Exercises with R Programming

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R Basics

Exercise 1: Download and install R from the CRAN http://cran.r-project.org/. Bonus points if you compile it yourself.

Exercise 2: Download and install Rstudio from http://www.rstudio.com/.

Exercise 3: Install the package: "DAAG, magic, schoolmath, tidyverse, broom, coefplot, cowplot, drat, fs, gapminder, GGally, ggrepel, ggridges, gridExtra, haven, here, interplot, margins, maps, mapproj, mapdata, MASS, quantreg, rlang, scales, survey, srvyr, viridis, viridisLite, devtools" from the CRAN using R's `install.packages()` function.

Exercise 4: Use console type before `prompt`:

a) 2012-2021+2020/20*30^3-log(2020)/sin(2020)
b) print ("Hello world!")‘
c) c("Phnom Penh", "Kandal", "Prey Veng", "Kampong Cham", "Kampong Thom", "Preah Vihear")
d) c(2020:3000, (20:10))

Exercise 5: Create an R script that contains the code

print ("Hello world!")

Save the file as Exercise1.r and run it from from an interactive R session using the command `source("Exercise1.r")`.

Exercise 6: Let's create the following vectors:

u <- 2020

v <- 2021

w <- 2022

Use the elementary arithmetic operators +, –, *, /, and ^ to:

a) add u, v and w
b) subtract v from u and w
c) multiply u by v and w
d) divide u by v and w
e) raise u to the power of v and w

Exercise 6: Suppose u and v are not scalars, but vectors with multiple elements:

u <- c(7, 9, 11, 13)

v <- c(2, 4, 6, 8)

Use the elementary arithmetic operators +, –, *, /, and ^ to:

a) add u and v
b) subtract v from u

c) multiply u by v
d) divide u by v
e) raise u to the power of v

Exercise 7: When we want to carry out a series of arithmetic operations, we can either use a single expression, or a series of expressions. Consider two vectors u and v:

```
u <- c(8, 9, 10)
v <- c(1, 2, 3)
```

We can create a new vector w in a single line of code:

```
w <- (2*u+v)/2021
```

Or carry out each operation on a separate line:

```
w <- 2 * u
w <- w + v
w <- w/2021
```

Convert the following expressions to separate operations, and check that both approaches give the same result:

```
w <- (u + 0.5 * v) ^ 2
w <- (u + 2) * (u - 5) + v
w <- (u + 2) / ((u - 5) * v)
```

Exercise 4: We can do the reverse as well. Convert the following multi-line operation to a single expression. Check that both approaches give the same result:

Part a:

```
w <- u + v
w <- w / 2021
w <- w + u
```

Part b:

```
w1 <- u ^ 4
w2 <- u - v
w <- w1 / w2
```

Exercises 1: Vectors

1. Create the vectors:

a) (1, 2, 3, . . . , 29, 30)

b) (30, 29, 28, . . . , 2, 1)

c) (1, 2, 3, . . . , 19, 20, 19, 18, . . . , 2, 1)

d) (44, 66, 33) and assign it to the name `futureforum`.

For parts e), f) and g) look at the help for the function `rep`.

e) (44, 66, 33, 44, 66, 33, . . . , 44, 66, 33) where there are 20 occurrences of 44.
f) (44, 66, 33, 44, 66, 33, . . . , 44, 66, 33, 44) where there are 11 occurrences of 44, 10 occurrences of 66 and 10 occurrences of 33.

g) (44, 44, . . . , 44, 66, 66, . . . , 66, 33, 33, . . . , 33) where there are 10 occurrences of 44, 20 occurrences of 44, 20 occurrences of 66, 30 occurrences of 33.

2. Create a vector of the value of $e^x cos(x)$ at $x = 3, 3.1, 3.2, \ldots, 7$.

3. Create the following vectors:

a) $(0.1^3 0.2^1, 0.1^6 0.2^3, ..., 0.1^{37} 0.2^{32})$

b) $(2, \frac{2^2}{4}, \frac{2^3}{4}, ..., \frac{2^{26}}{26})$

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