Homework 6 (Rcpp part II)

Select and solve **3** tasks from this list.
Develop an R package on GitHub. Include each solution in a separate C++ source file. Provide an extensive set of testthat tests. Don't forget to document all your functions with roxygen2. Create two vignettes: one that explains the package's features and the other one with benchmark results (compare each Rcpp function with some R solution, use data sets of different sizes).
When you're done, submit a link to your GitHub repository via courses.ipipan.edu.pl. I must be able to install the package with a single call to `devtools::install_github()`. Moreover, `R CMD check --as-cran` on your package shouldn't return any errors or warnings.
All the C++ source codes will be examined by plagiarism detection software.

Exercise 06.01. Write a function `mode()` to determine the most frequently occurring value in an integer vector (mode). If the mode is ambiguous (e.g. for 1, 2, 2, 2, 3, 3, 1, 3), return any mode.

Exercise 06.02. Write your own implementation of the `simplify2array()` function. Your function should expect a list of numeric vectors on input.

Exercise 06.03. Write an Rcpp function `perms()` to generate all the possible permutations of the set $\{1, 2, \ldots, n\}$ (for some given n). The function should return a matrix with $n!$ rows and n columns.

Exercise 06.04. Write a function `shortestpath()` with the following parameters:

1. `G` – a $n \times n$ 0–1 matrix (for some n) representing a directed graph with n vertices,
2. `x` – a single integer in $\{1, 2, \ldots, n\}$
3. `y` – a single integer in $\{1, 2, \ldots, n\}$

The function should return the length of the shortest path between the `x`th and the `y`th vertex of `G`.

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