Homework 1

PS923 - Methods and Analysis in Behavioural Science

Autumn Term 2022 (updated: 2022-09-30)

Submission

- Please submit your solution (including your `R` script) as a text document, or using RMarkdown, on Tabula by noon (12 midday) on the Thursday of week 2 (Thur 13th Oct).

Part 1

- Install `R` and `RStudio`, and open `RStudio`.
- Read chapters 1 to 5 (pp. 1 - 99) of Grolemund (2014).
- Create a new empty `R` script and save it so you can bring it to the seminar (e.g., `yourname_w1.R`)
- Add all code for this homework to this `R` script. Remember, you can use `#` to add comments to your script.

Part 2

These exercises are based on chapter 2 of Jones et al. (2010). If you struggle, it might help to read this as well.

2.1

Create variables, `x`, `a`, and `b`:

```
x <- 12
a <- 2
b <- 4
```

Based on this, give `R` assignment statements that set the variable `z` to:

1. x^{a^b}
2. $(x^a)^b$
3. $3x^3 + 2x^2 + 6x + 1$
4. $z + 1$

2.2

Give `R` expressions that return the following vectors

1. (1,2,3,4,5,6,7,8,7,6,5,4,3,2,1)
2. (1,2,2,3,3,3,4,4,4,4,5,5,5,5,5)

Hint: `rep()` could be helpful. See `?rep()`

2.3

Use R to produce a vector containing all integers from 1 to 100 that are not divisible by 2, 3, or 7.

Hint: Function `%%` could be helpful here.

2.4

Suppose that `queue <- c("Steve", "Russell", "Alison", "Liam")` and that queue represents a supermarket queue with Steve first in line. Using `R` expressions update the supermarket queue as successively:

1. Barry arrives;
2. Steve is served;
3. Pam talks her way to the front with one item;
4. Barry gets impatient and leaves;
5. Alison gets impatient and leaves.
6. Using the function `which(x)`, find the position of Russell in the queue.

For task 5, you should not assume that you know where in the queue Alison is standing.

Note that when assigning a text string to a variable, it needs to be in quotes.

Part 3

- Install `R` package `carData`.
- After attaching package `carData` (with `library("carData")`) the `data.frame` `Salaries` is available.
- Use `R` code to solve the following problems (i.e., do not only read the documentation):

1. How many rows and how many columns does `Salaries` have?
2. How many columns are numerical, how many columns contain factors?
3. Create a new `data.frame`, `salaries_a`, that only contains the data from `discipline = "A"`. How many rows does this `data.frame` have? Check the documentation, what does `discipline = "A"` stand for?
4. Create a new data.frame, `salaries_f`, that only contains the data from the `Female` professor at a `rank` of `AssocProf`. How many of those are in `discipline` `A`, how many in `discipline` `B`?
5. What is the percentage of professors that started this year (`yrs.service == 0`)?
6. How many professors in `discipline` `A` have been professor for more than 10 years (i.e., `yrs.service` larger than 10)?
7. Add a new column called `luck` to `Salaries` and fill it with random samples from the integers 1 to 6.
8. How many of the Associate Professors (i.e., `rank` of `AssocProf`) got lucky (i.e., have a 6 in column `luck`)? What percentage of the Associate Professors got lucky?

References

- Grolemund, G. (2014). *Hands-on programming with R.* Sebastopol, CA: O'Reilly.
- Jones, O., Maillardet, R., & Robinson, A. (2010). *Introduction to Scientific Programming and Simulation Using R.* New York: Chapman and Hall/CRC.