Package ‘rfordummies’

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Title  Code Examples to Accompany the Book `R for Dummies`

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Description  Contains all the code examples in the book `R for Dummies` (1st edition). You can view the table of contents as well as the sample code for each chapter.

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Print examples of chapter 1 of 'R for Dummies'.

Description

To print a listing of all examples of a chapter, use `ch1()`. To run all the examples of `ch1()`, use `example(ch1)`.

Usage

```r
ch01()
```

ch1()

See Also

toc

Other Chapters: ch02, ch03, ch04, ch05, ch06, ch07, ch08, ch09, ch10, ch11, ch12, ch13, ch14, ch15, ch16, ch17, ch18, ch19, ch20

Examples

```
# Chapter 1 - Introducing R: The Big Picture

# Recognizing the Benefits of Using R

## It comes as free, open-source code

### It runs anywhere
```
### It supports extensions

### It provides an engaged community

### It connects with other languages

# Looking At Some of the Unique Features of R

## Performing multiple calculations with vectors

```r
x <- 1:5
x
x + 2
x + 6:10
```

## Processing more than just statistics

## Running code without a compiler

---

**ch02**

*Print examples of chapter 2 of ‘R for Dummies’.*

---

**Description**

To print a listing of all examples of a chapter, use `ch2()`.
To run all the examples of `ch2()`, use `example(ch2)`.

**Usage**

```r
ch02()
```

**See Also**

`toc`

Other Chapters: `ch01`, `ch03`, `ch04`, `ch05`, `ch06`, `ch07`, `ch08`, `ch09`, `ch10`, `ch11`, `ch12`, `ch13`, `ch14`, `ch15`, `ch16`, `ch17`, `ch18`, `ch19`, `ch20`

**Examples**

# Chapter 2 - Exploring R

# Working with a Code Editor
## Exploring RGui

### Seeing the naked R console

### Issuing a simple command

24+7+11

### Closing the console

## Not run:
quit()

## End(Not run)

### Dressing up with RStudio

# Starting Your First R Session

### Saying hello to the world

print("Hello world!")

### Doing simple math

1+2+3+4+5

### Using vectors

c(1,2,3,4,5)
1:5
sum(1:5)

### Storing and calculating values

x <- 1:5
x

y <- 10
x + y

x

y

z <- x + y
z

h <- "Hello"
h

hw <- c("Hello", "world!")
hw

paste("Hello", "world!")

## Talking back to the user

h <- "Hello"
yourname <- readline("What is your name?")
paste(h, yourname)

# Sourcing a Script

h <- "Hello"
yourname <- readline("What is your name?")
print(paste(h, yourname))

### Finding help on functions

?paste
deephelp(paste)

# Navigating the Workspace

ls()

## Manipulating the content of the workspace

rm(z)
ls()

### Saving your work

getwd()

filename <- file.path(tempdir(), "yourname.rda")
## Not run:
save(yourname, file=filename)

## End(Not run)
list.files(tempdir(), pattern = ".rda")

### Retrieving your work

rm(yourname)
## Not run:
load("yourname.rda")

## End(Not run)
Description

To print a listing of all examples of a chapter, use ch3(). To run all the examples of ch3(), use example(ch3).

Usage

ch03()

ch3()

See Also

toc

Other Chapters: ch01, ch02, ch04, ch05, ch06, ch07, ch08, ch09, ch10, ch11, ch12, ch13, ch14, ch15, ch16, ch17, ch18, ch19, ch20

Examples

# Chapter 3 - The Fundamentals of R

# Using the Full Power of Functions

## Vectorizing your functions

baskets.of.Granny <- c(12,4,4,6,9,3)
baskets.of.Granny
sum(baskets.of.Granny)

firstname_s <- c("Joris", "Carolien", "Koen")
lastname_s <- "Meys"
paste(firstname_s, lastname_s)

authors_s <- c("Andrie", "Joris")
lastnames_s <- c("de Vries", "Meys")
paste(authors_s, lastnames_s)

## Putting the argument in a function

# print() ### This line of code leads to deliberate error for illustration
print(x = "Isn't this fun?")

print(digits=4, x = 11/7)

# Making history
filename <- file.path(tempdir(), "Chapter3.Rhistory")
## Not run:
savehistory(file = filename)

## End(Not run)
list.files(tempdir(), pattern = ".Rhistory")
## Not run:
loadhistory(file.path(tempdir(), "Chapter3.Rhistory"))

## End(Not run)

# Keeping Your Code Readable

## Following naming conventions

## Choosing a clear name
paste <- paste("This gets","confusing")
paste(paste("Don't","you","think?"))

## Choosing a naming style

## Structuring your code
baskets.of.Geraldine <- c(5,3,2,2,12,9)
Intro <- "It is amazing! The All Star Grannies scored a total of"
Outro <- "baskets in the last six games!"

Total.baskets <- baskets.of.Grandy +
baskets.of.Geraldine

Text <- paste(Intro,
    sum(Total.baskets),
    Outro)
cat(Text)

cat('If you doubt whether it works,
+ just try it out."

## Adding comments

# The All Star Grannies do it again!
baskets.of.Grandy <- c(12,4,4,6,9,3) # Granny rules
sum(baskets.of.Grandy) # total number of points

# Getting from Base R to More

## Finding packages
## Installing packages

## Not run:
install.packages("fortunes")

## End(Not run)

library("fortunes")
fortune("This is R")
fortune(161)
detach(package:fortunes)

---

### ch04

Print examples of chapter 4 of 'R for Dummies'.

---

### Description

To print a listing of all examples of a chapter, use ch4(). To run all the examples of ch4(), use example(ch4).

### Usage

ch04()

ch4()

### See Also

toc

Other Chapters: ch01, ch02, ch03, ch05, ch06, ch07, ch08, ch09, ch10, ch11, ch12, ch13, ch14, ch15, ch16, ch17, ch18, ch19, ch20

### Examples

# Chapter 4 - Getting Started with Arithmetic

# Working with Numbers, Infinity, and Missing Values

## Doing basic arithmetic

### Using arithmetic operators

baskets.of.Grandma <- c(12,4,6,9,3)
baskets.of.Geraldine <- c(5,3,2,12,9)
Granny.mONEY <- baskets.of.Granny * 120
Geraldine.mONEY <- baskets.of.Geraldine * 145

Granny.mONEY + Geraldine.mONEY

baskets.of.Granny * 120 + baskets.of.Geraldine * 145

### Controlling the order of the operations
4 + 2 * 3
(4 + 2) * 3

### Using mathematical functions

#### Calculating logarithms and exponentials

\[
\log(1:3)
\]
\[
\text{log}(1:3, \text{base}=6)
\]

x <- \log(1:3)

\[
\exp(x)
\]

### Putting the science in scientific notation

1.33e4
4.12e-2
1.2e6 / 2e3

### Rounding numbers

\[
\text{round}(123.456, \text{digits}=2)
\]
\[
\text{round}(-123.456, \text{digits}=-2)
\]
\[
\text{signif}(-123.456, \text{digits}=4)
\]

### Using trigonometric functions

\[
\cos(120)
\]
\[
\cos(120*\pi/180)
\]

### Calculating whole vectors

\'+'(2,3)

### To infinity and beyond

### Using infinity

2/0
4 - Inf
is.finite(10^((305:310)))

### Dealing with undefined outcomes
Inf / Inf
NaN + 4

### Dealing with missing values
x <- NA
x + 4

log(x)
is.na(x)

### Calculating infinite, undefined, and missing values

# Organizing Data in Vectors
### Discovering the properties of vectors
### Looking at the structure of a vector
str(baskets.of.Granny)
length(baskets.of.Granny)
authors <- c("Andrie", "Joris")
str(authors)

### Testing vector types

is.numeric(baskets.of.Granny)
is.integer(baskets.of.Granny)
x <- c(4L, 6L)
is.integer(x)

### Creating vectors
seq(from = 4.5, to = 2.5, by = -0.5)

seq(from = -2.7, to = 1.3, length.out = 9)

baskets.of.Granny <- c(12, 4, 4, 6, 9, 3)
baskets.of.Geraldine <- c(5, 3, 2, 2, 12, 9)

### Combining vectors
all.baskets <- c(baskets.of.Granny, baskets.of.Geraldine)
all.baskets

## Repeating vectors
rep(c(0, 0, 7), times = 3)
rep(c(2, 4, 2), each = 3)
rep(c(0, 7), times = c(4, 2))
rep(1:3, length.out=7)

# Getting Values in and out of Vectors

## Understanding indexing in R

numbers <- 30:1
numbers

## Extracting values from a vector

numbers[5]
numbers[c(5, 11, 3)]

indices <- c(5, 11, 3)
numbers[indices]
numbers[-3]
numbers[-(1:20)]
# numbers[-1:20] # NOT RUN, gives error

## Changing values in a vector

baskets.of.Granny

baskets.of.Geraldine[c(2, 4)] <- 4
baskets.of.Geraldine

Granny.copy <- baskets.of.Granny

baskets.of.Granny

baskets.of.Granny <- Granny.copy
baskets.of.Granny

# Working with Logical Vectors

## Comparing values

baskets.of.Granny > 5
which(baskets.of.Granny > 5)
the.best <- baskets.of.Geraldine < baskets.of.Granny
which(the.best)

