R Basics - Functions

Introduction to R - Day 1

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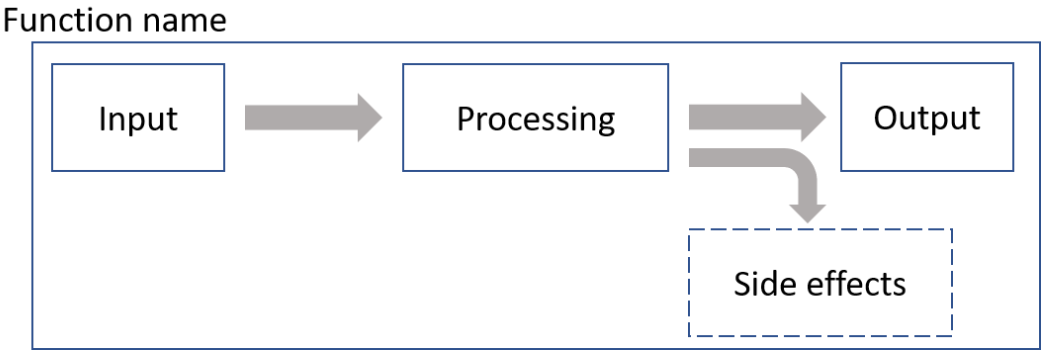
2021-08-01 (updated: 2022-08-26)

Functions

Functions make multiple operations available under one command.

Functions in R:

- Have a **name**
- Have (0, 1, or any number of) **arguments as input**
- They calculate something using the arguments
- They have a **return value** (the output)
- Can have **side effects** (like plotting)



General structure of a function call:

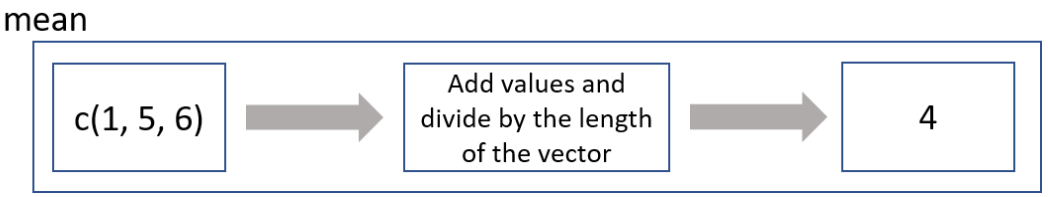
```
function_name ( argument = value )
```

The mean function

function_name (argument = value)

mean (x = c(1,5,6))

```
mean(x = c(1,5,6)) # or short: mean(c(1,5,6))
## [1] 4
```



- Arguments can also be variables
- The output of a function can be stored in a variable

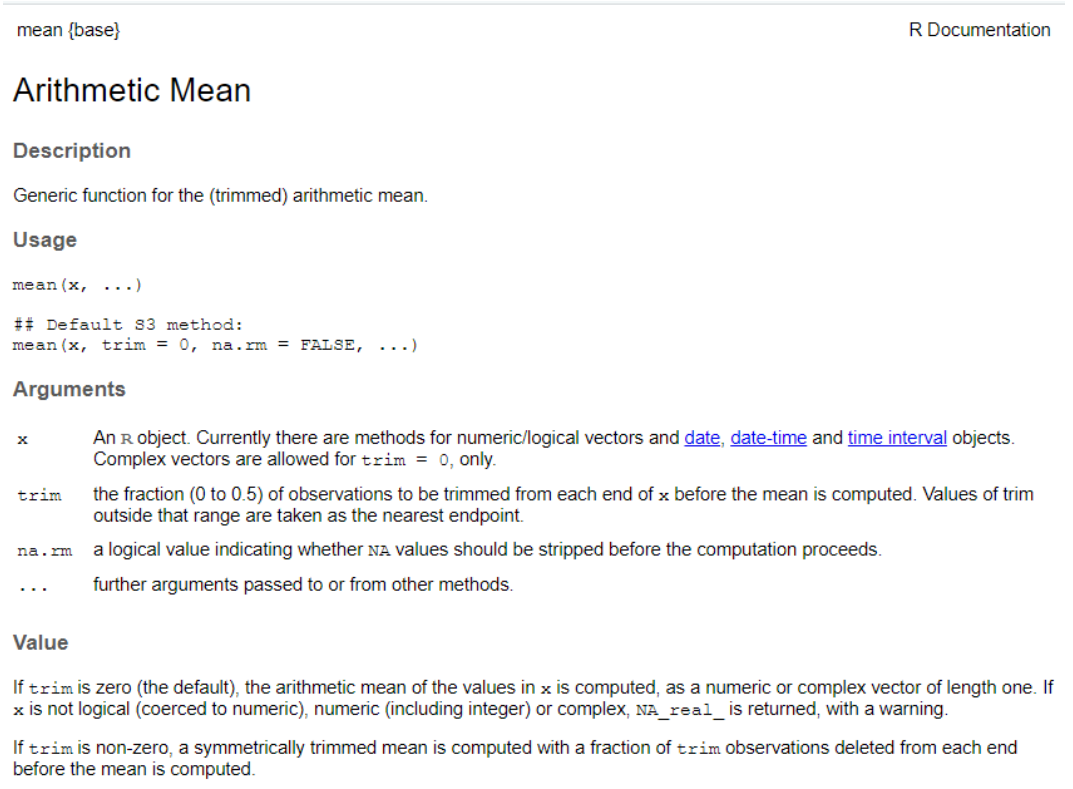
```
values <- c(1,5,6)
result <- mean(x = values)
result
## [1] 4
```

