

# Base R

## Cheat Sheet

### Getting Help

#### Accessing the help files

**?mean**  
Get help of a particular function.  
**help.search('weighted mean')**  
Search the help files for a word or phrase.  
**help(package = 'dplyr')**  
Find help for a package.

#### More about an object

**str(iris)**  
Get a summary of an object's structure.  
**class(iris)**  
Find the class an object belongs to.

### Using Packages

**install.packages('dplyr')**  
Download and install a package from CRAN.  
**library(dplyr)**  
Load the package into the session, making all its functions available to use.  
**dplyr::select**  
Use a particular function from a package.  
**data(iris)**  
Load a built-in dataset into the environment.

### Working Directory

**getwd()**  
Find the current working directory (where inputs are found and outputs are sent).  
**setwd('C://file/path')**  
Change the current working directory.  
**Use projects in RStudio to set the working directory to the folder you are working in.**

### Vectors

#### Creating Vectors

c(2, 4, 6)	2 4 6	Join elements into a vector
2:6	2 3 4 5 6	An integer sequence
seq(2, 3, by=0.5)	2.0 2.5 3.0	A complex sequence
rep(1:2, times=3)	1 2 1 2 1 2	Repeat a vector
rep(1:2, each=3)	1 1 1 2 2 2	Repeat elements of a vector

#### Vector Functions

<b>sort(x)</b> Return x sorted.	<b>rev(x)</b> Return x reversed.
<b>table(x)</b> See counts of values.	<b>unique(x)</b> See unique values.

#### Selecting Vector Elements

##### By Position

<b>x[4]</b>	The fourth element.
<b>x[-4]</b>	All but the fourth.
<b>x[2:4]</b>	Elements two to four.
<b>x[-(2:4)]</b>	All elements except two to four.
<b>x[c(1, 5)]</b>	Elements one and five.

##### By Value

<b>x[x == 10]</b>	Elements which are equal to 10.
<b>x[x &lt; 0]</b>	All elements less than zero.
<b>x[x %in% c(1, 2, 5)]</b>	Elements in the set 1, 2, 5.

##### Named Vectors

<b>x['apple']</b>	Element with name 'apple'.
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### Programming

#### For Loop

```
for (variable in sequence){  
  Do something  
}
```

##### Example

```
for (i in 1:4){  
  j <- i + 10  
  print(j)  
}
```

#### While Loop

```
while (condition){  
  Do something  
}
```

##### Example

```
while (i < 5){  
  print(i)  
  i <- i + 1  
}
```

#### If Statements

```
if (condition){  
  Do something  
} else {  
  Do something different  
}
```

##### Example

```
if (i > 3){  
  print('Yes')  
} else {  
  print('No')  
}
```

#### Functions

```
function_name <- function(var){  
  Do something  
  return(new_variable)  
}
```

##### Example

```
square <- function(x){  
  squared <- x*x  
  return(squared)  
}
```

### Reading and Writing Data

Also see the **readr** package.

Input	Ouput	Description
df <- read.table('file.txt')	write.table(df, 'file.txt')	Read and write a delimited text file.
df <- read.csv('file.csv')	write.csv(df, 'file.csv')	Read and write a comma separated value file. This is a special case of read.table/write.table.
load('file.RData')	save(df, file = 'file.Rdata')	Read and write an R data file, a file type special for R.

Conditions	a == b	Are equal	a > b	Greater than	a >= b	Greater than or equal to	is.na(a)	Is missing
	a != b	Not equal	a < b	Less than	a <= b	Less than or equal to	is.null(a)	Is null

## Types

Converting between common data types in R. Can always go from a higher value in the table to a lower value.

<code>as.logical</code>	TRUE, FALSE, TRUE	Boolean values (TRUE or FALSE).
<code>as.numeric</code>	1, 0, 1	Integers or floating point numbers.
<code>as.character</code>	'1', '0', '1'	Character strings. Generally preferred to factors.
<code>as.factor</code>	'1', '0', '1', levels: '1', '0'	Character strings with preset levels. Needed for some statistical models.