## Using logical vectors as indices

baskets.of.Granny[the.best]
x <- c(3, 6, 1, NA, 2)
x[x > 2]
x > 2

## Combining logical statements

min.baskets <- baskets.of.Granny == min(baskets.of.Granny)
max.baskets <- baskets.of.Granny == max(baskets.of.Granny)
min.baskets | max.baskets

x[!is.na(x)]

## Summarizing logical vectors

sum(the.best)
any(the.best)
all(the.best)

# Powering Up Your Math with Vector Functions

## Using arithmetic vector operations

### Summarizing a vector

min(baskets.of.Granny)
max(baskets.of.Granny)
sum(baskets.of.Granny, baskets.of.Geraldine)

x <- c(3,6,2,NA,1)
sum(x)
sum(x,na.rm=TRUE)

### Cumulating operations

cumsum(baskets.of.Granny)
cummax(baskets.of.Geraldine)
cummin(x)
### Calculating differences

```r
diff(baskets.of.Granny)
diff(x)
```

### Recycling arguments

```r
Granny.pointers <- c(10, 4, 0, 4, 1, 4, 2, 1, 2)
points <- Granny.pointers * c(2, 3)
points
sum(points)

sum(Granny.pointers * c(2, 3))
```

```r
round(diff(baskets.of.Granny) / baskets.of.Granny * 100)
round(diff(baskets.of.Granny) / baskets.of.Granny[1:5] * 100)
```

---

**ch05**

*Print examples of chapter 5 of 'R for Dummies'.*

---

### Description

To print a listing of all examples of a chapter, use `ch5()`. To run all the examples of ch5(), use `example(ch5)`.

### Usage

```r
ch05()
ch5()
```

### See Also

- `toc`

Other Chapters: `ch01`, `ch02`, `ch03`, `ch04`, `ch06`, `ch07`, `ch08`, `ch09`, `ch10`, `ch11`, `ch12`, `ch13`, `ch14`, `ch15`, `ch16`, `ch17`, `ch18`, `ch19`, `ch20`

### Examples

```r
# Chapter 5 - Getting Started with Reading and Writing

# Using Character Vectors for Text Data

## Assigning a value to a character vector

x <- "Hello world!"
```
is.character(x)
length(x)
nchar(x)

## Creating a character vector with more than one element

x <- c("Hello", "world!")
length(x)
nchar(x)

## Extracting a subset of a vector

letters
LETTERS
letters[10]
LETTERS[24:26]
tail(LETTERS, 5)
head(letters, 10)

## Naming the values in your vectors

### Looking at how named vectors work

str(islands)
islands[c("Asia", "Africa", "Antarctica")]
names(islands)[1:9]
names(sort(islands, decreasing=TRUE)[1:6])

## Creating and assigning named vectors

month.days <- c(31, 28, 31, 30, 31, 30, 31, 30, 31, 30, 31)
names(month.days) <- month.name
month.days
names(month.days[month.days==31])

# Manipulating Text

## String theory: Combining and splitting strings

### Splitting text

pangram <- "The quick brown fox jumps over the lazy dog"
pangram
strsplit(pangram, " ")

words <- strsplit(pangram, " ")[1]
words

### Changing text case

unique(tolower(words))
toupper(words[c(4, 9)])
tolower("Some TEXT in Mixed CASE")
### Concatenating text

```r
paste("The", "quick", "brown", "fox")
paste(c("The", "quick", "brown", "fox"))
paste(words, collapse=" ")
paste(words, collapse="_")
paste(LETTERS[1:5], 1:5, sep=".", collapse="---")
paste("Sample", 1:5)
paste(c("A", "B"), c(1, 2, 3, 4), sep="-")
paste(c("A"), c(1, 2, 3, 4, 5), sep="-")
```

### Sorting text

```r
sort(letters, decreasing=TRUE)
sort(words)
```

### Finding text inside text

### Searching for individual words

```r
head(state.name)
```

### Searching by position

```r
head(substr(state.name, start=3, stop=6))
```

### Searching by pattern

```r
grep("New", state.name)
state.name[29]
state.name[grep("New", state.name)]
state.name[grep("new", state.name)]
```

### Searching for multiple words

```r
state.name[grep(" ", state.name)]
state.name[grep("East", state.name)]
```

### Substituting text

```r
gsub("cheap", "sheep's", "A wolf in cheap clothing")
x <- c("file_a.csv", "file_b.csv", "file_c.csv")
y <- gsub("file_.", ", x)
y
gsub(".csv", ", y)
```

### Extending text functionality with stringr

```r
# Not run:
install.packages("stringr")
```
```r
## End(Not run)
library(stringr)

## Revving up with regular expressions
rwords <- c("bach", "back", "beech", "beach", "black")
grep("beach|beech", rwords)
rwords[grep("beach|beech", rwords)]
rwords[grep("be(a|e)ch", rwords)]
rwords[grep("b(e|a)ch", rwords)]

# Factoring in Factors

## Creating a factor

directions <- c("North", "East", "South", "South")
factor(directions)
factor(directions, levels= c("North", "East", "South", "West"))
factor(directions, levels= c("North", "East", "South", "West"), labels=c("N", "E", "S", "W"))

## Converting a factor

directions <- c("North", "East", "South", "South")
directions.factor <- factor(directions)
directions.factor
as.character(directions.factor)
as.numeric(directions.factor)

numbers <- factor(c(9, 8, 10, 8, 9))
as.character(numbers)
as.numeric(numbers)
as.numeric(as.character(numbers))

## Looking at levels

str(state.region)
levels(state.region)
levels(state.region) <- c("NE", "S", "NC", "W")
head(state.region)
nlevels(state.region)
length(levels(state.region))
levels(state.region)[2:3]

## Distinguishing data types

head(state.region)
table(state.region)
state.region

## Working with ordered factors
```
ordered.status <- factor(status, levels=c("Lo", "Med", "Hi"), ordered=TRUE)

Table(status)
Table(ordered.status)

---

ch06

Print examples of chapter 6 of 'R for Dummies'.

Description

To print a listing of all examples of a chapter, use ch6(). To run all the examples of ch6(), use example(ch6).

Usage

ch06()

ch6()

See Also

toc

Other Chapters: ch01, ch02, ch03, ch04, ch05, ch07, ch08, ch09, ch10, ch11, ch12, ch13, ch14, ch15, ch16, ch17, ch18, ch19, ch20

Examples

# Chapter 6 - Going on a Date with R

# Working with Dates

dx <- as.Date("2012-07-27")

str(dx)

weekdays(dx)

dx + 7

weekdays(dx + 0:6)

startDate <- as.Date("2012-01-01")

xm <- seq(startDate, by="2 months", length.out=6)

months(xm)

quarters(xm)
Sys.localeconv()
as.Date("27 July 2012", format="%d %B %Y")
as.Date("27/7/12", format="%d/%m/%y")

# Adding Time Information to Dates
apollo <- "July 20, 1969, 20:17:39"
apollo.fmt <- "%B %d, %Y, %H:%M:%S"
xct <- as.POSIXct(apollo, format=apollo.fmt, tz="UTC")
xct

format(xct, "%d/%m/%y")
format(xct, "%S minutes past %I%p, on %d %B %Y")

# Performing Operations on Dates and Times

## Addition and subtraction
24*60*60
xct + 7*86400
xct + 3*60*60
xct - 7*86400
as.Date(xct) - 7

## Comparison of dates
Sys.time()
Sys.time() < xct
dec.start <- as.POSIXct("1950-01-01")
dec <- seq(dec.start, by="10 years", length.out=4)
dec
dec > xct

## Extraction
xlt <- as.POSIXlt(xct)
xlt
xlt$year
xlt$mon
unclass(xlt)
Print examples of chapter 7 of 'R for Dummies'.

Description
To print a listing of all examples of a chapter, use ch7(). To run all the examples of ch7(), use example(ch7).

