Foundations of Computer Science

Semester 02, 2019

Final Practical Exam

Due: 4:00 pm Friday 08 Nov 2019

Note: You are required to read this entire notebook before starting any activity.

Important Notes

- This exam is individual. NO ACCESS to Internet/Google aside from Approved Links;
- At the start of your Final Practical Exam session, you must create and checkout the correct SVN directory as shown in the WebSubmission system.
- Functional marks are awarded based on the Websubmission system. Late submissions will not be marked.
    - https://cs.adelaide.edu.au/services/websubmission

Hurdle Marks:

- If your final mark for the course is greater than 44 F; **AND**
- your mark for the final practical exam or final quiz is less than 40%;
- your final mark for the course will be reduced to 44 F.

Functional Marks:

- Functional marks represent **60%** of total marks for the final practical exam;
- The functional marks are awarded with automatic test scripts from **WebSubmission**, for every problem there are a few test scripts;

Code Style Marks:

- To acquire full code style marks, follow standard commenting, indentation, annotation and header signature for all the files in **Problem 01** and **Problem 03**.

Basic Programming

Problem 01:

There are some concepts that are considered basic programming skills, such as operators, loops and conditions. These are the building blocks of complex software. In this problem, you are asked to demonstrate your knowledge in basic programming.

Find in attachment problem-01/BasicProgram.java

Requirements:

You are required to develop the following requirements.

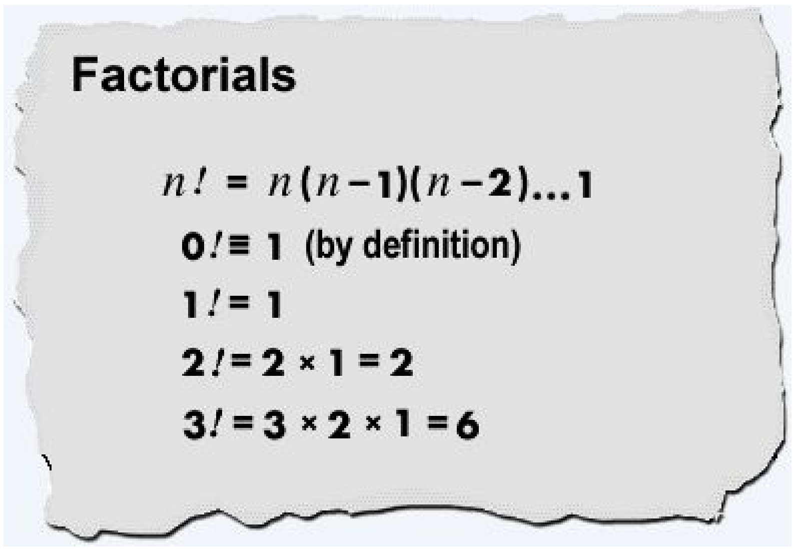
```
/*
* The class BasicProgram is a general class;
*
* Signatures:
* method sum:
*         return type: integer;
*         requirements:
*                 - return the sum of two numbers;
*
* method div:
*         return type: double;
*         requirements:
*                 - return the div of two numbers;
*                 - the number b must not be 0;
*                 - If division by zero, method MUST throw an error, with the
*                 message: “Not possible division by zero.”.
*                 - exception type: UnsupportedOperationException
*                 If necessary, you are allowed to check java docs, for this
*                 Exception (java.lang.UnsupportedOperationException)
*                 import java.lang.*;
*                 throw new UnsupportedOperationException
*
*         Note: your method just has to throw the exception, the message will
*         be handled by the testing script in Websubmission;
*
* method displayArray:
*         return type: void;
*         requirements:
*                 - print the values in an array;
*                 - display format: "[ 1, 2, 3, 4, 5];"
*                 - the number of elements in the array must not be 0;
*                 - If the number of elements is zero, method MUST
*                 throw an error, with message:    "No elements."
*                 -exception type: UnsupportedOperationException
```

Intermediate Programming

Problem 02:

Concepts such as recursion and complex manipulation of loops are found in intermediate programming skills. In this problem, you are asked to demonstrate your knowledge in intermediate programming.

Factorial number: For an integer n greater than or equal to 1, the factorial is the product of all integers less than or equal to n but greater than or equal to 1. The factorial value of 0 is defined as equal to 1. The factorial values for negative integers are not defined.



Factorials

$$n! = n(n-1)(n-2)\ldots 1$$

$0! \equiv 1$ (by definition)

$1! = 1$

$2! = 2 \times 1 = 2$

$3! = 3 \times 2 \times 1 = 6$

Find in attachment problem-02/Factorial.java

Requirements:

You are required to develop the following requirements.

```
/*
* The class Factorial is a general class;
* Signatures:
* method find:
*         return type: integer;
*         requirements:
*                 - return the factorial number of the value x;
*                 - the number x must not be negative;
*                 - If the value is negative, method MUST throw an exception,
*                 with message: “Not defined.”
*                 - exception type: UnsupportedOperationException
*                 If necessary, you are allowed to check java docs,
*                 for this Exception.
*                 - Recursive solution will be award with additional marks;
```

Object Oriented Programming

Problem 03:

Object-oriented programming (OOP) is a programming language model organized around objects rather than "actions". In this problem, you are asked to demonstrate your knowledge in OOP.

The following two classes have been given to you and do not need to be changed. Copy this code into relevant files in preparation for making a child class.

Find in attachment problem-03/*

Requirements:

In this problem you are asked to implement the class **Person.java**;

You are required to use the above classes with your code.

Specifications for the code.

```
/*
* class: Person.java
* The class Person consists of a class that inherits from the abstract
* class PersonAbstract.
*
* - Implement accessors & mutators for all attributes defined in
* PersonAbstract;
* - Implement 1) non-parametric constructor and set
*                          (name: "unknown",*        age: -99, address: "None");
*                   2) parametric constructor with all parameters in the order:
*                          (age, name, address)
* - Inheritance will be marked by tutors for this (4 marks)
*
* Signatures:
* method display:
*         return type: void;
*         requirements:
*                 - display information about person;
*                 - display format: "name: unknown, age: -99, address: None;"
```

Algorithms & Data Structure

Problem 04:

A data structure is a data organization, management and storage format that enables efficient access and modification. Algorithms are the structure that programs use to manage and deal with this data. In this problem, you are asked to demonstrate your knowledge in Algorithms and Data Structures.

Find in attachment problem-04

Requirements:

In this problem you are asked to implement the class **DataStructure.java**;

```
/*
* class: DataStructure.java
* The class DataStructure consists of a class that implements the
* interface Structurable
*
* Signatures:
* method sort:
*         return type: int [];
*         requirements:
*                 - Implement any sorting algorithm of your preference;
*                 - sort descending an array of integer values;
*                 - the number of elements in the array must not be 0;
*                 - If the number of elements is zero, method MUST throw an
*                 exception, with message: “No elements.”
*                 - exception type: UnsupportedOperationException
* method search:
*         return type: int;
*         requirements:
*                 - Implement any searching algorithm of your preference;
*                 - search for a value in an array of Strings;
*                 - return the index of a given element
*                 - If the value is not existent, return -99;
*                 - If there are repeated values, return the first found;
*                 - If the number of elements is zero, method MUST throw an
*                  exception, with message: “No elements.”
*                 - exception type: UnsupportedOperationException
```