

# R literacy for digital soil mapping. Part 4

Soil Security Laboratory

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## 1 Graphics: the basics

### 1.1 Introduction to the plot function

It is easy to produce publication-quality graphics in R. There are many excellent R packages at your finger tips to do this; some of which include `lattice` and `ggplot2` (see the help files and documentation for these). While in the course of this workshop we will revert to using these “high end” plotting packages, some fundamentals of plotting need to be bedded down. Therefore in this section we will focus on the simplest plots—those which can be produced using the `plot` function, which is a base function that come with R. This function produces a plot as a side effect, but the type of plot produced depends on the type of data submitted. The basic plot arguments, as given in the help file for `plot.default` are:

```
plot(x, y = NULL, type = 'p', xlim = NULL, ylim = NULL, log =
'', main = NULL, sub = NULL, xlab = NULL, ylab = NULL, ann =
par('ann'), axes = TRUE, frame.plot = axes, panel.first = NULL,
panel.last = NULL, asp = NA, ...)
```

To plot a single vector, all we need to do is supply that vector as the only argument to the function. This plot is shown in Figure 1.

```
z <- rnorm(10)
plot(z)
```

In this case, R simply plots the data in the order they occur in the vector. To plot one variable versus another, just specify the two vectors for the first two arguments. (see Figure 2)

```
x <- -15:15
y <- x^2
plot(x, y)
```

And this is all it takes to generate plots in R, as long as you like the default settings. Of course, the default settings generally will not be sufficient for publication- or presentation-quality graphics. Fortunately, plots in R are very flexible. The table below shows some of the more common arguments to the `plot` function, and some of the common settings. For many more arguments, see the help file for `par` or consult some online materials where

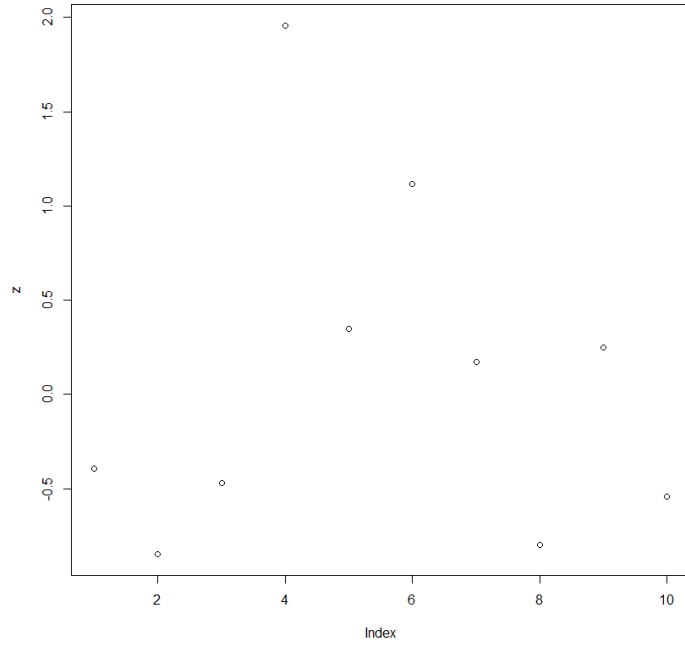


Figure 1: Your first plot

<http://www.statmethods.net/graphs/> is a useful starting point.

