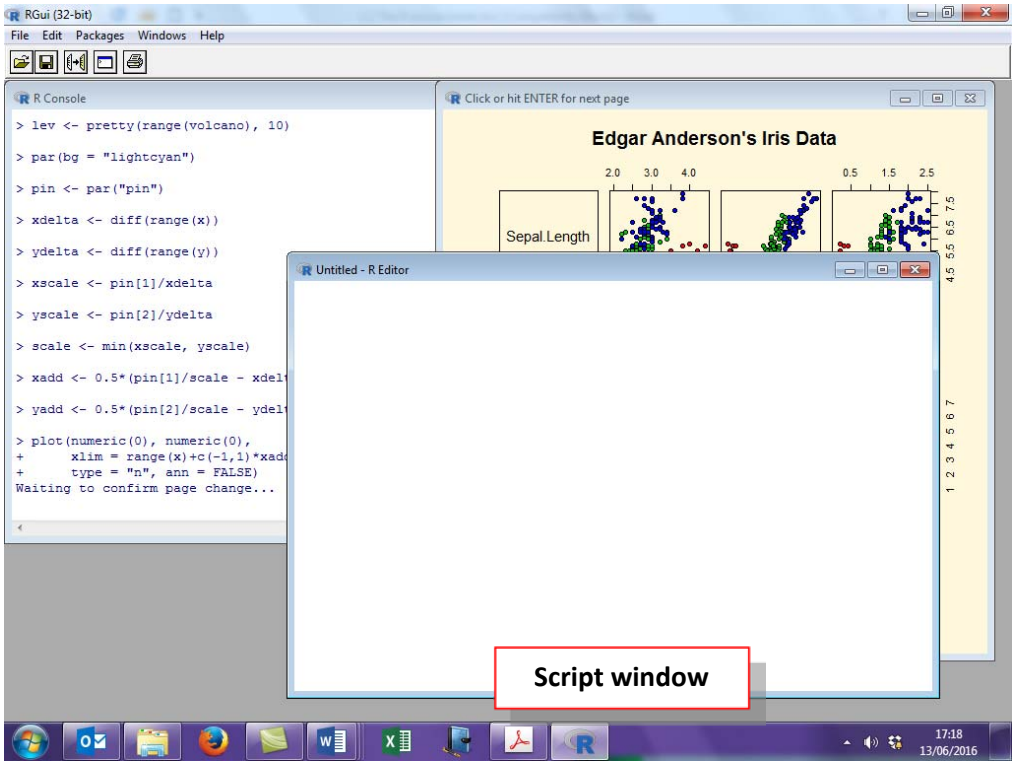
```
demo(graphics)
```

You'll need to hit enter each time to move onto the next graphic.

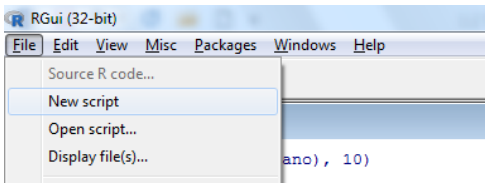
Use the standard windows icons to maximise, minimise or close the graphics window.

Script window

Rather than entering commands directly in the console window we can use another window called the **script window** (or **script editor**).



You can open this window first by clicking in the Console (to get the right menus at the top of the GUI), and then choosing *New script* from the File menu:



Just like a script for a play or movie which contains the lines that you read out – it has the lines of commands which can be "read out" or put into the console window either using copy and paste, or more quickly by clicking on the line and typing **CTRL+R**. We'll talk about scripts more later on.

Other interfaces

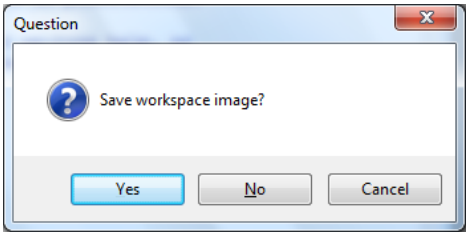
This is the basic graphics user interface (GUI) for R. As already mentioned, other packages are also available which offer user-friendly features, for example RStudio, which we will be using shortly. Another example is **R commander** which is another GUI which expands the menus to include standard commands such as importing data, producing graphs, carrying out tests and fitting models to the data set.

Quitting R

To end your session in R you could type the command **quit( )** or just **q( )** in the console.

