An introduction to R:
Algorithmics in R

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Contents

Review on data frame

Generic functions:

`read.table()`
`write.table()`

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`write.table()`

Example 1:
wghtcls ”smoker” lifespan
”3” 0 50.3
3 0 52.8

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Example 1:
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```
riscfactor <- read.table("lifespan2.txt",header=TRUE)
```

Review on data frame

Example 2:
wghtcls,smoker,lifespan
3,0,50.3
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riscfactor <- read.csv("lifespan.csv")
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sep=",", fill=TRUE)
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Review on data frame

Example 2:
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3,0,50.3
3,0,52.8

```
riscfactor <- read.csv("lifespan.csv")
riscfactor <- read.table("lifespan.csv",header=TRUE,
sep=",", fill=TRUE)
```

Example 3:
weight class smoker lifespan
3 0 50.3
3 0 52.8

```
riscfactor <- read.table("lifespan3.txt",header=TRUE)
```

Review on data frame

Example 2:
wghtcls,smoker,lifespan
3,0,50.3
3,0,52.8

```
riscfactor <- read.csv("lifespan.csv")
riscfactor <- read.table("lifespan.csv",header=TRUE,
sep=",", fill=TRUE)
```

Example 3:
weight class smoker lifespan
3 0 50.3
3 0 52.8

```
riscfactor <- read.table("lifespan3.txt",header=TRUE)
```

You have to change the first line of the file because of the space between weight and class.

Factors

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Example with text:

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x <-factor(x)
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Factors

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Example with text:

```
x <- c("female","male","male","female","female")
levels(x)
NULL
str(x)
chr [1:5] "female" "male" "male" "female" "female"
x <-factor(x)
levels(x)
[1] "female" "male"
str(x)
Factor w/ 2 levels "female","male":  1 2 2 1 1
```

Factors

Example with numbers:

```
y <- rep(c(17,17,18),4); str(y)
num [1:12] 17 17 18 17 17 18 17 17 18 17 ...
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summary(y)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  17.00   17.00   17.00   17.33   18.00   18.00
```

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summary(y)
Min.    1st Qu.     Median    Mean   3rd Qu.     Max.
17.00   17.00       17.00     17.33   18.00    18.00
y <- factor(y); str(y)
Factor w/ 2 levels "17","18":  1 1 2 1 1 2 1 1 2 1 ...
summary(y)
17   18
8     4
```

Back to input files

By default `read.table()` sets text variables as factors and not numerical variables.

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```

Back to input files

By default `read.table()` sets text variables as factors and not numerical variables.
This can be changed by specifying the class of the columns.

```
riscfactor <- read.table("lifespan2.txt",header=TRUE,
colClasses=c("factor","numeric","numeric"))
```

Or by changing the variables afterwards.

```
riscfactor$wghtcls <- factor(riscfactor$wghtcls)
```

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Logic rules in R

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[1] TRUE #TRUE is a constant in R
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3 != 3
3 <= 5
5 >= 2*2
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Caution:

```
cos(pi/2) == 0
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Caution:

```
cos(pi/2) == 0
[1] FALSE
cos(pi/2)
[1] 6.123234e-17
```

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5 > 3 & 0 != 1
```

Logic rules in R

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TRUE & TRUE # & is the logical AND
[1] TRUE
TRUE & FALSE
[1] FALSE
TRUE | FALSE # | is the logical OR
[1] TRUE
5 > 3 & 0 != 1
5 > 3 & 0 != 0
```

Logic rules in R

```
TRUE & TRUE # & is the logical AND
[1] TRUE
TRUE & FALSE
[1] FALSE
TRUE | FALSE # | is the logical OR
[1] TRUE

5 > 3 & 0 != 1
5 > 3 & 0 != 0

as.integer(TRUE); as.integer(FALSE)
[1] 1 # the internal representation of TRUE is 1
[1] 0 # the internal representation of FALSE is 0
```

Conditional execution

If(), else() and ifelse()

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Syntax:

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if ( condition ) { commands1 }
if ( condition ) { commands1 } else { commands2 }
ifelse ( conditions vector, yes vector, no vector )
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Example:

