Chapter 4: Matrices

Matrices store data

Section 4.1: Creating matrices

Under the hood, a matrix is a special kind of vector with two dimensions. Like a vector, a matrix can only have one data class. You can create matrices using the `matrix` function as shown below.

```
matrix(data = 1:6, nrow = 2, ncol = 3)
##      [,1] [,2] [,3]
## [1,]    1    3    5
## [2,]    2    4    6
```

As you can see this gives us a matrix of all numbers from 1 to 6 with two rows and three columns. The `data` parameter takes a vector of values, `nrow` specifies the number of rows in the matrix, and `ncol` specifies the number of columns. By convention the matrix is filled by column. The default behavior can be changed with the `byrow` parameter as shown below:

```
matrix(data = 1:6, nrow = 2, ncol = 3, byrow = TRUE)
##      [,1] [,2] [,3]
## [1,]    1    2    3
## [2,]    4    5    6
```

Matrices do not have to be numeric – any vector can be transformed into a matrix. For example:

```
matrix(data = c(TRUE, TRUE, TRUE, FALSE, FALSE, FALSE), nrow = 3, ncol = 2)
##      [,1]  [,2]
## [1,] TRUE FALSE
## [2,] TRUE FALSE
## [3,] TRUE FALSE
matrix(data = c("a", "b", "c", "d", "e", "f"), nrow = 3, ncol = 2)
##      [,1] [,2]
## [1,] "a"  "d"
## [2,] "b"  "e"
## [3,] "c"  "f"
```

Like vectors matrices can be stored as variables and then called later. The rows and columns of a matrix can have names. You can look at these using the functions `rownames` and `colnames`. As shown below, the rows and columns don't initially have names, which is denoted by `NULL`. However, you can assign values to them.

```
mat1 <- matrix(data = 1:6, nrow = 2, ncol = 3, byrow = TRUE)
rownames(mat1)
## NULL
colnames(mat1)
## NULL
rownames(mat1) <- c("Row 1", "Row 2")
colnames(mat1) <- c("Col 1", "Col 2", "Col 3")
mat1
##       Col 1 Col 2 Col 3
## Row 1     1     2     3
## Row 2     4     5     6
```

It is important to note that similarly to vectors, matrices can only have one data type. If you try to specify a matrix with multiple data types the data will be coerced to the higher order data class.

The `class`, `is`, and `as` functions can be used to check and coerce data structures in the same way they were used on the vectors in class 1.

```
class(mat1)
## [1] "matrix"
is.matrix(mat1)
## [1] TRUE
as.vector(mat1)
## [1] 1 4 2 5 3 6
```