

# Introduction to coding with R

## Part II

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# Let's recap

- How many dimensions do vectors have?
- What class of data can we store in a vector?
- Can vector elements be different types?
- How do we create a new vector?
- How do we access vector elements?

# Using the name as index

```
x <- c(1, 3, 10)
names(x)
```

```
## NULL
```

```
x <- c("number_a" = 10, "number_b" = 50, "number_c" = 100)
x
```

```
## number_a number_b number_c
##          10         50        100
```

```
names(x)
```

```
## [1] "number_a" "number_b" "number_c"
```

```
x <- c(10, 50, 100)
```

```
names(x) <- c("number_a", "number_b", "number_c")  
x
```

```
## number_a number_b number_c  
##          10         50        100
```

```
x["number_b"]
```

```
## number_b  
##          50
```

```
x[c("number_a", "number_c")]
```

```
## number_a number_c  
##          10        100
```

# Using logical evaluation as index

```
x <- seq(1:10)
x
```

```
## [1] 1 2 3 4 5 6 7 8 9 10
```

```
x < 5
```

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

```
x[x < 5]
```

```
## [1] 1 2 3 4
```

```
x <- c("a", "a", "b", "c", "c", "c")
```

```
x == "c"
```

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

```
x[x == "c"]
```

```
## [1] "c" "c" "c"
```

# Your turn!

The following vector shows the temperature in New York during the last week:

```
temperature_nyc <- c("Monday" = 55,  
                      "Tuesday" = 55,  
                      "Wednesday" = 66,  
                      "Thursday" = 50,  
                      "Friday" = 48,  
                      "Saturday" = 45,  
                      "Sunday" = 47)
```

- Select the temperatures from the first 3 days.
- Select the temperatures from Tue, Thu and Sat.
- What days registered temperatures above the mean?

# How to modify a vector?

- Adding a new element

```
x <- c("a", "b", "c")  
x
```

```
## [1] "a" "b" "c"
```

```
x[4] <- "d"  
x
```

```
## [1] "a" "b" "c" "d"
```



- Removing an element

```
x
```

```
## [1] "a" "b" "c" "d"
```

```
x[-2]
```

```
## [1] "a" "c" "d"
```

```
x <- x[-2]  
x
```

```
## [1] "a" "c" "d"
```

# Your turn!

Using the vector:

```
fruits <- c("apples" = 1,  
            "cherries" = 10,  
            "mangos" = 7)
```

- Add a new fruit to the vector
- Remove the cherries

- Replacing an element by index

```
x
```

```
## [1] "a" "c" "d"
```

```
x[1] <- "m"  
x
```

```
## [1] "m" "c" "d"
```

- Replacing an element by logical evaluation

```
x
```

```
## [1] "m" "c" "d"
```

```
x[x == "d"] <- "e"  
x
```

```
## [1] "m" "c" "e"
```

# Exercise

Using the vector:

```
fruits <- c("apples" = 1,  
            "cherries" = 10,  
            "mangos" = 7)
```

- Select all fruits with values bigger than 5
- Replace the apples number with 4

# Matrices

# Creating a matrix

Matrices are objects with elements arranged in a two-dimensional layout.

```
my_matrix <- matrix(data = 1:12, nrow = 4)
my_matrix
```

```
##      [,1] [,2] [,3]
## [1,]    1    5    9
## [2,]    2    6   10
## [3,]    3    7   11
## [4,]    4    8   12
```

- rows and columns
- All elements must be the same type

```
my_matrix <- matrix(data = 1:12, ncol = 4)
my_matrix
```

```
##      [,1] [,2] [,3] [,4]
## [1,]    1    4    7   10
## [2,]    2    5    8   11
## [3,]    3    6    9   12
```



```
my_matrix <- matrix(data = 1:12,  
                    ncol = 4,  
                    byrow = TRUE)  
my_matrix
```

```
##      [,1] [,2] [,3] [,4]  
## [1,]    1    2    3    4  
## [2,]    5    6    7    8  
## [3,]    9   10   11   12
```

# Operations with matrices

# Arithmetic operations

```
my_matrix + 10
```

```
##           [,1] [,2] [,3] [,4]
## [1,]      11  12  13  14
## [2,]      15  16  17  18
## [3,]      19  20  21  22
```

```
my_matrix * 2
```

```
##           [,1] [,2] [,3] [,4]
## [1,]         2   4   6   8
## [2,]        10  12  14  16
## [3,]        18  20  22  24
```

# Arithmetic operations

```
matrix1 <- matrix(1:6, nrow = 2, ncol = 3)  
matrix2 <- matrix(7:12, nrow = 2, ncol = 3)
```

```
matrix1
```

```
##      [,1] [,2] [,3]  
## [1,]    1    3    5  
## [2,]    2    4    6
```

```
matrix1 + matrix2
```

```
##      [,1] [,2] [,3]  
## [1,]    8   12   16  
## [2,]   10   14   18
```

```
matrix2
```

```
##      [,1] [,2] [,3]  
## [1,]    7    9   11  
## [2,]    8   10   12
```

# Your turn!

- Create a matrix with numbers 101:125, arrange them in 5 rows.
- Add 10 units, then multiply by 3

# How do we access matrices elements?

```
matrix1 <- matrix(101:125, nrow = 5)  
matrix1
```

```
##      [,1] [,2] [,3] [,4] [,5]  
## [1,]  101  106  111  116  121  
## [2,]  102  107  112  117  122  
## [3,]  103  108  113  118  123  
## [4,]  104  109  114  119  124  
## [5,]  105  110  115  120  125
```

```
matrix1[1:7]
```

```
## [1] 101 102 103 104 105 106 107
```

# How do we access matrices elements?

```
matrix1[1,2]
```

```
## [1] 106
```

```
matrix1[1:2,1:2]
```

```
##      [,1] [,2]  
## [1,] 101 106  
## [2,] 102 107
```

# Your turn!

- How would you select the number 120 from the matrix?
- How would you select the last two columns?



# Some extra information about packages

# Two main repositories

## CRAN

- More than 19000 packages
- Topics: Statistics, machine learning, plotting, economy, spatial data, databases, phylogenetics, natural language processing, ...
- <https://cran.rstudio.com> > Packages
- How do we install packages from CRAN?

```
install.packages("ggplot2")
```

# Two main repositories

## Bioconductor

- Software, Annotation, and Experiment packages
- 2183 software packages
- <https://bioconductor.org>
- How do we install packages from Bioconductor?

```
install.packages("BiocManager")  
BiocManager::install("Biostrings")
```

# Installing packages from the source

- Main source of code: GitHub
- Under development packages, small packages, in preparation for submitting to CRAN or Bioconductor...
- How do we install packages from GitHub?

```
install.packages("remotes")  
remotes::install_github("nstrayer/datadrivencv")
```

**Thanks!**

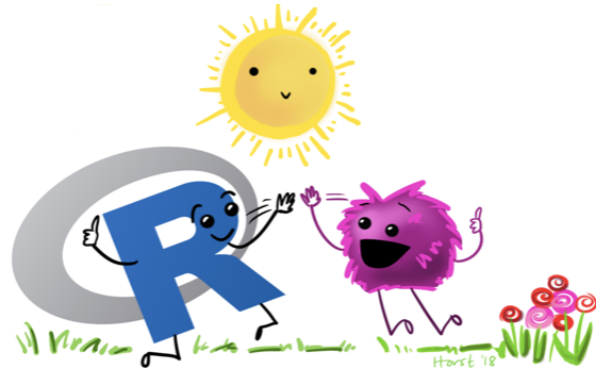


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