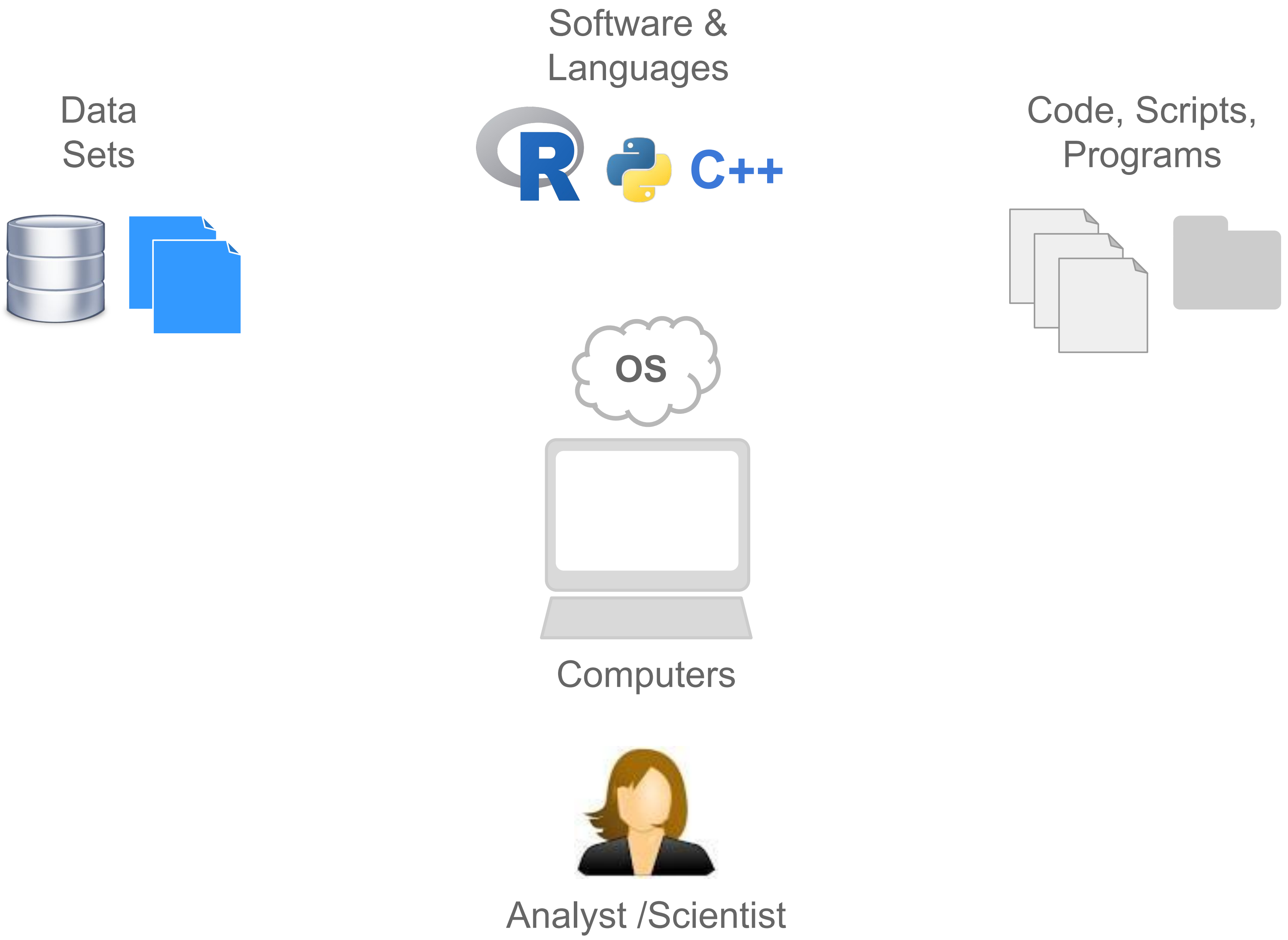
Vectors in R (part 1)

Stat 133 with Gaston Sanchez

DCD
Data Computing Diagram


Software &
Languages
R
C++
Data
Sets
Code, Scripts,
Programs
OS
Computers
Analyst /Scientist

We’ll be working with “Data”

How do statisticians / analysts think of data?