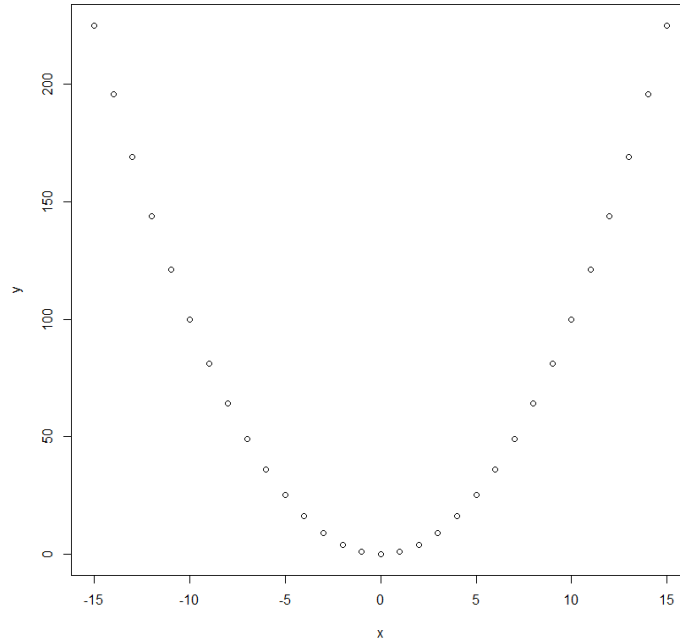


Figure 2: Your second plot

Table 1: Some of the more commonly used `plot` arguments

| Argument          | Common options   | Additional information  |
|-------------------|--|---|
| <code>col</code>  | <code>'red'</code><br><code>'blue'</code><br>1<br>through<br>657 | Colour of plotting symbols and lines. Type <code>colors()</code> to get list. You can also mix your own colours. See “color specification” in the help file for <code>par</code> or <a href="http://research.stowers-institute.org/efg/R/Color/Chart/">http://research.stowers-institute.org/efg/R/Color/Chart/</a> |
| <code>bg</code>   | <code>'red'</code><br><code>'blue'</code><br>many more           | Colour of fill for some plotting symbols (see below)  |
| <code>las</code>  | 0<br>1<br>2<br>3   | Rotation of numeric axis labels   |
| <code>main</code> | Any character string,<br>e.g., <code>'plot 1'</code>             | Adds a main title at the top of the plot  |
| <code>log</code>  | <code>'x'</code><br><code>'y'</code><br><code>'xy'</code>        | For making logarithmic scaled axes.   |

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Table 1 – continued from previous page

| Argument   | Common options   | Additional information   |
|------------|--|--|
| lty        | 0<br>1 or ‘‘solid’’<br>2 or ‘‘dashed’’<br>3 or ‘‘dashed’’<br>through<br>6                | Line types   |
| pch        | 0<br>through<br>25   | Plotting symbols. See below for symbols.<br>Can also use any single character, e.g., ‘‘v’’,<br>or ‘‘X’’ etc. |
| type       | ‘‘p’’ for points<br>‘‘l’’ for line<br>‘‘b’’ for both<br>‘‘o’’ for over<br>‘‘n’’ for none | ‘‘n’’ can be handy for setting up a plot<br>that you later add data to                                       |
| xlab, ylab | Any character string,<br>e.g., ‘‘soil depth’’  | For specifying axis labels   |
| xlim, ylim | Any two element vector,<br>e.g., c(0-100)<br>c(-10-10)<br>c(55-0)                        | List higher value first to reverse axis  |

Use of some of the arguments in Table 1 is shown in the following example (Figure 3).

```
plot(x, y, type = "o", xlim = c(-20, 20), ylim = c(-10, 300), pch = 21, col = "red",
     bg = "yellow", xlab = "The X variable", ylab = "X squared")
```

The `plot` function is effectively vectorised. It accepts vectors for the first two arguments (which specify the x and y position of your observations), but can also accept vectors for some of the other arguments, including `pch` or `col`. Among other things, this provides an easy way to produce a reference plot demonstrating R’s plotting symbols and lines. If you use R regularly, you may want to print a copy out (or make your own)—see Figure 4.

```
plot(1:25, rep(1, 25), pch = 1:25, ylim = c(0, 10), xlab = "", ylab = "", axes = FALSE)
text(1:25, 1.8, as.character(1:25), cex = 0.7)
text(12.5, 2.5, "Default", cex = 0.9)
points(1:25, rep(4, 25), pch = 1:25, col = "blue")
text(1:25, 4.8, as.character(1:25), cex = 0.7, col = "blue")
text(12.5, 5.5, "Blue", cex = 0.9, col = "blue")
points(1:25, rep(7, 25), pch = 1:25, col = "blue", bg = "red")
text(1:25, 7.8, as.character(1:25), cex = 0.7, col = "blue")
text(10, 8.5, "Blue", cex = 0.9, col = "blue")
text(15, 8.5, "Red", cex = 0.9, col = "red")
```