## Maths Functions

<code>log(x)</code>	Natural log.	<code>sum(x)</code>	Sum.
<code>exp(x)</code>	Exponential.	<code>mean(x)</code>	Mean.
<code>max(x)</code>	Largest element.	<code>median(x)</code>	Median.
<code>min(x)</code>	Smallest element.	<code>quantile(x)</code>	Percentage quantiles.
<code>round(x, n)</code>	Round to n decimal places.	<code>rank(x)</code>	Rank of elements.
<code>signif(x, n)</code>	Round to n significant figures.	<code>var(x)</code>	The variance.
<code>cor(x, y)</code>	Correlation.	<code>sd(x)</code>	The standard deviation.

## Variable Assignment

```
> a <- 'apple'
> a
[1] 'apple'
```

## The Environment

<code>ls()</code>	List all variables in the environment.
<code>rm(x)</code>	Remove x from the environment.
<code>rm(list = ls())</code>	Remove all variables from the environment.

You can use the environment panel in RStudio to browse variables in your environment.

## Matrices

```
m <- matrix(x, nrow = 3, ncol = 3)
Create a matrix from x.
```



`m[2, ]` - Select a row



`m[, 1]` - Select a column



`m[2, 3]` - Select an element

`t(m)`

Transpose

`m %*% n`

Matrix Multiplication

`solve(m, n)`

Find x in:  $m \cdot x = n$

## Lists

```
l <- list(x = 1:5, y = c('a', 'b'))
```

A list is a collection of elements which can be of different types.

`l[[2]]`

Second element of l.

`l[1]`

New list with only the first element.

`l$x`

Element named x.

`l['y']`

New list with only element named y.

Also see the **dplyr** package.

## Data Frames

```
df <- data.frame(x = 1:3, y = c('a', 'b', 'c'))
A special case of a list where all elements are the same length.
```

x	y
1	a
2	b
3	c

### Matrix subsetting

`df[, 2]`



`df[2, ]`



`df[2, 2]`



### List subsetting

`df$x`



`df[[2]]`



Understanding a data frame

`View(df)`

See the full data frame.

`head(df)`

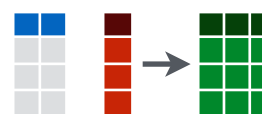
See the first 6 rows.

`nrow(df)`  
Number of rows.

`ncol(df)`  
Number of columns.

`dim(df)`  
Number of columns and rows.

`cbind` - Bind columns.



`rbind` - Bind rows.



## Strings

Also see the **stringr** package.

<code>paste(x, y, sep = ' ')</code>	Join multiple vectors together.
<code>paste(x, collapse = ' ')</code>	Join elements of a vector together.
<code>grep(pattern, x)</code>	Find regular expression matches in x.
<code>gsub(pattern, replace, x)</code>	Replace matches in x with a string.
<code>toupper(x)</code>	Convert to uppercase.
<code>tolower(x)</code>	Convert to lowercase.
<code>nchar(x)</code>	Number of characters in a string.

## Factors

<code>factor(x)</code>	Turn a vector into a factor. Can set the levels of the factor and the order.
<code>cut(x, breaks = 4)</code>	Turn a numeric vector into a factor by 'cutting' into sections.

## Statistics

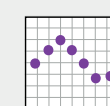
<code>lm(y ~ x, data=df)</code> Linear model.	<code>t.test(x, y)</code> Perform a t-test for difference between means.	<code>prop.test</code> Test for a difference between proportions.
<code>glm(y ~ x, data=df)</code> Generalised linear model.	<code>pairwise.t.test</code> Perform a t-test for paired data.	<code>aov</code> Analysis of variance.
<code>summary</code> Get more detailed information out a model.		

## Distributions

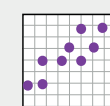
	Random Variates	Density Function	Cumulative Distribution	Quantile
Normal	<code>rnorm</code>	<code>dnorm</code>	<code>pnorm</code>	<code>qnorm</code>
Poisson	<code>rpois</code>	<code>dpois</code>	<code>ppois</code>	<code>qpois</code>
Binomial	<code>rbinom</code>	<code>dbinom</code>	<code>pbinom</code>	<code>qbinom</code>
Uniform	<code>runif</code>	<code>dunif</code>	<code>punif</code>	<code>qunif</code>

## Plotting

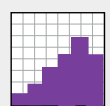
Also see the **ggplot2** package.



`plot(x)`  
Values of x in order.



`plot(x, y)`  
Values of x against y.



`hist(x)`  
Histogram of x.

## Dates

See the **lubridate** package.