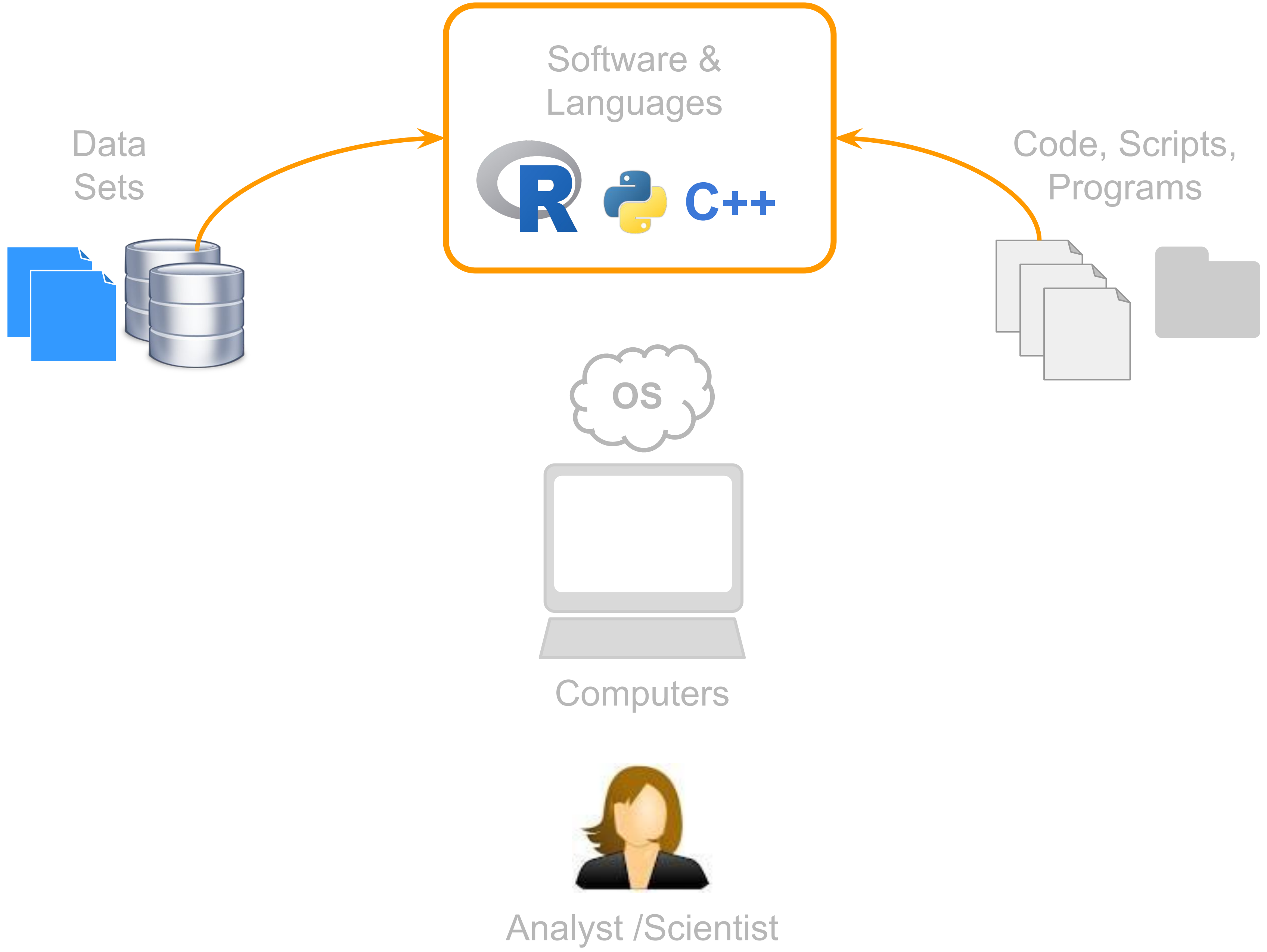
How do computers treat data?

How do data sets get stored?

How do programs “understand” data?

Be the **boss** of your **data**

How do programming languages handle data?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Data for Software & Languages?

Data Types

Basic kinds

Data Structures

Containers

Data Types (for programming languages)

Also refer to as *data primitives* or primitive types

They serve as the building blocks (i.e. they are like the atoms)

Common Data Types (for programming languages)

- Integers (i.e. whole numbers)
- Real numbers (i.e. decimal numbers)
- Boolean (i.e. logical)
- Character (i.e. strings)

Common Data Types (for programming languages)

In many programming languages, everytime you create an object or a variable, you must declare its type:

```
char first_name

int age
```

(you don't have to do this in R)

Data Types in R

Data types in R

- **Logical** (boolean)
- **Integer** (whole numbers)
- **Double** (real, decimal numbers)
- **Character** (or strings)
- **Complex (rarely used)*
- **Raw (rarely used)*

Data Types (primitives)

```
TRUE     # logical
1L       # integer
2.5      # double (real)
"hello"  # character
1 + 3i   # complex
```

