

CSC 3112 PRINCIPLES OF PROGRAMMING LANGUAGES  
ASSIGNMENT 2 2021/2022  
April 2022

## Instructions

1. This is a group assignment to be handed in via MUELE on 24<sup>th</sup> April 2022 11:00pm. This deadline is final and will not be extended.
2. Place all your solutions in a zipped folder with the name of the group as the folder name.
3. All code should be in their executable formats ready to be run and not in word/pdf documents.

## Questions

1. Write a simple assignment statement with one arithmetic operator in a programming language you know. For each component of the statement, list the various bindings that are required to determine the semantics when the statement is executed. For each binding, indicate the binding time used for the language.
2. Mention one problem likely to be faced by programs written in programming languages which do not support garbage collection.
3. Describe the following approaches to garbage collection, giving advantages and disadvantages of each approach.
  - (a) the lazy approach
  - (b) the eager approach
  - (c) generational garbage collection.
4. Describe 2 problems that appear in the construction of large programs that led to the development of encapsulation constructs.
5. Use code examples to differentiate between operator overloading and subprogram overloading.
6. Why are destructors rarely used in Java but essential in C++?
7. Write an abstract data type for rational numbers (a numerator and a denominator). Include a constructor and methods for getting the numerator, getting the denominator, addition, subtraction, multiplication, division, equality testing, and display. Use any programming language you know.
8. Write a Java program that inputs a list of integer values in the range of -100 to 100 from the keyboard and computes the sum of the squares of the input values. This program must use exception handling to ensure that the input values are in range and are legal integers, to handle the error of the sum of the squares becoming larger than a standard Integer variable can store, and to detect end-of-file and use it to cause the output of the result. In the case of overflow of the sum, an error message must be printed and the program terminated.

GOOD LUCK