Introduction to $\mathcal{R}$

Sessions 3: Data management

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Introduction

Outline

Sequential Execution

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- Run a script
  - step by step;
  - from start to end.

```
A <- "Well"
B <- "hello there."
paste(A, B, sep = ", ")
rm(A B) # Explain the error.
```

Iterative Execution

A.k.a. Looping

- Execute statement(s) repeatedly
  a. over a set of values
  b. as long as some condition holds
  c. until an abort condition is met
- Includes: for, while, and repeat
- Typical use-case: transform several variables

for()-Loops[2]

- repeats statements for each element on an input set

```
# Generic example
for (VALUE in THAT) { # Do THIS for each VALUE in THAT
  THIS
}
# A first working example
for (value in c("Waiting", "for", "statistics.")) {
  print(value)
}
```

- for() creates an object called VALUE
- reassigns VALUE for each element in the set THIS

[2] People don't like for(). For alternatives see https://bit.ly/2IEbeGj.

for()-Loops, contd.

- for() returns nothing unless told to[3]
- Save the output to an object
- Good practice:
  - Execute on a set of integers
  - Index both object and storage simultanously

```
words <- c("So", "how's", "looping", "so", "far?")
chr <- vector("character", length = length(words))
for (i in 1:length(words)){
    chr[i] <- words[i]
}
```

[3]"for loops are like Las Vegas: what happens in a for loop stays in a for loop" (Gorrelmund 2014: 164).

Quick Exercise

Remember last session's data management challenge? Let's try to express our solution as a for()-Loop.

```r
grade_quantiles <- quantile(
  student_data[, "grade"], probs = c(.2,.4,.6,.8)
)
student_data[, "grade_alp"] <- "F"
student_data[
  student_data[, "grade"] > grade_quantiles["20%"],
  "grade_alp"
] <- "D"
# ... and so on until A.
```

While()-Loops

- Rerun statement(s) as long as some condition is TRUE
- Condition should be a logical test
- Remember “Groundhog Day”
  - Include a change of condition in the while()’s body!

```
k <- 0
while (k < 20) {
  k <- k + 1
  print("Still running")
}
```

- Returns anything unless told to

Repeat()-Statements

- Reruns statement(s) until meets **break**

```r
chr <- "All work and no play makes Jack a dull boy"
k <- 0
repeat {
    print(chr)
    k <- k + 1
    if (k > 100) break
}
```

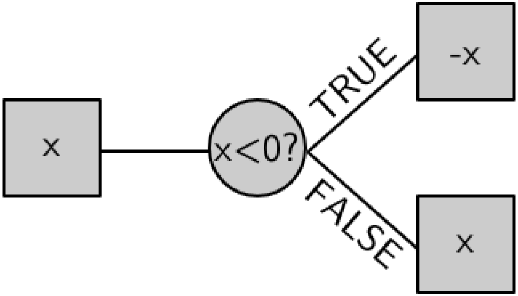
But...

How do we tell $\mathcal{R}$ to execute some code conditionally?

Conditional Execution

Intuition

- How does the absolute value $|x|$ algorithmically work?



- *Different* operations follow depending on some condition
- $\rightarrow$ code handles parallel cases

if() Statements

- Code executes if and only if some condition is TRUE
- Condition **must** evaluate to a single TRUE/FALSE statement

```
if (THIS) { # If this is TRUE
  THAT # then do THAT.
}
x <- 4
if (x < 0) {
  x <- -1 * x
}
```

if() Statements: What will this return?

```r
# Example 1 ========================================
x <- 1
if (TRUE) {
  x <- 2
}
# Example 2 ========================================
x <- 1
if (x == 1) {
  x <- 2
  if (x == 1) {
    x <- 3
  }
}
```

else() Statements

- tell $\mathcal{R}$ what to do should if() evaluate to FALSE
- multiple if/else statements can be nested

```r
if (this) {
  Plan A
} else {
  Plan B
}
dec <- 3.141 # Example: Round a decimal to integer
if (dec - trunc(dec) >= 0.5) {
  dec <- trunc(dec) + 1
} else {
  dec <- trunc(dec)
}
```

Practical Challenges

In a world without π. . .

Simulate collider bias

Summary