Vectors in R

To a large extent,
R is a **vector**-based
language

R vectors

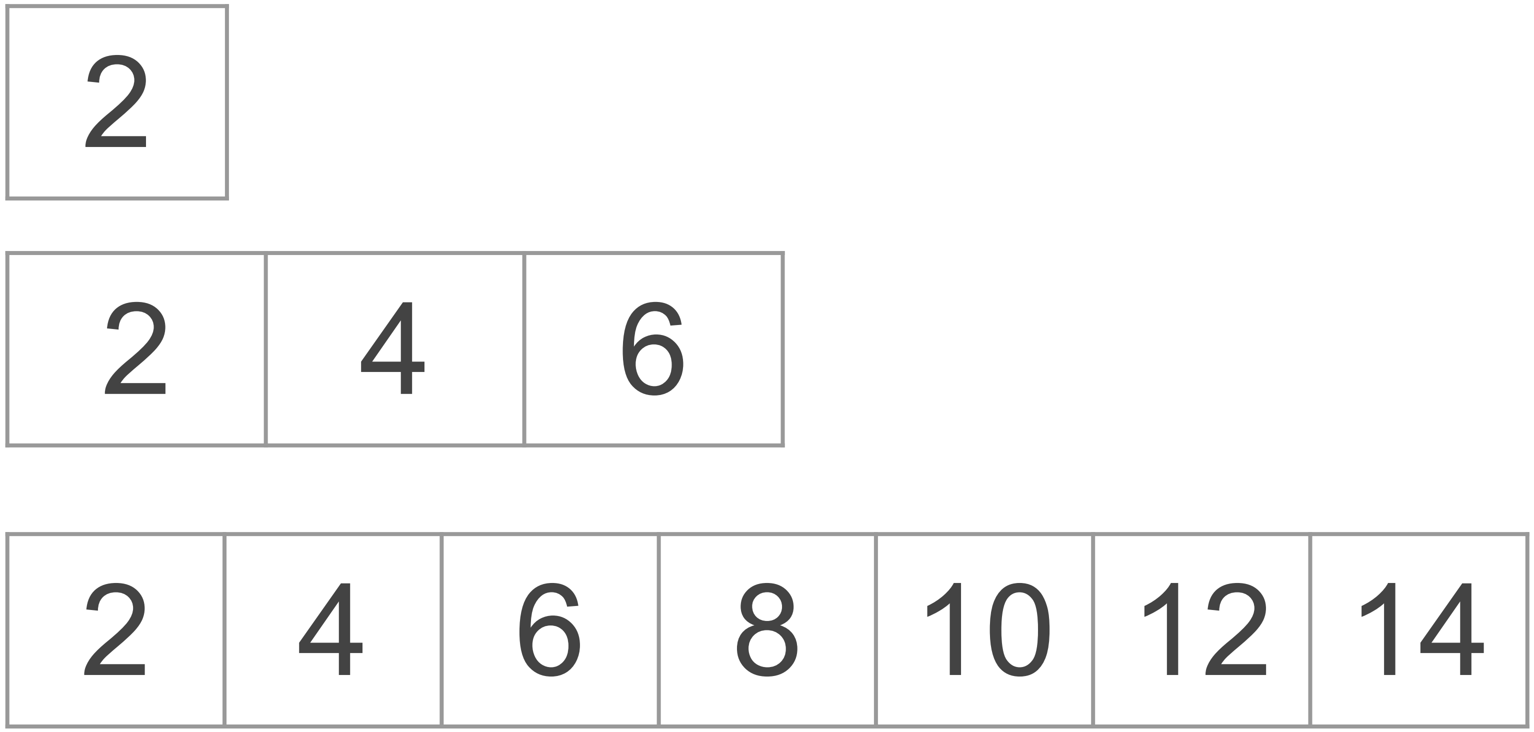
A vector is the **most basic** data structure in R