Usage
ch07()

ch7()

See Also
toc
Other Chapters: ch01, ch02, ch03, ch04, ch05, ch06, ch08, ch09, ch10, ch11, ch12, ch13, ch14, ch15, ch16, ch17, ch18, ch19, ch20

Examples

# Chapter 7
# Working in More Dimensions

# Adding a Second Dimension

## Discovering a new dimension

### Creating your first matrix

first.matrix <- matrix(1:12, ncol=4)
first.matrix
matrix(1:12, ncol=4, byrow=TRUE)

### Looking at the properties

str(first.matrix)
dim(first.matrix)
length(first.matrix)
my.array <- array(1:24, dim=c(3,4,2))
baskets.of.Granny <- c(12,4,5,6,9,3)
baskets.of.Geraldine <- c(5,4,2,4,12,9)
baskets.team <- rbind(baskets.of.Granny, baskets.of.Geraldine)
attributes(my.array)
attr(baskets.team,'season') <- '2010-2011'
attr(baskets.team,'season')
attr(baskets.team,'season') <- NULL
```
## Combining vectors into a matrix

baskets.of.Granny <- c(12,4,5,6,9,3)
baskets.of.Geraldine <- c(5,2,4,12,9)
baskets.team <- rbind(baskets.of.Granny, baskets.of.Geraldine)

baskets.team

cbind(1:3, 4:6, matrix(7:12, ncol=2))

# Using the Indices

## Extracting values from a matrix

### Using numeric indices

first.matrix[1:2, 2:3]
first.matrix[2:3,]

### Dropping values using negative indices

first.matrix[-2,-3]

nr <- nrow(first.matrix)
id <- nr*2+2
first.matrix[-id]

first.matrix[-(2 * nrow(first.matrix) + 2)]

### Juggling dimensions

first.matrix[-c(1, 3),]
first.matrix[2, , drop=FALSE]

## Replacing values in a matrix

first.matrix[3, 2] <- 4
first.matrix

first.matrix[2, ] <- c(1,3)
first.matrix

first.matrix[1:2, 3:4] <- c(8,4,2,1)
first.matrix

# Naming Matrix Rows and Columns

## Changing the row and column names

rownames(baskets.team) <- c('Granny','Geraldine')
rownames(baskets.team)
```
colnames(baskets.team) <- c('1st', '2nd', '3rd', '4th', '5th', '6th')
baskets.team

colnames(baskets.team)[3] <- '3rd'
baskets.copy <- baskets.team
colnames(baskets.copy) <- NULL
baskets.copy

## Using names as indices
baskets.team[, c("2nd", "5th")]
baskets.team["Granny",]

# Calculating with Matrices

## Using standard operations with matrices
first.matrix + 4
second.matrix <- matrix(1:3, nrow=3, ncol=4)
first.matrix + second.matrix

# first.matrix + second.matrix[,1:3] # gives error for illustration
# Error in first.matrix + second.matrix[,1:3] : non-conformable arrays
first.matrix + 1:3

## Calculating row and column summaries
rowSums(baskets.team)

## Doing matrix arithmetic

### Transposing a matrix
t(first.matrix)
t(1:10)
t(first.matrix[2,])

### Inverting a matrix
square.matrix <- matrix(c(1,0,3,2,2,4,3,2,1), ncol=3)
solve(square.matrix)

### Multiplying two matrices
first.matrix %*% t(second.matrix)
first.matrix %*% 1:4
1:3 %%% first.matrix

# Adding More Dimensions
### Creating an array
#### Using the creator functions
my.array <- array(1:24, dim=c(3,4,2))
my.array

### Changing the dimensions of a vector

my.vector <- 1:24
dim(my.vector) <- c(3,4,2)
identical(my.array, my.vector)

# Using dimensions to extract values
my.array[2,3,1]
my.array[, 3, 2, drop=FALSE]
my.array[2, , ]

# Combining Different Types of Values in a Data Frame
### Creating a data frame from a matrix
#### Using the function as.data.frame
baskets.df <- as.data.frame(t(baskets.team))

### Looking at the structure of a data frame
baskets.df
str(baskets.df)

### Counting values and variables
nrow(baskets.df)
length(baskets.df)

### Creating a data frame from scratch
#### Making a data frame from vectors
employee <- c('John Doe', 'Peter Gynn', 'Jolie Hope')
salary <- c(21000, 23400, 26800)
startdate <- as.Date(c('2010-11-1', '2008-3-25', '2007-3-14'))
employ.data <- data.frame(employee, salary, startdate)

str(employ.data)

### Keeping characters as characters

employ.data <- data.frame(employee, salary, startdate, stringsAsFactors=FALSE)

str(employ.data)

## Naming variables and observations

### Working with variable names

colnames(employ.data)
names(employ.data)

names(employ.data)[3] <- 'firstday'
names(employ.data)

## Naming observations

rownames(employ.data)
rownames(employ.data) <- c('Chef','BigChef','BiggerChef')

employ.data

# Manipulating Values in a Data Frame

## Extracting variables, observations, and values

### Pretending it’s a matrix

baskets.df['3rd', 'Geraldine']
baskets.df[, 1]

str(baskets.df[, 1, drop=FALSE])

## Putting your dollar where your data is

baskets.df$Granny

## Adding observations to a data frame

### Adding a single observation

result <- rbind(baskets.df, c(7,4))

result

baskets.df <- rbind(baskets.df,'7th' = c(7,4))
baskets.df

### Adding a series of new observations using rbind
```r
new.baskets <- data.frame(Granny=c(3,8), Geraldine=c(9,4))
rownames(new.baskets) <- c('8th','9th')
baskets.df <- rbind(baskets.df, new.baskets)

### Adding a series of values using indices

baskets.df[cb('8th','9th'),] <- matrix(c(3,8,9,4), ncol=2)
baskets.df[cb('8th','9th'),] <- c(3,8,9,4)

### Adding variables to a data frame

### Adding a single variable

baskets.of.Gabrielle <- c(11,5,6,7,3,12,4,5,9)
baskets.df$Gabrielle <- baskets.of.Gabrielle

head(baskets.df, 4)

### Adding multiple variables using cbind

new.df <- data.frame(
    Gertrude = c(3,5,2,1,NA,3,1,1,4),
    Guinevere = c(6,9,7,3,3,6,2,10,6)
)

head(cbind(baskets.df, new.df), 4)

# Combining Different Objects in a List

### Creating a list

### Creating an unnamed list

baskets.list <- list(baskets.team, '2010-2011')
baskets.list

### Creating a named list

baskets.nlist <- list(scores=baskets.team, season='2010-2011')
baskets.nlist

### Playing with the names of elements

names(baskets.nlist)

### Getting the number of elements

length(baskets.list)

### Extracting elements from lists

### Using [[]]
```
```r
baskets.list[[1]]
baskets.nlist[['scores']] 

### Using []

baskets.list[-1]
baskets.nlist[names(baskets.nlist)=='season'] 

## Changing the elements in lists

### Changing the value of elements

baskets.nlist[[1]] <- baskets.df
baskets.nlist[['scores']] <- baskets.df
baskets.nlist$scores <- baskets.df

baskets.nlist[1] <- list(baskets.df)

baskets.list[1:2] <- list(baskets.df, '2009-2010')

### Removing elements

baskets.nlist[[1]] <- NULL
baskets.nlist$scores <- NULL
baskets.nlist[['scores']] <- NULL

baskets.nlist <- list(scores=baskets.df, season='2010-2011')
baskets.nlist[['scores']] <- list(NULL)
baskets.nlist 

### Adding extra elements using indices

baskets.nlist$players <- c('Granny','Geraldine')
baskets.nlist[['players']] <- c('Granny','Geraldine')
baskets.nlist[['players']] <- list(c('Granny','Geraldine'))

baskets.list[[3]] <- c('Granny','Geraldine')
baskets.list[3] <- list(c('Granny','Geraldine')) 

### Combining lists

baskets.list <- list(baskets.team,'2010-2011')
players <- list(rownames(baskets.team))

c(baskets.list, players)

## Reading the output of str() for lists

str(baskets.list)```
### Seeing the forest through the trees

---

**Print examples of chapter 8 of ’R for Dummies’**

#### Description

To print a listing of all examples of a chapter, use `ch8()`. To run all the examples of `ch8()`, use `example(ch8)`.

#### Usage

```r
ch08()
```
```
ch8()
```

#### See Also

`toc`

Other Chapters: `ch01, ch02, ch03, ch04, ch05, ch06, ch07, ch09, ch10, ch11, ch12, ch13, ch14, ch15, ch16, ch17, ch18, ch19, ch20`

#### Examples

```r
# Chapter 8
# Putting the Fun in Functions

# Moving from Scripts to Functions

## Making the script

```r
x <- c(0.458, 1.6653, 0.83112)
percent <- round(x * 100, digits = 1)
result <- paste(percent, "\%", sep = " ")
print(result)
```

```r
# source(’pastePercent.R’)  # Only after saving
```

## Transforming the script

```r
addPercent <- function(x){
  percent <- round(x * 100, digits = 1)
  result <- paste(percent, "\%", sep = " ")
  return(result)
}
```

## Using the function

```r
ls()
```
### Formatting the numbers

```r
ew.numbers <- c(0.8223, 0.02487, 1.62, 0.4)
addPercent(new.numbers)
```

### Playing with function objects

```r
ppaste <- addPercent
ppaste
```

### Reducing the number of lines

### Returning values by default

```r
# AddPercent function without last return - not written in book
addPercent <- function(x){
  percent <- round(x * 100, digits = 1)
  result <- paste(percent, "\%", sep = "")
}
print( addPercent(new.numbers) )
```

```r
addPercent <- function(x){
  percent <- round(x * 100, digits = 1)
  paste(percent, "\%", sep = "")
}
addPercent <- function(x){
  if(!is.numeric(x) ) return(NULL)
  percent <- round(x * 100, digits = 1)
  paste(percent, "\%", sep = "")
}
```

### Breaking the walls

```r
odds <- function(x) x / (1-x)
```

```r
odds(0.8)
```

```r
addPercent <- function(x) paste(round(x * 100, digits = 1), "\%", sep = "")
```