The mean function

But what does the mean function do? What are the arguments that I can use?

→ Call the function help using `?`

```
?mean
```



mean {base} R Documentation

Arithmetic Mean

Description

Generic function for the (trimmed) arithmetic mean.

Usage

```
mean(x, ...)

## Default S3 method:
mean(x, trim = 0, na.rm = FALSE, ...)
```

Arguments

`x`	An `R` object. Currently there are methods for numeric/logical vectors and date, date-time and time interval objects. Complex vectors are allowed for `trim = 0`, only.
`trim`	the fraction (0 to 0.5) of observations to be trimmed from each end of `x` before the mean is computed. Values of trim outside that range are taken as the nearest endpoint.
`na.rm`	a logical value indicating whether `NA` values should be stripped before the computation proceeds.
`...`	further arguments passed to or from other methods.

Value

If `trim` is zero (the default), the arithmetic mean of the values in `x` is computed, as a numeric or complex vector of length one. If `x` is not logical (coerced to numeric), numeric (including integer) or complex, `NA_real_` is returned, with a warning.

If `trim` is non-zero, a symmetrically trimmed mean is computed with a fraction of `trim` observations deleted from each end before the mean is computed.

Function arguments

- Arguments are the **input** to a function
- Functions can provide **default values** for some arguments
- Default values for arguments are indicated in the function help

```
## Default S3 method:
mean(x, trim = 0, na.rm = FALSE, ...)
```

Arguments

`x`	An R object. Currently there are methods for numeric/logical vectors and date, date-time and time interval objects. Complex vectors are allowed for `trim = 0`, only.
`trim`	the fraction (0 to 0.5) of observations to be trimmed from each end of `x` before the mean is computed. Values of trim outside that range are taken as the nearest endpoint.
`na.rm`	a logical value indicating whether NA values should be stripped before the computation proceeds.
`...`	further arguments passed to or from other methods.

Function arguments

```
# NA is a missing value
values <- c(1, 5, 6, NA)
mean(x = values)
## [1] NA
```

What happened? → `na.rm` argument is `FALSE` by default.
Set it to `TRUE` if you want to calculate the mean despite missing values:

```
mean(x = values, na.rm = TRUE)
## [1] 4
```

Arguments with default values are optional, arguments without default values are not!

```
mean()
## Error in mean.default(): argument "x" is missing, with no default
```

Function arguments

Argument matching can be achieved by **position** or by **name**

```
mean(x, trim = 0, na.rm = FALSE, ...)
values <- c(1, 5, 6, NA)
```

These calls to mean all are the same:

```
mean(values, , TRUE) # by position
```

```
mean(x = values, na.rm = TRUE) # by name
```

```
mean(na.rm = TRUE, x = values) # this also works but is not really nice
```

```
mean(values, na.rm = TRUE) # a mix of both
```

Function arguments

Argument matching can be achieved by **position** or by **name**

- Named arguments are (generally) preferred
  - Easier to remember
  - Easier to read
  - Some functions have a lot of arguments

```
mean(x = values, na.rm = TRUE) # by name
```

- However, it is common to match the first argument by position (especially when the first argument is the data)

```
mean(values, na.rm = TRUE) # a mix of both
```

Where do functions come from?

- Built into R (**base R** functions)

```
mean()  # calculate mean
seq()   # generate a sequence of values
[]      # This is also a (special) function
```

- From **additional packages**
  - Packages must be installed first
  - Call a function from a package using `packageName::functionName()`
  - Load the package with `library(packageName)` and then use the function

```
# use read_csv function from readr package
readr::read_csv()

# or use library()
library(readr)
read_csv()
```

- **Custom** functions
  - Write your own functions and then use them in the code

```
# custom function that prints input in a
sentence
my_function <- function(x) {
  return(x + 5)
}
my_function(5)
```

Summary

- Functions take **input** in the form of (named) arguments, calculate something and **return** a result
- Functions are called by their name, followed by parentheses:
  `functionName(argument1 = value, argument2 = value, ...)`
- Functions from additional packages can be called in two ways:
  - `packageName::functionName()`
  - first load the package with `library(packageName)` then call the function anywhere in the script with `functionName()`
- Call `?functionName` to open the help of a function