Advanced Software Technology — ST 2015

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Distributed on Mar-31 — Due Date: Apr-07

10 **Exercise 1: Integers, Part I**

Write a Java program which performs the following tasks:

1. It first inputs an integer between 1 and 100 from the user. Let's assume the user inputs n.
2. It then reads n more integers and stores them.
3. It computes the sum, the product, the average, the variance, the smallest and the largest value of these numbers.
4. It outputs, in a nicely formatted way, all the numbers input and the statistics computed.

Note: The output should also be integers, i.e. if the user input three numbers which sum up to 13, the average computed should be 4, not 4.3333...

10 **Exercise 2: Integers, Part II**

Write a Java program which performs the following tasks:

1. It finds all prime numbers between 0 and the largest integer, and between 0 and the largest long integer.
2. It determines the time needed to count from the smallest to the largest integer, and the smallest long to the largest long integer.
3. It outputs, in a nicely formatted way, all the numbers computed.

10 **Exercise 3: Calculations**

Write an application that iterates over positive integers from 0 to 100, calculates various functions in n as listed below, and outputs the results (as integer, where possible and sensible) in table format, each function value in a separate column.

$f(n) = 2n$ $\quad$ $f(n) = n^{\frac{1}{2}}$ $\quad$ $f(n) = 10^n$

$f(n) = n^3$ $\quad$ $f(n) = 2^{\frac{1}{n}}$ $\quad$ $f(n) = e^n$

Some function values may exceed the range of commonly used variable types. Think of alternative ways of representating or calculating them in this case.

10 **Exercise 4: Pi is not a Pie**

Write a program that inputs the diameter of a circle as a number x from the user and outputs the circumference and the area of the circle.
Then extend your program such that it demonstrates the effect of approximating π, as follows:

- It asks the user to input the maximum precision (number of digits after the period) of π to be considered.
- Check if this number is reasonable. Otherwise take the maximum reasonable number.
- Approximate by iterating over the the number of digits of precision for π, i.e. in the first iteration π is approximated by 3, in the second iteration by 3.1, then 3.14, and so forth. The program should cut off π after the current precision length, not round it!
- Do this until the maximum number of digits of precision is reached, and give the percentage of increase of the circumference and the area over the previous iteration.