### Using Arguments the Smart Way

### Adding more arguments

```r
percentages <- c(58.23, 120.4, 33)
addPercent(percentages/100)
```

### Adding the mult argument

```r
addPercent <- function(x, mult){
  percent <- round(x * mult, digits = 1)
```
```r
paste(percent, "\%", sep = "")
}

addPercent(percentage, mult = 1)

### Adding a default value

# addPercent(new.numbers) # Gives error for illustrative purposes
# Error in x * mult : 'mult' is missing

addPercent <- function(x, mult = 100){
  percent <- round(x * mult, digits = 1)
  paste(percent, "\%", sep = "")
}

addPercent(new.numbers)

addPercent(percentage, 1)

## Conjuring tricks with dots

addPercent <- function(x, mult = 100, ...){
  percent <- round(x * mult, ...)
  paste(percent, "\%", sep = "")
}

addPercent(new.numbers, digits = 2)
addPercent(new.numbers)

addPercent <- function(x, mult = 100, digits = 1){
  percent <- round(x * mult, digits = digits)
  paste(percent, "\%", sep = "")
}

## Using functions as arguments

### Applying different ways of rounding

addPercent <- function(x, mult = 100, FUN = round, ...){
  percent <- FUN(x * mult, ...)
  paste(percent, "\%", sep = "")
}

addPercent(new.numbers, FUN = signif, digits = 3)

### Using anonymous functions

profits <- c(2100, 1430, 3580, 5230)
rel.profit <- function(x) round(x / sum(x) * 100)
addPercent(profits,
  FUN = function(x) round(x / sum(x) * 100) )
```
addPercent(profits / sum(profits))

# Coping with Scoping

## Crossing the borders

### Creating a test case

```r
x <- 1:5
test <- function(x){
  cat("This is x:", x, "\n")
  rm(x)
  cat("This is x after removing it:", x, "\n")
}
test(5:1)
```

### Searching the path

### Using internal functions

```r
calculate.eff <- function(x, y, control){
  min.base <- function(z) z - mean(control)
  min.base(x) / min.base(y)
}
```

```r
half <- c(2.23, 3.23, 1.48)
full <- c(4.85, 4.95, 4.12)
nothing <- c(0.14, 0.18, 0.56, 0.23)
calculate.eff(half, full, nothing)
```

# Dispatching to a Method

### Finding the methods behind the function

print

### Using methods with UseMethod

```r
small.one <- data.frame(a = 1:2, b = 2:1)
print.data.frame(small.one)
```

### Using default methods

```r
print.default(small.one)
```

## Doing it yourself

### Adapting the addPercent function
addPercent.character <- function(x){
    paste(x,"\%",sep="")
}

# Not written out in the book - needed for rest code#
addPercent.numeric <- function(x, mult = 100, FUN = round, ...){
    percent <- FUN(x * mult, ...)
    paste(percent, "\%", sep = "")
}

addPercent <- function(x,...){
    UseMethod("addPercent")
}

addPercent(new.numbers, FUN = floor)

addPercent(letters[1:6])

# Adding a default function

# addPercent(small.one) # Gives error on purpose
# Error in UseMethod("addPercent"):
# no applicable method for 'addPercent' applied to an object of class "data.frame"

addPercent.default <- function(x){
    cat('You should try a numeric or character vector.\n')
}

ch09

Print examples of chapter 9 of 'R for Dummies'.

Description

To print a listing of all examples of a chapter, use ch9(). To run all the examples of ch9(), use example(ch9).

Usage

ch09()

ch9()

See Also
toc

Other Chapters: ch01, ch02, ch03, ch04, ch05, ch06, ch07, ch08, ch10, ch11, ch12, ch13, ch14, ch15, ch16, ch17, ch18, ch19, ch20
Examples

# Chapter 9
# Controlling the Logical Flow

# Making Choices with if Statements

priceCalculator <- function(hours, pph=40){
  net.price <- hours * pph
  round(net.price)
}

priceCalculator <- function(hours, pph=40){
  net.price <- hours * pph
  if(hours > 100) {
    net.price <- net.price * 0.9
  }
  round(net.price)
}

priceCalculator(hours = 55)
priceCalculator(hours = 110)

priceCalculator <- function(hours, pph=40){
  net.price <- hours * pph
  if(hours > 100) net.price <- net.price * 0.9
  round(net.price)
}

?"if"

# Doing Something Else with an if...else Statement

priceCalculator <- function(hours, pph=40, public=TRUE){
  net.price <- hours * pph
  if(hours > 100) net.price <- net.price * 0.9
  if(public) {
    tot.price <- net.price * 1.06
  } else {
    tot.price <- net.price * 1.12
  }
  round(tot.price)
}

priceCalculator(25, public=TRUE)
priceCalculator(25, public=FALSE)

priceCalculator <- function(hours, pph=40, public=TRUE){
  net.price <- hours * pph
  if(hours > 100) net.price <- net.price * 0.9
  if(public) tot.price <- net.price * 1.06 else
tot.price <- net.price * 1.12
round(tot.price)
}

priceCalculator <- function(hours, pph=40, public=TRUE){
  net.price <- hours * pph
  if(hours > 100) net.price <- net.price * 0.9
  tot.price <- net.price * if(public) 1.06 else 1.12
  round(tot.price)
}

# Vectorizing Choices

## Looking at the problem

priceCalculator(c(25,110))
priceCalculator(110)
c(25, 110) > 100

## Choosing based on a logical vector

### Understanding how it works

ifelse(c(1,3) < 2.5 , 1:2 , 3:4)

### Trying it out

my.hours <- c(25,110)
my.hours * 40 * ifelse(my.hours > 100, 0.9, 1)

### Adapting the function

priceCalculator <- function(hours, pph=40, public){
  net.price <- hours * pph
  net.price <- net.price * ifelse(hours > 100 , 0.9, 1)
  tot.price <- net.price * ifelse(public, 1.06, 1.12)
  round(tot.price)
}

clients <- data.frame(
  hours = c(25, 110, 125, 40),
  public = c(TRUE,TRUE,FALSE,FALSE)
)

with(clients, priceCalculator(hours, public = public))

# Making Multiple Choices

## Chaining if...else statements

# Code example # NOT run
#if(client=='private'){
# tot.price <- net.price * 1.12  # 12% VAT
#else {
   # if(client=='public'){
      # tot.price <- net.price * 1.06  # 6% VAT
   # } else {
      # tot.price <- net.price * 1  # 0% VAT
   # }
#}

# Code example # NOT run
#if(client=='private'){
   # tot.price <- net.price * 1.12
#else if(client=='public'){
   # tot.price <- net.price * 1.06
#else {
   # tot.price <- net.price
#}

# Code example # NOT run
#VAT <- ifelse(client=='private', 1.12,
#     ifelse(client == 'public', 1.06, 1)
#)
#tot.price <- net.price * VAT
#

### Switching between possibilities

##### Making choices with switch

# Code example # NOT run
# VAT <- switch(client, private=1.12, public=1.06, abroad=1)

##### Using default values in switch

# Code example # NOT run
# VAT <- switch(client, private=1.12, public=1.06, 1)

client <- 'other'
switch(client, private=1.12, public=1.06, 1)

### Looping Through Values

#### Constructing a for loop

#### Calculating values in a for loop

##### Using the values of the vector

priceCalculator <- function(hours, pph=40, client){
   net.price <- hours * pph *
ifelse(hours > 100, 0.9, 1)

VAT <- numeric(0)
for(i in client){
  VAT <- c(VAT, switch(i, private=1.12, public=1.06, 1))
}

tot.price <- net.price * VAT
round(tot.price)
}

clients$type <- c('public', 'abroad', 'private', 'abroad')
priceCalculator(clients$hours, client=clients$type)

### Using loops and indices

nclient <- length(client)
VAT <- numeric(nclient)
for(i in seq_along(client)){
  VAT[i] <- switch(client[i], private=1.12, public=1.06, 1)
}
VAT

# Looping without Loops: Meeting the Apply Family

songline <- 'Get out of my dreams...'
for(songline in 1:5) print('...Get into my car!')

songline

## Looking at the family features

## Meeting three of the members

### Applying functions on rows and columns

#### Counting birds

counts <- matrix(c(3, 2, 4, 6, 5, 1, 8, 6, 1), ncol=3)
colnames(counts) <- c('sparrow', 'dove', 'crow')
counts

apply(counts, 2, max)

#### Adding extra arguments

counts[2, 2] <- NA
apply(counts, 2, max)
apply(counts, 2, max, na.rm=TRUE)

## Applying functions to listlike objects
### Applying a function to a vector

#### Using switch on vectors

`sapply(c('a','b'), switch, a='Hello', b='Goodbye')`

#### Replacing a complete for loop with a single statement

```r
priceCalculator <- function(hours, pph, client){
  net.price <- hours * pph * ifelse(hours > 100, 0.9, 1)
  VAT <- sapply(client, switch, private=1.12, public=1.06, 1)
  tot.price <- net.price * VAT
  round(tot.price)
}
```

### Applying a function to a data frame

`sapply(customers, class)`

### Simplifying results (or not) with `sapply`

`sapply(customers, unique)`

### Getting lists using `lapply`

```r
sapply(customers[c(1,3), ], unique)
lapply(customers[c(1,3), ], unique)
```

---

**ch10**  

*Print examples of chapter 10 of 'R for Dummies'.*

**Description**

To print a listing of all examples of a chapter, use `ch10()`. To run all the examples of `ch10()`, use `example(ch10)`.

