## Preliminaries in R

## Function calls

## Function calls

In general, function calls in R take the following structure:

```
## Generic code (this won't run)
function_name(formal_argument_1 = named_argument_1,
              formal_argument_2 = named_argument_2,
              [etc.])
```

A function call forms a complete R expression, and the output will be the result of running `print` or `show` on the object that is output by the function call.

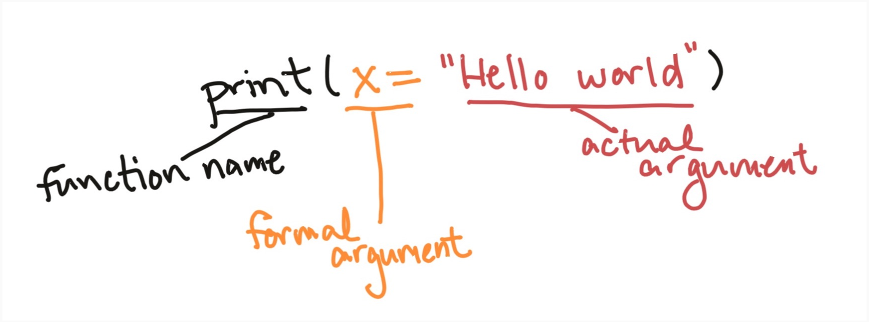
## Function calls

Here is an example of this structure:

```r
print(x = "Hello world")
```

```
## [1] "Hello world"
```

## Function calls



In this example, we're **calling** a function with the **name** `print`. It has one **argument**, with a **formal argument** of `x`, which in this call we've provided the **named argument** “Hello world”.

## Function calls

The **arguments** are how you customize the call to an R function.

For example, you can use change the named argument value to print different messages with the `print` function:

```r
print(x = "Hello world")
```

```
## [1] "Hello world"
```

```r
print(x = "Hi Fort Collins")
```

```
## [1] "Hi Fort Collins"
```

## Function calls

Some functions do not require any arguments. For example, the `getRversion` function will print out the version of R you are using.

```r
getRversion()
```

```
## [1] '4.0.2'
```

## Function calls

Some functions will accept multiple arguments. For example, the `print` function allows you to specify whether the output should include quotation marks, using the `quote` formal argument:

```r
print(x = "Hello world", quote = TRUE)
```

```
## [1] "Hello world"
```

```r
print(x = "Hello world", quote = FALSE)
```

```
## [1] Hello world
```

## Function calls

Arguments can be **required** or **optional**.

For a required argument, if you don't provide a value for the argument when you call the function, R will respond with an error. For example, `x` is a **required argument** for the `print` function, so if you try to call the function without it, you'll get an error:

```r
print()
```

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

## Function calls

For an **optional argument** on the other hand, R knows a **default value** for that argument, so if you don't give it a value for that argument, it will just use the default value for that argument.

For example, for the `print` function, the `quote` argument has the default value `TRUE`. So if you don't specify a value for that argument, R will assume it should use `quote = TRUE`. That's why the following two calls give the same result:

```
print(x = "Hello world", quote = TRUE)
```

```
## [1] "Hello world"
```

```
print(x = "Hello world")
```

```
## [1] "Hello world"
```

## Function helpfiles

Often, you'll want to find out more about a function, including:

- Examples of how to use the function
- Which arguments you can include for the function
- Which arguments are required versus optional
- What the default values are for optional arguments.

You can find out all this information in the function's **helpfile**, which you can access using the function `?`.

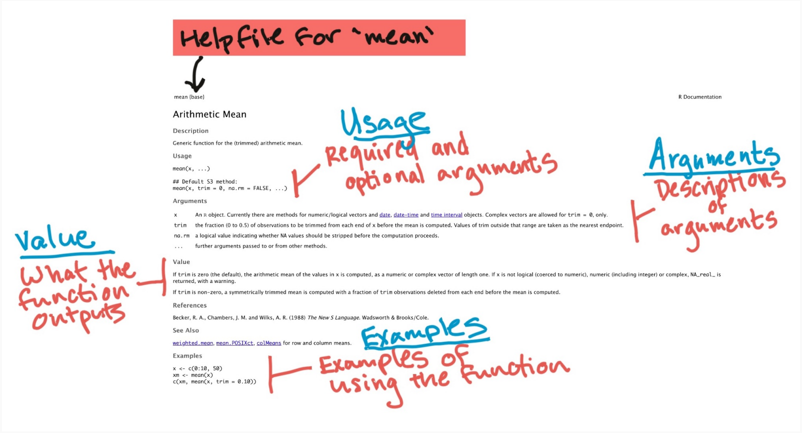
## Function helpfiles

For example, the `mean` function will let you calculate the mean (average) of a group of numbers. To find out more about this function, at the console type:

```
?mean
```

This will open a helpfile in the “Help” pane in RStudio.

## Function helpfiles


Helpfile for `mean`
Usage
Required and optional arguments
Arguments
Descriptions of arguments
Value
What the function outputs
Examples
Examples of using the function

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.

References

Becker, R. A., Chambers, J. M. and Wilks, A. R. (1988) *The New S Language*. Wadsworth & Brooks/Cole.

See Also

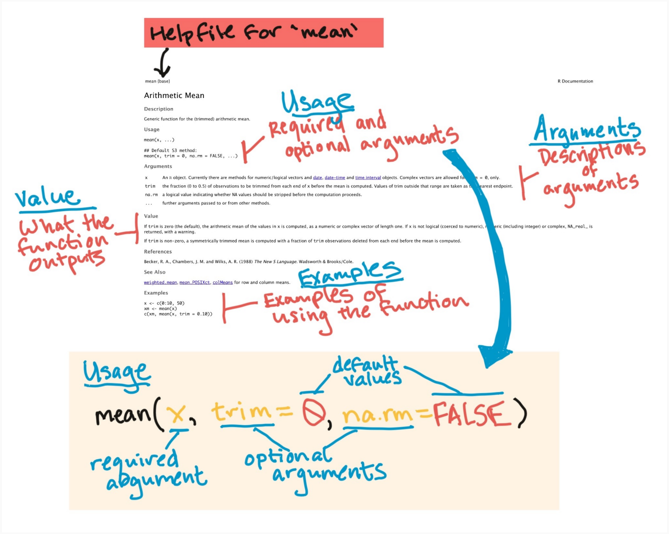
`weighted.mean`, `mean.POSIXct`, `colMeans` for row and column means.

Examples

```
x <- c(0:10, 50)
xm <- mean(x)
c(xm, mean(x, trim = 0.10))
```

The helpfile includes sections giving the function's **usage**, **arguments**, **value**, and **examples**.

## Function helpfiles



mean {base} R Documentation

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Examples

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Helpfile for `mean`
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Required and optional arguments
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Descriptions of arguments
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Usage
mean(x, trim=0, na.rm=FALSE)
default values
required argument
optional arguments

You can figure out which arguments are **required** and which are **optional** in the Usage section of the helpfile.

## Operators

There's one class of functions that looks a bit different from others. These are the infix **operator** functions.

Instead using parentheses after the function name, they usually go *between* two arguments.

One common example is the + operator:

```r
2 + 3
```

```
## [1] 5
```

## Operators

There are operators for several mathematical functions: `+`, `-`, `*`, `/`.

There are also other operators, including **logical operators** and **assignment operators**, which we'll cover later.