

Part 1: R Foundations

(b) Lists

Recap - R Data Types

	Homogenous	Heterogenous
1d	Atomic Vector	List
2d	Matrix	Data Frame/Tibble
nd	Array	

- ▶ Lists are different from atomic vectors because their elements can be of any type, including lists.
- ▶ `list()` creates a list, instead of `c()`

Creating a list

```
x <- list(1:3, "a", c(T,F,T), c(1.2, 1.3, 1.4))  
str(x)
```

```
## List of 4  
## $ : int [1:3] 1 2 3  
## $ : chr "a"  
## $ : logi [1:3] TRUE FALSE TRUE  
## $ : num [1:3] 1.2 1.3 1.4
```

Subsetting Lists

- ▶ Works in the same way as subsetting an atomic vector
- ▶ Using `[` will always return a list
- ▶ `[[` and `$` pull out the contents of a list
- ▶ If list `x` is a train carrying objects, then `x[[5]]` is the object in car 5, `x[4:6]` is a train of cars 4-6" @RLangTip



Figure 1: A list and its contents

Example

```
x <- list(1:3, c(T,F,T))  
x[1]
```

```
## [[1]]  
## [1] 1 2 3
```

```
str(x[1])
```

```
## List of 1  
## $ : int [1:3] 1 2 3
```

```
x[[1]]
```

```
## [1] 1 2 3
```

```
str(x[[1]])
```

```
## int [1:3] 1 2 3
```

Naming list elements

```
x <- list(e11=1:3, e12=c(T,F,T))  
x
```

```
## $e11  
## [1] 1 2 3  
##  
## $e12  
## [1] TRUE FALSE TRUE
```

The \$ operator

- ▶ \$ is a shorthand operator, where x\$y is equivalent to x[["y",exact=FALSE]]
- ▶ Often used to access variables in a data frame
- ▶ \$ does partial matching

```
x
```

```
## $e11
## [1] 1 2 3
##
## $e12
## [1] TRUE FALSE TRUE
```

```
x$e11
```

```
## [1] 1 2 3
```

```
x$e12
```

```
## [1] TRUE FALSE TRUE
```

Visualising Lists

- ▶ Lists have rounded corners.
- ▶ Atomic vectors have square corners
- ▶ Children are drawn inside their parent, and have a slightly darker background

```
y <- list(c(1,2),c(3,4))
```

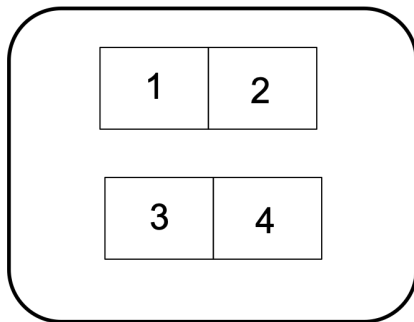
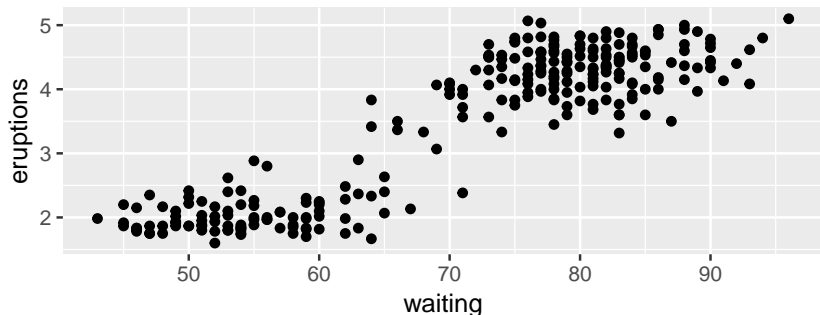


Figure 2: A list and its contents

Using Lists

- ▶ Are the basis of many S3 objects that are returned from regression functions (e.g. linear regression)
- ▶ The basis for data frames (the \$ operator identifies columns)

```
ggplot(data=faithful)+  
  geom_point(aes(x=waiting,y=eruptions))
```



lm function - Returns a list of 12

```
mod <- lm(eruptions ~ waiting, data=faithful)
mod$coefficients
```

```
## (Intercept)      waiting
## -1.87401599  0.07562795
```

```
class(mod)
```

```
## [1] "lm"
```

```
coefficients(mod)
```

```
## (Intercept)      waiting
## -1.87401599  0.07562795
```

```
str(coefficients(mod))
```

```
##  Named num [1:2] -1.874 0.0756
##  - attr(*, "names")= chr [1:2] "(Intercept)" "waiting"
```