Vectors are contiguous cells containing data

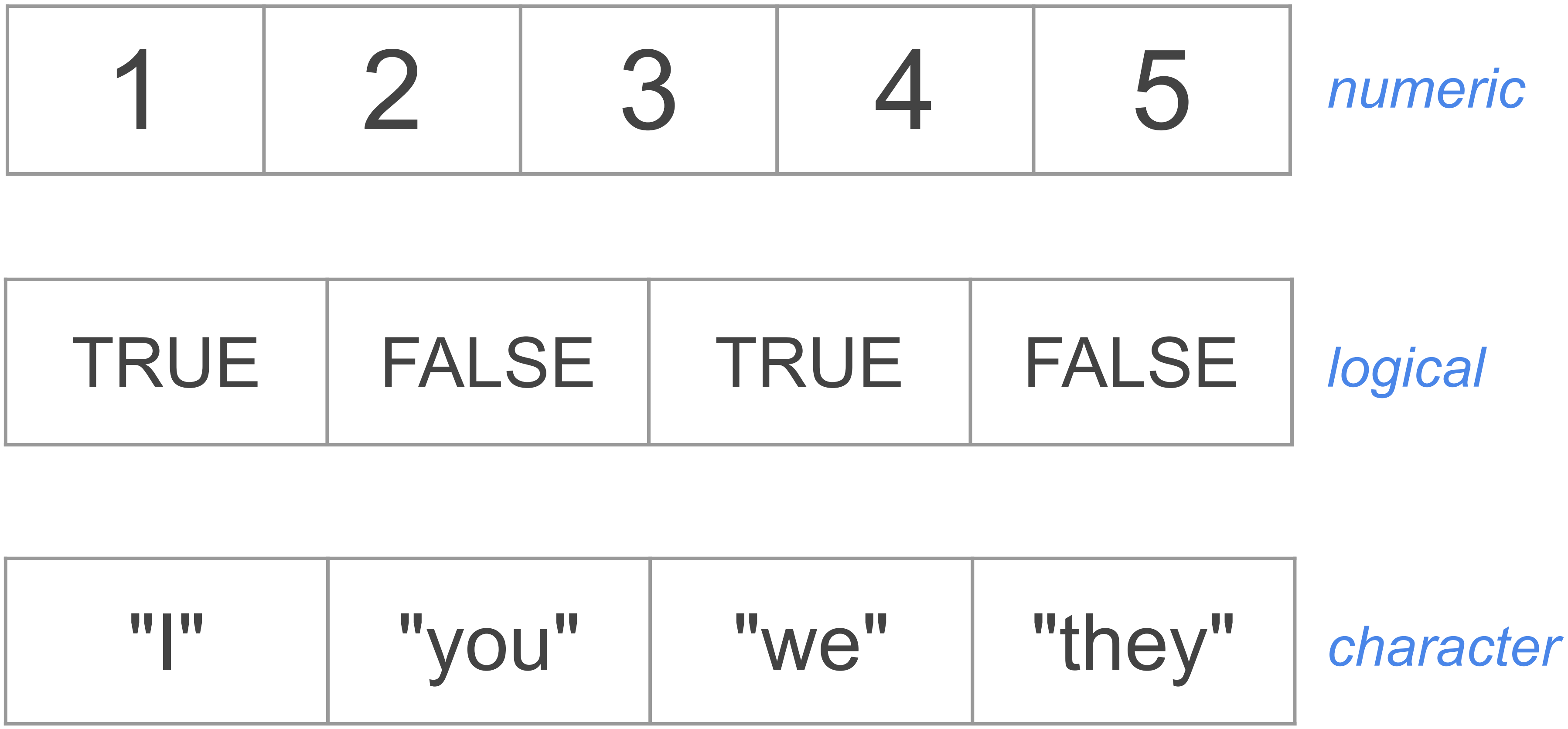
2	4	6	8	10

R vectors

Can be of any length (including zero)



Different kinds of vectors



Common *(and not so common*)* data types in R

A **logical** vector stores TRUE and FALSE values

An **integer** vector stores integers

A **double** vector stores regular (real) numbers

A **character** vector stores character strings

A **complex vector stores complex numbers*

A **raw vector stores raw bytes*

“Scalars” = one element vectors

```
z <- TRUE     # logical
x <- 1L       # integer
y <- 2.5      # real
w <- "hello"  # character
u <- 1 + 3i   # complex
```

R parlance: Types and Modes

The function `typeof()` returns the type of data: this is how the values are stored internally in R.

In **S** terminology, instead of talking about **types** we talk about **modes**.

The function `mode()` returns the “mode” of an R object.

Data types and modes

A bit confusing at the beginning

value	example	mode	type
integer	`1L, 2L`	`numeric`	`integer`
real	`1, -0.5`	`numeric`	`double`
complex	`3 + 5i`	`complex`	`complex`
logical	`TRUE, FALSE`	`logical`	`logical`
character	`"hello"`	`character`	`character`

useRs typically talk about the **mode**

Special Values

There are some special data values in R

`NULL` = null object

`NA` = Not Available (missing value)

`Inf` = positive infinite

`-Inf` = negative infinite

`NaN` = Not a Number (different from NA)

Creating Vectors

Creating vectors

R provides a very large number of functions for creating all kinds of vectors.

Creating vectors with the combine function **c()**

```
x <- c(1, 2, 3, 4, 5)

y <- c("one", "two", "three")

z <- c(TRUE, FALSE, TRUE)
```

Sequences

Sequences

A common task involves creating sequences. The primary function is **seq()** but there’s also **seq_along()** , **seq_len()** and **seq.int()**

Numeric Sequences with colon operator :

```
1:5

1.5:5.5

5:1

-5:5
```

Numeric Sequences

```
seq(from = 1, to = 10)


seq(from = 1, to = 10, by = 2)


seq(from = 10, to = 1, by = -2)
```

Numeric Sequences

```
seq(from=1, to=100, length.out=10)
```

```
seq_along(c(2,4,6,8))
```

```
seq.int(from = 2, to = 10, by = 2)
```