Alternatively choose exit from the File menu or just click on the close window icon in the corner:

R will then ask you if you want to save the workspace image:

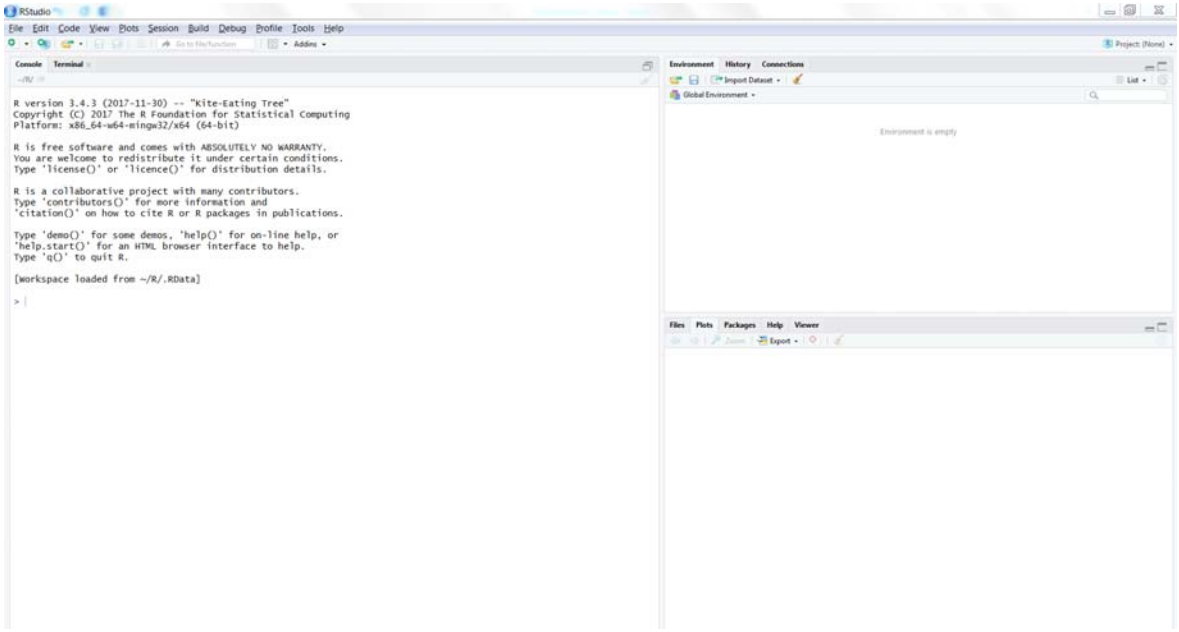


We'll talk about *workspaces* more later. Suffice to say, if you have created any objects (that is important things assigned a special name) that you want next time then you may wish to click on yes. If you haven't done anything you wish to save, the just click *No*.

4 Working in RStudio

Now you have had a quick look at R, it won't take long to become familiar with the basics of RStudio.

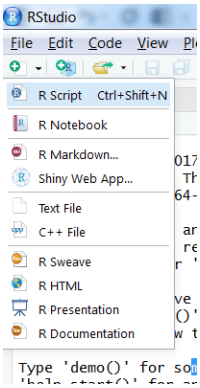
Start/run RStudio and you will probably see something like this:



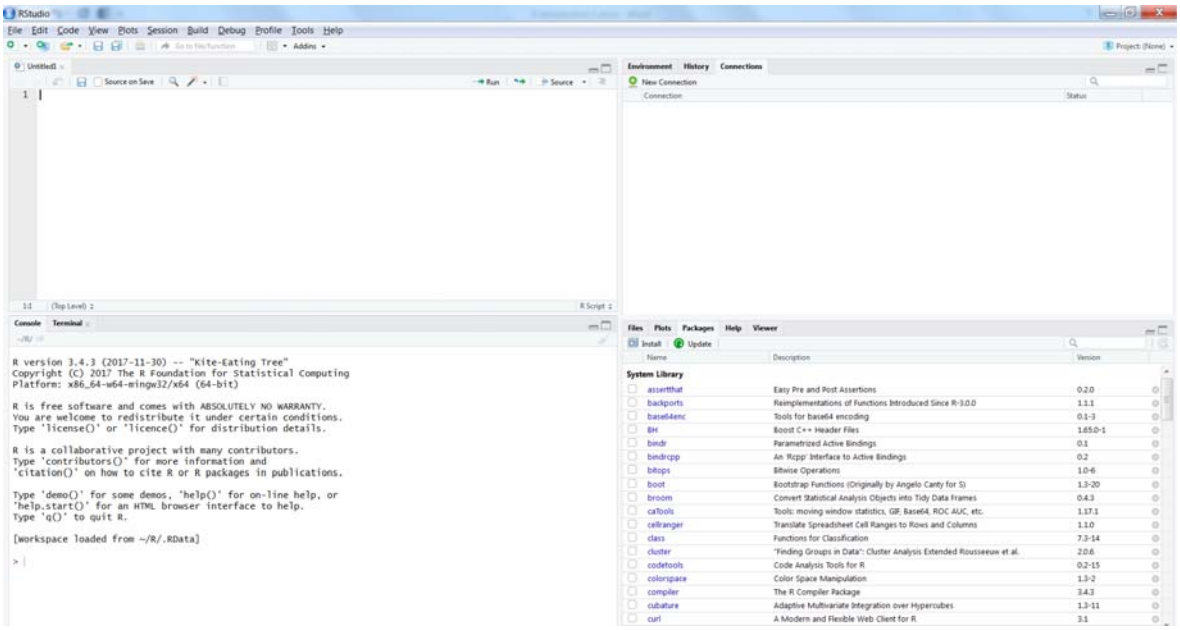
The panel on the left hand side is simply R's Console, which we have already met. The panel at the top on the right has a number of tabs. The first is the Environment (or Workspace) which will prove very useful as it displays the values of variables and contents of datasets that we are using. The second tab, History, not surprisingly displays a history of your work in R. We won't worry about the third tab for now.

The panel at the bottom on the right also has a number of useful tabs. One displays recently used files, allowing you to access them quickly. Another, *Plots*, is simply the graphics window and will display the plots/graphs that you ask R to produce. There are also important tabs called *Packages* and *Help* which we will look at later.

If you open up a Script in RStudio, using File, New File, R Script, or by clicking on the drop-down arrow and then R Script (found in the top right-hand corner of the screen), then RStudio will display all four panels neatly arranged.



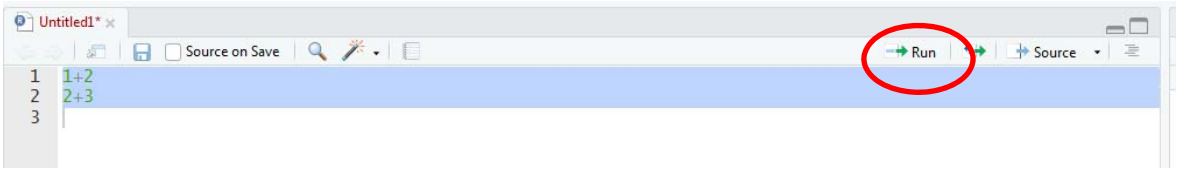
You can drag the edges of the panels to size them as you wish:



Commands

Just like in R, to clear the Console press Ctrl L from within the prompt of the Console.

To run lines of codes from the Script window, press Ctrl Enter (and not Ctrl R). Alternatively use the *Run* Button on the top bar of the Script window.



Quitting RStudio

You can exit RStudio in the same way you exit R, or just press Ctrl Q.

5 Summary

Key terms

GUI	Graphics User Interface The name given to the appearance of the R program on your computer.
Console window	The window where commands are entered and then executed by hitting the enter key.
Graphics window	The window where graphics are displayed. You can then export these to put in any documentation you produce.
Script window	A window where commands can be written but not executed. We can transfer them to the console window and execute them using CTRL+R. This will be covered in a later chapter.

Menus

R	**RStudio**	
File, Exit	File, Quit Session	Exit/quit the R program
Edit/Clear console	Edit/Clear console	Clear the console window
Edit/GUI preferences	Tools, Global Options, Appearance	To change the font size, type, etc

Key commands

R	**RStudio**	
Ctrl L	Ctrl L	Clear the console
quit() or q()	quit() or q() or Ctrl Q	Quit the program
Ctrl R	Ctrl Enter	Used in a Script window to run a line or selected lines of code

6 Have a go

You will only get proficient at R by practising.

Try the following in R or RStudio:

- Start a new session
- Clear the console screen
- Use R to calculate 3+5 (or something more daring)
- Quit R using a command, not the menu or windows icons.