**Usage**

`ch10()`

**See Also**

`toc`

Other Chapters: `ch01, ch02, ch03, ch04, ch05, ch06, ch07, ch08, ch09, ch11, ch12, ch13, ch14, ch15, ch16, ch17, ch18, ch19, ch20`
Examples

```r
# Chapter 10
# Debugging Your Code

# NOTE: Much code is commented out, as they generate
# errors on purpose. Uncomment the code and run the
# line to see the error and try the debugging out

# Knowing What to Look For

# Reading Errors and Warnings

## Reading error messages

"a" + 1
# Error in "a" + 1: non-numeric argument to binary operator

data.frame(1:10, 10:1,)
# Error in data.frame(1:10, 10:1,): argument is missing, with no default

## Caring about warnings (or not)

x <- 1:10
y <- if (x < 5) 0 else 1
x <- 4
sqrt(x - 5)

plot(1:10, 10:1, color='green')

# Going Bug Hunting

## Calculating the logit

# checks input and does logit calculation
logit <- function(x){
  x <- ifelse(x < 0 | x > 1, "NA", x)
  log(x / (1 - x))
}

# transforms percentage to number and calls logit
logitpercent <- function(x){
  x <- gsub("%", ",", x)
  logit(as.numeric(x))
}

## Knowing where an error comes from

# logitpercent('50%')
# Error in 1 - x: non-numeric argument to binary operator
```
# traceback()

## Looking inside a function

### Telling R which function to debug

# debug(logit)
# logitpercent('50%')

### Stepping through the function

### Start browsing from within the function

logit <- function(x){
  x <- ifelse(x < 0 | x > 1, "NA", x)
  browser()
  log(x / (1 - x))
}

# logit(50)

## Generating Your Own Messages

### Creating errors

logit <- function(x){
  if( any(x < 0 | x > 1) ) stop('x not between 0 and 1')
  log(x / (1 - x))
}

# logitpercent(c('50%','150%'))
# Error in logit(as.numeric(x)/100) : x not between 0 and 1

### Creating warnings

# Function wrapped around for illustrative purposes
# In book only body is given
logit <- function(x){
  x <- ifelse(x < 0 | x > 1, NA, x )
  if( any(is.na(x)) ) warning('x not between 0 and 1')
  log(x / (1 - x))
}

logitpercent(c('50%','150%'))

# Recognizing the Mistakes You're Sure to Make

### Starting with the wrong data

### Having your data in the wrong format
### Dropping dimensions when you don't expect it

```
rowsum.df <- function(x){
  id <- sapply(x,is.numeric)
  rowSums(x[, id])
}
# rowsum.df(sleep)
```

### Messing up with lists

```
strsplit('this is a sentence',' ')[2]
strsplit('this is a sentence',' ')[[1]][2]
customer <- c('Johan Delong','Marie Petit')
namesplit <- strsplit(customer,' ')  
paste(namesplit[2],collapse='.')
paste(namesplit[[2]],collapse='.')
```

### Mixing up factors and numeric vectors

```
cyl.factor <- as.factor(mtcars$cyl)
median(as.numeric(cyl.factor))
as.numeric(levels(cyl.factor))[cyl.factor]
```

---

**ch11**  
*Print examples of chapter 11 of 'R for Dummies'.*

---

**Description**

To print a listing of all examples of a chapter, use `ch11()`. To run all the examples of `ch11()`, use `example(ch11)`.

**Usage**

```
ch11()
```
See Also

Other Chapters: ch01, ch02, ch03, ch04, ch05, ch06, ch07, ch08, ch09, ch10, ch12, ch13, ch14, ch15, ch16, ch17, ch18, ch19, ch20

Examples

# Chapter 11 - Getting Help

# Finding Information in the R Help Files

## When you know exactly what you're looking for

?date

## When you don't know exactly what you're looking for

??date

# Searching the Web for Help with R

## Not run:
RSiteSearch("cluster analysis")

## End(Not run)

## Not run:
install.packages("sos")

## End(Not run)
library("sos")

## Not run:
findFn("cluster")

## End(Not run)

# Getting Involved in the R Community

## Using the R mailing lists

## Discussing R on Stack Overflow and Stack Exchange

## Tweeting about R

# Making a Minimal Reproducible Example
dput(cars[1:4, ])

## Creating sample data with random values
set.seed(1)
x <- rnorm(5)
x

cards <- c(1:9, "J", "Q", "K", "A")
suits <- c("Spades", "Diamonds", "Hearts", "Clubs")
deck <- paste(rep(suits, each=13), cards)
set.seed(123)
sample(deck, 7)

set.seed(5)
sample(LETTERS[1:3], 12, replace=TRUE)

set.seed(42)
dat <- data.frame(
  x = sample(1:5),
  y = sample(c("yes", "no"), 5, replace = TRUE)
)
dat
dput(cars[1:4, ])

## Producing minimal code
## Providing the necessary information

sessionInfo()

ch12  
\textit{Print examples of chapter 12 of 'R for Dummies'.}

\textbf{Description}

To print a listing of all examples of a chapter, use ch12(). To run all the examples of ch12(), use example(ch12).

\textbf{Usage}

ch12()

\textbf{See Also}

toc

Other Chapters: ch01, ch02, ch03, ch04, ch05, ch06, ch07, ch08, ch09, ch10, ch11, ch13, ch14, ch15, ch16, ch17, ch18, ch19, ch20
Examples

```r
# Chapter 12
# Getting Data into and out of R

# NOTE: Most of the code depends on actions, directories
# and the presence of files. Code that isn't runnable is
# commented out.

# Getting Data into R

## Entering data in the R text editor

elements <- data.frame()
# elements <- edit(elements)

# print(elements)

## Using the Clipboard to copy and paste
# Reminder: This only works on Windows

## Not run:
# x <- readclipboard()

## End(Not run)
# x

## Not run:
# x <- readclipboard()

## End(Not run)
# x

## Reading data in CSV files

### Using read.csv() to import data

# elements <- read.csv(file.path("f:\", "elements.csv"))
# str(elements)
# elements <- read.csv(file.path("f:\", "elements.csv"), stringsAsFactors=FALSE)
# str(elements)

### Using read.table() to import tabular data in text files

## Reading data from Excel
## Not run:
# install.packages("XLConnect")

## End(Not run)
# library("XLConnect")
# excel.file <- file.path("~/Elements.xlsx")
```
# elements <- readWorksheetFromFile(excelfile, sheet=1)
# elements <- readWorksheetFromFile(excelfile, sheet="Sheet1")

## Working with other data types

# library(foreign)
# read.spss(file="location/of/myfile")

# Getting Your Data out of R

# writeClipboard(names(iris))

# write.table(head(iris), file="clipboard", sep="\t", row.names=FALSE)

# Working with Files and Folders

## Understanding the working directory

getwd()

# setwd("F:/git/roxygen2")
# getwd()
# setwd("F:/git\stringr")
# getwd()

currentDirectory()

# setwd(file.path("F:/", "git", "surveyor"))
# getwd()

file.path("F:/", "git", "roxygen2")

# setwd(file.path("F:/", "git", "roxygen2"))
# getwd()

file.path("F:/", "git", "roxygen2", "roxygen2", "README.md")

## Manipulating files

# list.files(file.path("F:/", "git", "roxygen2"))
my.file <- tempfile()
my.file
write.csv(iris, file=my.file)
list.files(tempdir())

file.iris <- read.csv(my.file)

file.remove(my.file)
list.files(tempdir())
Description
To print a listing of all examples of a chapter, use \texttt{ch13()}. To run all the examples of \texttt{ch13()}, use \texttt{example(ch13)}.

Usage
\texttt{ch13()}

See Also
toc

Other Chapters: \texttt{ch01, ch02, ch03, ch04, ch05, ch06, ch07, ch08, ch09, ch10, ch11, ch12, ch14, ch15, ch16, ch17, ch18, ch19, ch20}

Examples
\# C haper 13 - Manipulating and Processing Data

\# Deciding on the Most Appropriate Data Structure

\# Creating Subsets of Your Data

## Understanding the three subset operators
## Understanding the five ways of specifying the subset

\texttt{str(islands)}
\texttt{islands[]}
\texttt{islands[c(8, 1, 1, 42)]}
\texttt{islands[-(3:46)]}
\texttt{islands[islands < 20]}
\texttt{islands[c("Madagascar", "Cuba")]}%0A

## Subsetting data frames

\texttt{str(iris)}
\texttt{iris[1:5, ]}
\texttt{iris[, c("Sepal.Length", "Sepal.Width")]}%0A
\texttt{iris[, 'Sepal.Length']}%0A
\texttt{iris[, 'Sepal.Length', drop=FALSE]}%0A
\texttt{iris[1:5, c("Sepal.Length", "Sepal.Width")]}%0A

## Taking samples from data

\texttt{sample(1:6, 10, replace=TRUE)}

\texttt{set.seed(1)}
\texttt{sample(1:6, 10, replace=TRUE)}
\texttt{sample(1:6, 10, replace=TRUE)}
\texttt{set.seed(1)}
sample(1:6, 10, replace=TRUE)

set.seed(123)
index <- sample(1:nrow(iris), 5)
index
iris[index, ]