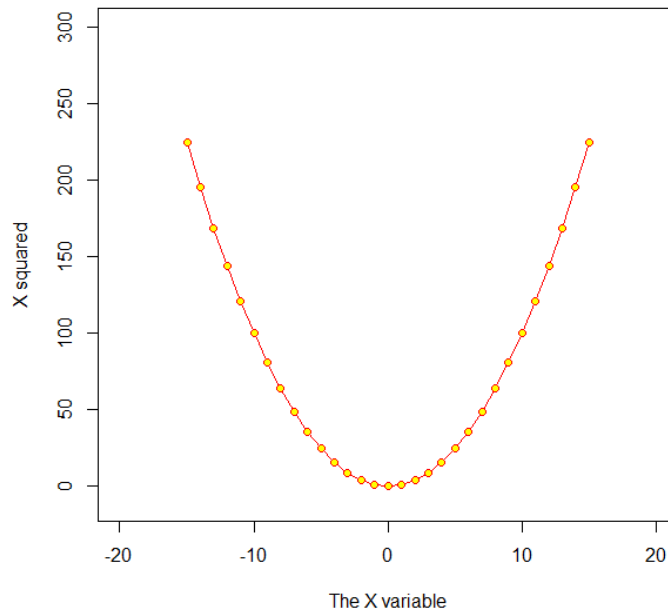


Figure 3: Your first plot using some of the `plot` arguments

`box()`

## 1.2 Exercises

1. Produce a data frame with two columns:  $x$ , which ranges from  $-2\pi$  to  $2\pi$  and has a small interval between values (for plotting), and  $\cos(x)$ . Plot the  $\cos(x)$  vs.  $x$  as a line. Repeat, but try some different line types or colours.
2. Read in the data from the `ithir` package called ‘`USYD_dIndex`’, which contains some observed soil drainage characteristics based on some defined soil colour and drainage index (first column). In the second column is a corresponding prediction which was made by a soil spatial prediction function. Plot the observed drainage index (`DI_observed`) vs. the predicted drainage index (`DI_predicted`). Ensure your plot has appropriate axis limits and labels, and a heading. Try a few plotting symbols and colours. Add some informative text somewhere. If you feel inspired, draw a line of concordance i.e. a 1:1 line on the plot.

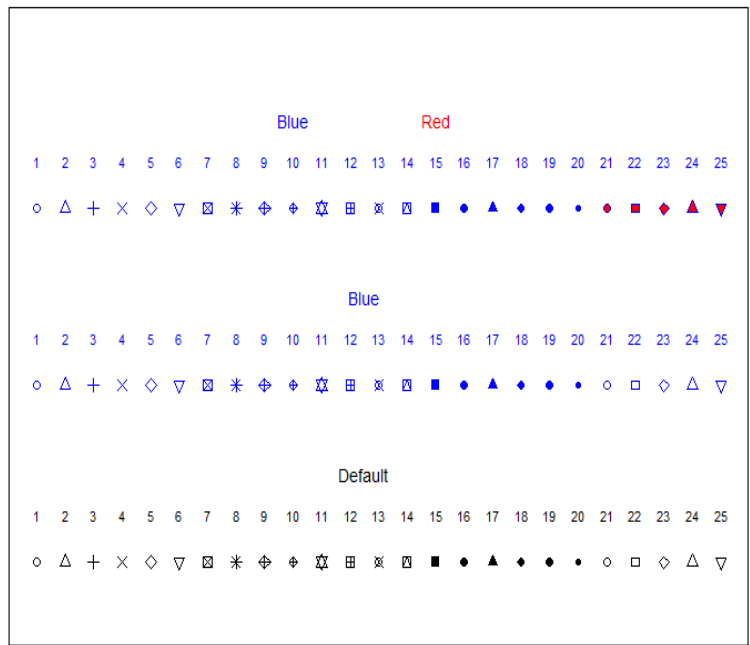


Figure 4: Illustration of some of the `plot` arguments and symbols