

## CECS 342-04 Spring 2020

# Assignment 2

## Overview

The objective of this assignment is to research how *generic programming* works in different programming languages.

The general idea of *generics* (or *polymorphism* as it is sometimes called in a functional programming context) is to reuse the same source code with different types.

## Homework 3

1. Read about “Generic programming”:  
Start with [https://en.wikipedia.org/wiki/Generic\\_programming](https://en.wikipedia.org/wiki/Generic_programming)
2. Review Lab Assignment 1. Remember that the sort functions in C and Haskell had different types: In C we sorted arrays of integers, in Haskell we sorted lists of arbitrary elements that had some notion of order. Why do you think did we restrict the type of the C sort functions in this way?

## Lab Assignment 3

1. In this lab, you will use 5 different programming languages to solve the same problem:  
Use the same generic sort function to sort values of different types. The values to sort could be integers, floating point numbers, strings, pairs of values (say a string and a number), etc.
2. Write a console application in each of these 5 languages: C, C++, C#, Python and Haskell.
3. Each application has to use the following data:

The sequence of floating point numbers:

**645.32, 37.40, 76.30, 5.40, -34.23, 1.11, -34.94, 23.37, 635.46, -876.22, 467.73, 62.26**

The following sequence of people with name and age of each person. The name is a string and the age an integer:

**Hal, 20; Susann, 31; Dwight, 19; Cassandra, 21; Lawrence, 25; Cindy, 22; Cory, 27; Mac, 19; Romana, 27; Doretha, 32; Danna, 20; Zara, 23; Rosalyn, 26; Risa, 24; Benny, 28; Juan, 33; Natalie, 25**

Use appropriate data structures to represent the data above in each of the 5 languages and define the variables **numbers** and **people**, respectively.

4. Find generic sort functions for *each* of the 5 languages.

- (i) The objective of this assignment is to understand generics (not sorting). You can use the sort functions from Lab Assignment 1 or just use a sort function provided in some standard library for the respective language.
  - (ii) C doesn't really provide generics. However, a **void\*** can be used to point to any value.
  - (iii) One way to specify an order on a type is to define a comparison function that compares two values. This comparison function could be an argument to your sort function. Some languages might provide predefined comparison functions.
  - (iv) Try to use everything we learned about these different programming languages, e.g., Python uses duck-typing, Haskell uses the type-class **Ord** to express order on a type, LINQ in C# includes the **orderby** operator, etc.
5. Use the generic sort functions of each language to
    - (i) sort **numbers** ascending by numerical value,
    - (ii) sort **people** alphabetically (lexicographically) by name, and to
    - (iii) sort **people** descending by age, where people of the same age should be sorted alphabetically (lexicographically).
  6. The point here is to reuse as much code as possible to perform all 3 different sort operations. Try to isolate the specific code that is needed for each of the three tasks.
  7. Write a main function in each of the 5 languages to test your code by writing the sort results to the console.

## Deliverable

1. You can work on this assignment in a group of up to 6 students.
2. At the due date you will take a brief quiz to test your understanding of the assignment.
3. During the lab session on the due date each group will do
  1. A brief demonstration of the running applications.
  2. A presentation explaining the source code.
4. *Due date:* **Monday 12 October 2020** at the beginning of lecture.