### Removing duplicate data

duplicated(c(1,2,1,3,1,4))
duplicated(iris)
which(duplicated(iris))
iris[duplicated(iris), ]
index <- which(duplicated(iris))
iris[-index, ]

### Removing rows with missing data

str(airquality)
complete.cases(airquality)

x <- airquality[complete.cases(airquality), ]
str(x)
x <- na.omit(airquality)

# Adding Calculated Fields to Data

## Doing arithmetic on columns of a data frame

x <- iris$Sepal.Length / iris$Sepal.Width
head(x)

## Using with and within to improve code readability

y <- with(iris, Sepal.Length / Sepal.Width)
head(y)
identical(x, y)

iris$ratio <- iris$Sepal.Length / iris$Sepal.Width
iris <- within(iris, ratio <- Sepal.Length / Sepal.Width)
head(iris$ratio)

## Creating subgroups or bins of data

### Using cut to create a fixed number of subgroups

head(state.x77)
frost <- state.x77[, "Frost"]
head(frost, 5)
cut(frost, 3, include.lowest=TRUE)
### Adding labels to cut

```r
cut(frost, 3, include.lowest=TRUE, labels=c("Low", "Med", "High"))
```

### Using table to count the number of observations

```r
x <- cut(frost, 3, include.lowest=TRUE, labels=c("Low", "Med", "High"))
table(x)
x
```

# Combining and Merging Data Sets

## Creating sample data to illustrate merging

```r
all.states <- as.data.frame(state.x77)
all.states$Name <- rownames(state.x77)
rownames(all.states) <- NULL
str(all.states)
```

### Creating a subset of cold states

```r
cold.states <- all.states[all.states$Frost>150, c("Name", "Frost")]
cold.states
```

### Creating a subset of large states

```r
large.states <- all.states[all.states$Area>=100000, c("Name", "Area")]
large.states
```

## Using the `merge()` function

### Using merge to find the intersection of data

```r
merge(cold.states, large.states)
```

### Understanding the different types of merge

```r
merge(cold.states, large.states, all=TRUE)
```

## Working with lookup tables

### Finding a match

```r
index <- match(cold.states$Name, large.states$Name)
index
large.states[na.omit(index), ]
```

### Making sense of `%in%`
index <- cold.states$Name %in% large.states$Name
index
!is.na(match(cold.states$Name, large.states$Name))
cold.states[index, ]

# Sorting and Ordering Data

some.states <- data.frame(  
    Region = state.region,  
    state.x77)

some.states <- some.states[1:10, 1:3]
some.states

## Sorting vectors

### Sorting a vector in ascending order

sort(some.states$Population)

### Sorting a vector in decreasing order

sort(some.states$Population, decreasing=TRUE)

## Sorting data frames

### Getting the order

order.pop <- order(some.states$Population)

## Sorting a data frame in ascending order

some.states[order.pop, ]

### Sorting on more than one column

index <- with(some.states, order(Region, Population))
some.states[index, ]

### Sorting multiple columns in mixed order

index <- order(-xtfrm(some.states$Region), some.states$Population)
some.states[index, ]

# Traversing Your Data with the Apply Functions

## Using the apply() function to summarize arrays
str(Titanic)
apply(Titanic, 1, sum)
apply(Titanic, 3, sum)
apply(Titanic, c(3, 4), sum)

## Using lapply() and sapply() to traverse a list or data frame
lapply(iris, class)
sapply(iris, class)
sapply(iris, mean)
sapply(iris, function(x) ifelse(is.numeric(x), mean(x), NA))

## Using tapply() to create tabular summaries
tapply(iris$Sepal.Length, iris$Species, mean)
with(iris, tapply(Sepal.Length, Species, mean))

### Using tapply() to create higher-dimensional tables
str(mtcars)
cars <- within(mtcars,
    am <- factor(am, levels=0:1, labels=c("Automatic", "Manual"))
)
with(cars, tapply(mpg, am, mean))
with(cars, tapply(mpg, list(gear, am), mean))

### Using aggregate()
with(cars, aggregate(mpg, list(gear=gear, am=am), mean))

# Getting to Know the Formula Interface

aggregate(mpg ~ gear + am, data=cars, mean)
aov(mpg ~ gear + am, data=cars)
library(lattice)
xyplot(mpg ~ gear + am, data=cars)

# Whipping Your Data into Shape

## Understanding data in long and wide format

## Getting started with the reshape2 package

## Not run:
install.packages("reshape2")
```r
## End(Not run)
library("reshape2")

goals <- data.frame(
  Game = c("1st", "2nd", "3rd", "4th"),
  Venue = c("Bruges", "Ghent", "Ghent", "Bruges").
  Granny = c(12, 4, 5, 6),
  Geraldine = c(5, 4, 2, 4),
  Gertrude = c(11, 5, 6, 7)
)

## Melting data to long format
mgoals <- melt(goals)
mgoals <- melt(goals, id.vars=c("Game", "Venue"))

## Casting data to wide format
dcast(mgoals, Venue + Game ~ variable, sum)
dcast(mgoals, variable ~ Venue, sum)
dcast(mgoals, Venue ~ variable, sum)
dcast(mgoals, Venue + variable ~ Game, sum)

library(ggplot2)
ggplot(mgoals, aes(x=variable, y=value, fill=Game)) + geom_bar(stat="identity")
```

---

ch14  

Print examples of chapter 14 of 'R for Dummies'.

Description

To print a listing of all examples of a chapter, use ch14(). To run all the examples of ch14(), use example(ch14).

Usage

ch14()

See Also

toc

Other Chapters: ch01, ch02, ch03, ch04, ch05, ch06, ch07, ch08, ch09, ch10, ch11, ch12, ch13, ch15, ch16, ch17, ch18, ch19, ch20
Examples

# Chapter 14
# Summarizing Data

# Starting with the Right Data

## Using factors or numeric data

## Counting unique values

sapply(mtcars, function(x) length(unique(x)))

## Preparing the data

cars <- mtcars[c(1,2,9,10)]
cars$gear <- ordered(cars$gear)
cars$am <- factor(cars$am, labels=c('auto', 'manual'))
str(cars)

# Describing Continuous Variables

## Talking about the center of your data

mean(cars$mpg)
median(cars$cyl)

## Describing the variation

sd(cars$mpg)

## Checking the quantiles

### Calculating the range

range(cars$mpg)

### Calculating the quantiles

quantile(cars$mpg)

### Getting on speed with the quantile function

quantile(cars$mpg, probs=c(0.05, 0.95))

# Describing Categories

## Counting appearances

### Creating a table

amttable <- table(cars$am)
amttable

### Working with tables

## Calculating proportions

amttable/sum(amttable)
prop.table(amtale)

## Finding the center
id <- amtale == max(amtale)
names(amtale)[id]

# Describing Distributions

## Plotting histograms

#### Making the plot
hist(cars$mpg, col='grey')

#### Playing with breaks
hist(cars$mpg, breaks=c(5,15,25,35))

## Using frequencies or densities

#### Creating a density plot
mpgdens <- density(cars$mpg)
plot(mpgdens)

#### Plotting densities in a histogram
hist(cars$mpg, col='grey', freq=FALSE)
lines(mpgdens)

# Describing Multiple Variables

## Summarizing a complete dataset

#### Getting the output
summary(cars)

#### Fixing a problem
cars$cyl <- as.factor(cars$cyl)

## Plotting quantiles for subgroups
boxplot(mpg ~ cyl, data=cars)

## Tracking correlations
names(iris)

#### Looking at relations
plot(iris[-5])

#### Getting the numbers
with(iris, cor(Petal.Width, Petal.Length))
### Calculating correlations for multiple variables

```r
iris.cor <- cor(iris[-5])
str(iris.cor)

iris.cor['Petal.Width', 'Petal.Length']
```

### Dealing with missing values

# Working with Tables

## Creating a two-way table

### Creating a table from two variables

```r
with(cars, table(am, gear))
```

### Creating tables from a matrix

```r
trial <- matrix(c(34,11,9,32), ncol=2)
colnames(trial) <- c('sick', 'healthy')
rownames(trial) <- c('risk', 'no_risk')
trial.table <- as.table(trial)
trial.table
```

### Extracting the numbers

```r
trial.table['risk', 'sick']
```

### Converting tables to a data frame

```r
trial.df <- as.data.frame(trial)
str(trial.df)

trial.table.df <- as.data.frame(trial.table)
str(trial.table.df)
```

### Looking at margins and proportions

### Adding margins to the table

```r
addmargins(trial.table)
addmargins(trial.table, margin=2)
```

### Calculating proportions

```r
prop.table(trial.table)
```

### Calculating proportions over columns and rows

```r
prop.table(trial.table, margin=1)
```
Print examples of chapter 15 of 'R for Dummies'.

Description

To print a listing of all examples of a chapter, use ch15(). To run all the examples of ch15(), use example(ch15).

