

R2

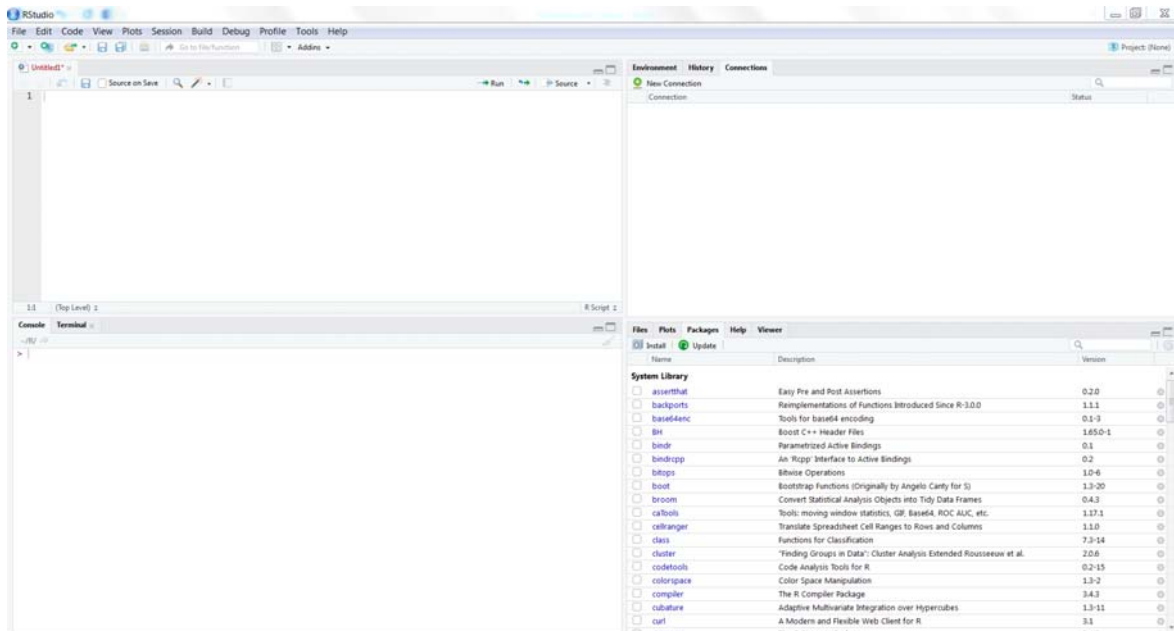
Basic arithmetic

Covered in R2

- Using R for basic arithmetic
- The index numbering in the R Console
- Scrolling back in the Console
- Non-numeric output

1 Arithmetic operators

Load up RStudio and clear the Console (using Ctrl L from within the Console).



Recall from the previous chapter that R is a command based programming language.

So we have to type in commands rather than clicking on icons or through menus.

In the Console you'll see a little greater than symbol which is the prompt:

>

We'll type in a command at the prompt and then press enter to ask R to execute the command.

R will then return the result, or produce the graphical output or send the output to a file or device.

Throughout this and later chapters we will use red for the commands we enter and blue for the output/results that we get by executing that command.

Addition

So let's get R to carry out some simple arithmetic. Type:

```
2 + 3
```

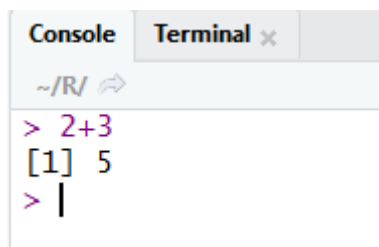
We hit enter to execute this command.

R returns as the output to this command the correct answer of:

```
5
```

Index numbers

However note that the output line is preceded by a [1]:



```
Console Terminal x
~/R/ ↵
> 2+3
[1] 5
> |
```

This is an index number of the first answer on that line.

If the output consists of many values over several lines then each new line starts with the index number of the first element on that line.

So supposing I had five answers, three answers on the 1st line (say 5, 7 and 2) and two on the 2nd line (say 8 and 3). Then the 1st line would have [1] and the 2nd line would have [4], eg:

```
[1] 5 7 2
```

```
[4] 8 3
```

Subtraction

Similarly we can subtract numbers. Enter the following:

```
-3 -- 5
```

```
2
```

Spaces

Note that R ignores spaces so typing the same command with lots of spaces will give the same answer. Try it again with spaces between the numbers, signs and operator:

```
- 3 - - 5
```

```
2
```

Spaces are often useful to help us read complicated commands.

Multiplication and division

Just like Excel and other software, multiplication uses the asterisk and division uses the forward slash:

```
3 * 2 - 1 / 4
```

```
5.75
```

We can see that R uses algebraic logic to calculate expressions – that is it calculates multiplication and division before addition and subtraction.

So to do something different we'll need to use brackets:

```
3*(2 - 1/4)
```

```
5.25
```

Note that RStudio automatically enters the closed bracket for you.

Editing previous commands

Suppose you make a mistake – and you actually wanted to calculate $1/5$ not $1/4$.

Rather than retyping the expression again, you can use the up arrows key \uparrow to move back to previous commands and then edit that command and re-execute it.

Try it out yourself. Use \uparrow to bring up the previous command then \leftarrow to go back into that command to edit it to read:

```
3*(2-1/5)
```

```
5.4
```

Alternatively you could use the mouse to copy and paste the expression.

Powers

Powers can be obtained using the \wedge key (or even a double asterisk, $**$):

```
2^3
```

```
8
```

```
2**3
```

```
8
```

Non-numeric outputs

Let's look at some non-numeric outputs you might see in the future. Try entering the following:

5/0

You'll get the output:

Inf

which, unsurprisingly, stands for infinity.

However if we try to calculate:

0/0

we get the output:

NaN

which isn't a misspelling of naan but stands for "Not a Number", ie it's undefined.

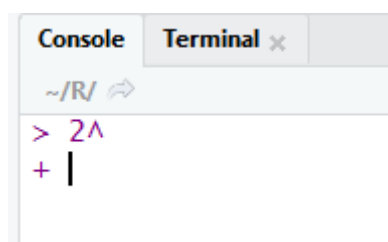
Mistakes and correcting them

Finally, what happens if we make a **mistake**?

Suppose we execute the following incomplete command:

2^

R realises that we have clearly not finished our command and so it helpfully puts a **+ prompt** to say "and...":



We can then enter the bit we've forgotten:

3

8

This + prompt also appears if our expression goes onto the next line or we can use this feature to deliberately split up longer expressions over several lines to make it easier to read.

If you make a mistake and want to **cancel** what you are doing and type something else then just press the *Esc* button.

2 Summary

Key terms

Prompt	<p>The icon that appears to the left of each line</p> <p>> means R awaits the next command</p> <p>+ means R is expecting more input for the current command.</p>
Index number	<p>The start of each line of output has an index number eg [1]</p> <p>This gives the position of the first output on that line.</p>
Inf	An output from R which is infinite
NaN	An output from R which is “not a number”, ie undefined

Key commands

+	add
-	subtract
*	multiply
/	divide
^	power
**	power
↑	cycle through previous commands
ESC	stop a command from finishing executing

3 Have a go

You will only get proficient at R by practising.

1. Without referring to the previous chapter, try the following:

- start a new session
- clear the console screen.

2. Use R to calculate the following:

$$3--8$$

$$-7+5$$

$$3 \times (2+5)$$

$$4^5$$

$$8 \div 0$$

$$\frac{1 - 1.08^{-3}}{0.08}$$

3. Quit R using an R command, not using the menu or windows icons.

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