```
x <- 4
if (x==5) {x <- x+1} else {x <- x*2}
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If(), else() and ifelse()
Syntax:

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```

Example:

```
x <- 4
if (x==5) {x <- x+1} else {x <- x*2}
x
[1] 8
```

Organization of the script and indentation

```
x <- 8
if ( x != 5 & x>3 ) {
    x <- x+1
    17+2
} else {
    x <- x*2
    21+5
}
```

Organization of the script and indentation

```
x <- 8
if ( x != 5 & x>3 ) {
     x <- x+1
     17+2
} else {
     x <- x*2
     21+5
}
[1] 19
x
[1] 9
```

Another example

```
T <- TRUE
F <- FALSE
if ( T & F ) {
    print("T & F is TRUE")
} else {
    print("T & F is FALSE")
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if ( T | F ) {
    print("T | F is TRUE")
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Another example

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T <- TRUE
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if ( T & F ) {
    print("T & F is TRUE")
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    print("T & F is FALSE")
}
```

```
[1] T & F is FALSE
```

```
T <- TRUE
F <- FALSE
if ( T | F ) {
    print("T | F is TRUE")
} else {
    print("T | F is FALSE")
}
```

```
[1] T | F is TRUE
```

Example from Day 1

```
Begin
Write "Enter water temperature:"
Read Temp
If Temp ≤ 0 then
    Write "This is ice"
Else then
    If Temp < 100 then
        Write "This is liquid"
    Else then
        Write "This is vapor"
    End of If
End of If
End
```

Example from Day 1

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Write "Enter water temperature:"
Read Temp
If Temp ≤ 0 then
    Write "This is ice"
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    If Temp < 100 then
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        Write "This is vapor"
    End of If
End of If
End
```

```
Temp <- readline(prompt="Enter water +
temperature:  ")
Temp <- as.numeric(Temp)
if (Temp <= 0) {
    print("This is ice")
} else {
    if (Temp < 100) {
        print("This is liquid")
    } else {
        print("This is vapor")
    }
}
```

Mind the sign for <=

ifelse()

```
y <- 1:10
z <- ifelse( y<6, y^2, y-1 )
```

ifelse()

```
y <- 1:10
z <- ifelse( y<6, y^2, y-1 )
z
[1] 1 4 9 16 25 5 6 7 8 9
```

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for(), while() and repeat()

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Syntax:

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for ( var in set ) { commands }
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for ( var in set ) { commands }
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`break` stops all loops
`next` goes directly to the next iteration of the loop

Examples

```
x <- 0
for ( i in 1:5 ) { if (i==3) { next } ; x <- x + i }
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x <- 0
for ( i in 1:5 ) { if (i==3) { next } ; x <- x + i }
 # i=3 is skipped, so x <- 1+2+4+5
x
[1] 12
```

Examples

```
x <- 0
for ( i in 1:5 ) { if (i==3) { next } ; x <- x + i }
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y <- 1; j <- 1
while ( y < 12 & j < 8 ) { y <- y*2 ; j <- j + 1}
```

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y ; j
[1] 16
[1] 5
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Examples

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x <- 0
for ( i in 1:5 ) { if (i==3) { next } ; x <- x + i }
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while ( y < 12 & j < 8 ) { y <- y*2 ; j <- j + 1}
y ; j
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z <- 3
repeat { z<- z^2; if ( z>100 ) { break }; print(z)}
```

Examples

```
x <- 0
for ( i in 1:5 ) { if (i==3) { next } ; x <- x + i }
 # i=3 is skipped, so x <- 1+2+4+5
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[1] 12

y <- 1; j <- 1
while ( y < 12 & j < 8 ) { y <- y*2 ; j <- j + 1}
y ; j
[1] 16
[1] 5

z <- 3
repeat { z<- z^2; if ( z>100 ) { break }; print(z)}
[1] 9
[1] 81
```

The loop stopped after 81^2 so z is 6561.

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Executing a command from a script

R scripts and stored in .R or .r files and are executed with the command `source()`

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setwd('C:/Documents/R')
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Rscript myscript.R
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On Monday

To be continued ...