Usage

ch15()

See Also
toc

Other Chapters: ch01, ch02, ch03, ch04, ch05, ch06, ch07, ch08, ch09, ch10, ch11, ch12, ch13, ch14, ch16, ch17, ch18, ch19, ch20

Examples

# Chapter 15
# Testing Differences and Relations
#
# Taking a Closer Look at Distributions
## Observing beavers
str(beaver2)

## Testing normality graphically
library(lattice)
histogram(~temp | factor(activ), data=beaver2)

## Using quantile plots

#### Comparing two samples
qqplot(beaver2$temp[beaver2$activ==1],
       beaver2$temp[beaver2$activ==0])

#### Using a QQ plot to check for normality
qqnorm( beaver2$temp[beaver2$activ==0], main='Inactive')
qqline( beaver2$temp[beaver2$activ==0] )

## Testing normality in a formal way
shapiro.test(beaver2$temp)
result <- shapiro.test(beaver2$temp)
result$p.value
with(beaver2, tapply(temp, activ, shapiro.test))

# Comparing Two Samples
## Testing differences
### Carrying out a t-test

t.test(temp ~ activ, data=beaver2)

activetemp <- beaver2$temp[beaver2$activ==1]
inactivermptemp <- beaver2$temp[beaver2$activ==0]
t.test(activetemp, inactivermptemp)

### Dropping assumptions

wilcox.test(temp ~ activ, data=beaver2)

### Testing direction

### Comparing paired data

t.test(extra ~ group, data=sleep, paired=TRUE)

# Testing Counts and Proportions

## Checking out proportions

survivors <- matrix(c(1781,1443,135,47), ncol=2)
colnames(survivors) <- c('survived','died')
rownames(survivors) <- c('no seat belt','seat belt')
survivors

result.prop <- prop.test(survivors)
result.prop

## Analyzing tables

### Testing contingency of tables

chisq.test(survivors)

### Testing tables with more than two columns

str(HairEyeColor)

HairEyeMargin <- margin.table(HairEyeColor, margin=c(1,2))

HairEyeMargin

chisq.test(HairEyeMargin)

### Extracting test results

str(result)
t.test(temp ~ activ, data=beaver2)$p.value
# Working with Models

## Analyzing variances

```r
str(InsectSprays)
```

### Building the model

```r
AOVModel <- aov(count ~ spray, data=InsectSprays)
```

### Looking at the object

```r
AOVModel
```

## Evaluating the differences

```r
summary(AOVModel)
```

### Checking the model tables

```r
model.tables(AOVModel, type='effects')
```

### Looking at the individual differences

```r
Comparisons <- TukeyHSD(AOVModel)
Comparisons$spray['D-C',]
```

### Plotting the differences

```r
plot(Comparisons, las=1)
```

## Modeling linear relations

### Building a linear model

```r
Model <- lm(mpg ~ wt, data=mtcars)
```

### Extracting information from the model

```r
coef.Model <- coef(Model)
coef.Model
```

```r
plot(mpg ~ wt, data = mtcars)
abline(a=coef.Model[1], b=coef.Model[2])
```

## Evaluating linear models

### Summarizing the model

```r
Model.summary <- summary(Model)
Model.summary
```

```r
coef(Model.summary)
```

### Testing the impact of model terms

```r
Model.anova <- anova(Model)
Model.anova
```

```r
Model.anova['wt','Pr(>F)']
```

## Predicting new values
### Getting the values

```r
new.cars <- data.frame(wt=c(1.7, 2.4, 3.6))
predict(Model, newdata=new.cars)
```

### Having confidence in your predictions

```r
predict(Model, newdata=new.cars, interval='confidence')
predict(Model, newdata=new.cars, interval='prediction')
```

---

**Print examples of chapter 16 of 'R for Dummies'**

**Description**

To print a listing of all examples of a chapter, use `ch16()`. To run all the examples of `ch16()`, use `example(ch16)`.

**Usage**

`ch16()`

**See Also**

`toc`

Other Chapters: `ch01`, `ch02`, `ch03`, `ch04`, `ch05`, `ch06`, `ch07`, `ch08`, `ch09`, `ch10`, `ch11`, `ch12`, `ch13`, `ch14`, `ch15`, `ch16`, `ch17`, `ch18`, `ch19`, `ch20`

**Examples**

```r
# Chapter 16 - Using Base Graphics

# Creating Different Types of Plots

## Getting an overview of plot

classes <- head(sort(islands, decreasing=TRUE), 10)
plot(classes, main="Land area of continents and islands",
     ylab="Land area in square miles")
text(classes, labels=names(classes), adj=c(0.5, 1))

## Adding points and lines to a plot

plot(faithful)

## Adding points
```
short.eruptions <- with(faithful, faithful[eruptions < 3, ])

plot(faithful)
points(short.eruptions, col="red", pch=19)

## Changing the shape of points
## Changing the color

head(colors(), 10)

## Adding lines to a plot

fit <- lm(waiting~eruptions, data=faithful)

plot(faithful)
lines(faithful$eruptions, fitted(fit), col="blue")
abline(v=3, col="purple")

abline(h=mean(faithful$waiting))
abline(a=coef(fit)[1], b=coef(fit)[2])
abline(fit, col = "red")

# Different plot types

plot(LakeHuron, type="l", main='type="l"')
plot(LakeHuron, type="p", main='type="p"')
plot(LakeHuron, type="b", main='type="b"')

x <- seq(0.5, 1.5, 0.25)
y <- rep(1, length(x))
plot(x, y, type="n")
points(x, y)

with(mtcars, plot(mpg, disp))
with(mtcars, boxplot(disp, mpg))
with(mtcars, hist(mpg))

# Controlling Plot Options and Arguments

## Adding titles and axis labels

plot(faithful, 
     main = "Eruptions of Old Faithful",
     xlab = "Eruption time (min)",
     ylab = "Waiting time to next eruption (min)"
)

## Changing plot options

### The axes label style
plot(faithful, las=1)

### The box type
plot(faithful, bty="n")

### More than one option
plot(faithful, las=1, bty="1", col="red", pch=19)

### Font size of text and axes
x <- seq(0.5, 1.5, 0.25)
y <- rep(1, length(x))
plot(x, y, main="Effect of cex on text size")
text(x, y+0.1, labels=x, cex=x)
plot(x, y, main="Effect of cex.main, cex.lab and cex.axis", 
   cex.main=1.25, cex.lab=1.5, cex.axis=0.75)

### Putting multiple plots on a single page
old.par <- par(mfrow=c(1, 2))
plot(faithful, main="Faithful eruptions")
plot(large.islands, main="Islands", ylab="Area")
par(old.par)

# Saving Graphics to Image Files
filename <- file.path(tempdir(), "faithful.png")
## Not run:
png(filename=filename)

## End(Not run)
plot(faithful)
## Not run:
dev.off()

## End(Not run)

---

**Description**

To print a listing of all examples of a chapter, use `ch17()`. To run all the examples of `ch17()`, use `example(ch17)`. 
Usage

ch17()

See Also

toc

Other Chapters: ch01, ch02, ch03, ch04, ch05, ch06, ch07, ch08, ch09, ch10, ch11, ch12, ch13, ch14, ch15, ch16, ch18, ch19, ch20

Examples

# Chapter 17 - Creating Faceted Graphics with Lattice

# Creating a Lattice Plot

str(mtcars)

## Loading the lattice package

library("lattice")

## Making a lattice scatterplot

xyplot(mpg ~ hp | factor(cyl), data=mtcars)

## Adding trend lines

xyplot(mpg ~ hp | factor(cyl), data=mtcars, 
   type=c("p", "r"))

# Changing Plot Options

## Adding titles and labels

xyplot(mpg ~ hp | factor(cyl), data=mtcars, 
   type=c("p", "r"), 
   main="Fuel economy vs. Performance", 
   xlab="Performance (horse power)", 
   ylab="Fuel economy (miles per gallon)", 
)

xyplot(mpg ~ hp | factor(cyl), data=mtcars, 
   type=c("p", "r"), 
   main=list( 
     label="Fuel economy vs. Performance given Number of Cylinders", 
     cex=0.75) 
)

## Changing the font size of titles and labels
xyplot(mpg ~ hp | factor(cyl), data=mtcars,
        type=c("p", "r"),
        main=list(
          label="Fuel economy vs. Performance given Number of Cylinders",
          cex=0.75),
        xlab=list(
          label="Performance (horse power)",
          cex=0.75),
        ylab=list(
          label="Fuel economy (miles per gallon)",
          cex=0.75),
        scales=list(cex=0.5))

## Using themes to modify plot options

xyplot(mpg ~ hp | factor(cyl), data=mtcars,
        type=c("p", "r"),
        par.settings=simpleTheme(col="red", col.line="blue"))

# Plotting Different Types

## Making a bar chart

mtcars$cars <- rownames(mtcars)

barchart(cars ~ mpg | factor(cyl), data=mtcars,
         main="barchart",
         scales=list(cex=0.5),
         layout=c(3, 1))

## Making a box-and-whisker plot

bwplot(~ hp | factor(cyl), data=mtcars, main="bwplot")

# Plotting Data in Groups

## Using data in tall format

str(longley)
library("reshape2")
mlongley <- melt(longley, id.vars="Year")

str(mlongley)

xyplot(value ~ Year | variable, data=mlongley,
       layout=c(6, 1),
       type="b")
par.strip.text=list(cex=0.7),
scales=list(cex=0.7)
)

## Creating a chart with groups

mtcars$cars <- rownames(mtcars)
mtcars$am <- with(mtcars, ifelse(am==0, "Automatic", "Manual"))

barchart(cars ~ mpg | factor(cyl), data=mtcars,
group=am,
scales=list(cex=0.5),
layout=c(3, 1),
)

## Adding a key

barchart(cars ~ mpg | factor(cyl), data=mtcars,
main="barchart with groups",
group=am,
auto.key=TRUE,
par.settings = simpleTheme(col=c("grey80", "grey20")),
scales=list(cex=0.5),
layout=c(3, 1))

# Printing and Saving a Lattice Plot

## Assigning a lattice plot to an object

my.plot <- xyplot(mpg ~ hp | cyl, data=mtcars)
class(my.plot)

## Printing a lattice plot in a script

xyplot(mpg ~ hp | cyl, data=mtcars)

my.plot <- xyplot(mpg ~ hp | cyl, data=mtcars)
print(my.plot)

## Saving a lattice plot to file

filename <- file.path(tempdir(), "xyplot")
## Not run:
trellis.device(device="png", filename=filename)

## End(Not run)
print(my.plot)
## Not run:
dev.off()}
Print examples of chapter 18 of 'R for Dummies'.

Description
To print a listing of all examples of a chapter, use ch18(). To run all the examples of ch18(), use example(ch18).

Usage
ch18()

See Also
toc

Other Chapters: ch01, ch02, ch03, ch04, ch05, ch06, ch07, ch08, ch09, ch10, ch11, ch12, ch13, ch14, ch15, ch16, ch17, ch19, ch20

Examples

# Chapter 18 - Looking At ggplot2 Graphics

# Installing and Loading ggplot2

## Not run:
install.packages("ggplot2")

## End(Not run)
library("ggplot2")

# Looking At Layers

ggplot(faithful, aes(x=eruptions, y=waiting)) + geom_point() + stat_smooth()

# Using Geoms and Stats

## Defining what data to use

## Mapping data to plot aesthetics

ggplot(faithful, aes(x=eruptions, y=waiting)) + geom_point() + stat_smooth()

## Getting geoms

### Creating a bar chart
ggplot(chemicals, aes(x=depth)) + geom_bar()
ggplot(chemicals, aes(x=depth)) + geom_bar(binwidth=50)
ggplot(chemicals, aes(x=depth)) + geom_histogram(binwidth=50)

quakes$agg <- aggregate(mag ~ round(depth, -1), data=quakes, FUN=length)
names(quakes$agg) <- c("depth", "mag")
ggplot(quakes$agg, aes(x=depth, y=mag)) +
  geom_bar(stat="identity")

### Making a scatterplot

ggplot(chemicals, aes(x=long, y=lat)) + geom_point()

### Creating line charts

ggplot(longley, aes(x=Year, y=Unemployed)) + geom_line()

# Sussing Stats

## Binning data

ggplot(chemicals, aes(x=depth)) + geom_bar(binwidth=50)
ggplot(chemicals, aes(x=depth)) + stat_bin(binwidth=50)

## Smoothing data

ggplot(longley, aes(x=Year, y=Employed)) + geom_point()
ggplot(longley, aes(x=Year, y=Employed)) +
  geom_point() + stat_smooth()

# Adding Facets, Scales, and Options

## Adding facets

ggplot(mtcars, aes(x=hp, y=mpg)) + geom_point()
ggplot(mtcars, aes(x=hp, y=mpg)) + geom_point() +
  stat_smooth(method="lm") + facet_grid(~cyl)

# Adding Facets, Scales, and Options
ch19

Print examples of chapter 19 of 'R for Dummies'.

Description

To print a listing of all examples of a chapter, use ch19(). To run all the examples of ch19(), use example(ch19).

Usage

ch19()

See Also

toc

Other Chapters: ch01, ch02, ch03, ch04, ch05, ch06, ch07, ch08, ch09, ch10, ch11, ch12, ch13, ch14, ch15, ch16, ch17, ch18, ch20

Examples

# Chapter 19 - Ten Things You Can Do in R That You Would've Done in Microsoft Excel

# Adding Row and Column Totals

iris.num <- iris[, -5]

colSums(iris.num)
colMeans(iris.num)

apply(iris.num, 2, min)
apply(iris.num, 2, max)

sapply(iris.num, min)
sapply(iris.num, max)

# Formatting Numbers
format(12345.6789, digits=9, decimal.mark=".",
    big.mark=" ", small.mark=".", small.interval=3)

x <- colMeans(mtcars[, 1:4])
format(x, digits=2, nsmall=2)

x <- seq(0.5, 0.55, 0.01)
sprintf("%.1f %%", 100*x)

set.seed(1)
x <- 1000*runif(5)
sprintf("$ %.3f", x)

stuff <- c("bread", "cookies")
price <- c(2.1, 4)
sprintf("%s costed $ %.3f ", stuff, price)

# Sorting Data
with(mtcars, mtcars[order(hp), ])
with(mtcars, mtcars[order(hp, decreasing=TRUE), ])

# Making Choices with If
mtcars <- within(mtcars,
    mpgClass <- ifelse(mpg < mean(mpg), "Low", "High"))

mtcars[mtcars$mpgClass == "High", ]

# Calculating Conditional Totals
with(mtcars, mean(mpg))
with(mtcars, mean(mpg[hp < 150]))
with(mtcars, mean(mpg[hp >= 150]))
with(mtcars, length(mpg[hp > 150]))

# Transposing Columns or Rows
x <- matrix(1:12, ncol=3)
x	(t(x)
t(mtcars[1:4, ])

# Finding Unique or Duplicated Values
unique(mtcars$cyl)
dupes <- duplicated(iris)
# Working with Lookup Tables

```r
index <- match("Toyota Corolla", rownames(mtcars))
index
mtcars[index, 1:4]
```

# Working with Pivot Tables

```r
with(mtcars, tapply(hp, list(cyl, gear), mean))
aggregate(hp~cyl+gear+am, mtcars, mean)
```

# Using the Goal Seek and Solver

```r
sales <- function(price) { 100 - 0.5 * price }
revenue <- function(price) { price * sales(price) }

par(mfrow=c(1, 2))
curve(sales, from=50, to=150, xname="price", ylab="Sales", main="Sales")
curve(revenue, from=50, to=150, xname="price", ylab="Revenue", main="Revenue")
par(mfrow=c(1, 1))

optimize(revenue, interval=c(50, 150), maximum=TRUE)
```

---

The code above demonstrates various R functions and operations:

- `head()`: Displays the first few rows of a dataset.
- `which()`: Returns the indices of the TRUE values in a logical vector.
- `iris[]`: Accesses data from the iris dataset.
- `nrow()`: Returns the number of rows in a dataset.
- `index`: Uses `match()` to find the index of a string in another vector.
- `tapply()`: Applies a function to subsets of a vector.
- `aggregate()`: Generates summary statistics for each combination of factors.
- `curve()` and `optimize()`: Visualize and optimize a function.

---

**Description**

To print a listing of all examples of a chapter, use `ch20()`. To run all the examples of `ch20()`, use `example(ch20)`.

**Usage**

```r
ch20()
```

**See Also**

- `toc`

Other Chapters: `ch01, ch02, ch03, ch04, ch05, ch06, ch07, ch08, ch09, ch10, ch11, ch12, ch13, ch14, ch15, ch16, ch17, ch18, ch19`
Examples

# Chapter 20 - Ten Tips on Working with Packages

## Poking Around the Nooks and Crannies of CRAN

options("repos" = c(CRAN = "http://cran.ma.imperial.ac.uk/"))

## Finding Interesting Packages

## Installing Packages

## Not run:
install.packages("fortunes")

## End(Not run)

## Loading Packages

library("fortunes")

## Reading the Package Manual and Vignette

library(help="fortunes")

## Not run:
vignette("fortunes")

## End(Not run)

## Updating Packages

## Not run:
update.packages()

## End(Not run)

## Unloading Packages

search()
detach(package:fortunes, unload=TRUE)

## Forging Ahead with R-Forge

## Not run:
install.packages("data.table", repos="http://R-Forge.R-project.org")

## End(Not run)

## Conducting Installations from BioConductor

source("http://bioconductor.org/biocLite.R")

## Reading the R Manual
**elements**

*Periodic table of elements.*

**Description**

A data set containing properties of the periodic table of elements.

**Format**

A data frame with 118 rows and 9 variables

**Details**

- Atomic.no
- Name
- Symbol
- Group
- Period
- Block
- State.at.STP
- Occurrence
- Description

**Source**


---

**rfordummies**

*A package to accompany the book "R for Dummies".*

**Description**

This package contains all the code examples in the book ‘R for Dummies’ (1st edition)

**References**

saveElements

Saves a copy of the periodic table of elements as excel or csv file.

Description
Saves a copy of the periodic table of elements as excel or csv file.

Usage
saveElements(outfile, type = c("excel", "csv"))

Arguments
outfile File name
type Either excel or csv

Examples
if(require("XLConnect")){
  saveElements(file.path(tempdir(), "elements.xlsx"))
  saveElements(file.path(tempdir(), "elements.csv"), type = "csv")
  list.files(tempdir(), pattern = "xlsx|csv", full.names = TRUE)
}

toc

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