

## CMSC 245 Principles of Programming Languages

### Lab#5/Assignment#5: Exploring programming Language Quirkiness

1. Consider the function defined below:

$$isOdd(n) = \begin{cases} true & \text{if } n \text{ is odd} \\ false & \text{o/w} \end{cases}$$

2. You can use the modulo operator (%) to test if a number is odd. That is, **n** is an odd number if **(n % 2)** equals 1. Thus, the function **isOdd(n)** can be defined using the algorithm shown below:

**function isOdd(n: integer) returns true/false**

**if (n % 2) equals 1**

**return true**

**else**

**return false**

3. Next, code the function **isOdd()** using the algorithm described in above in **three** programming languages: Java, Python, and your chosen language. The function should return a boolean value. Only in case a boolean type is not available in a language, you may use an integer result where 1 stands for true and 0 for false.
4. Write a program that uses **isOdd()** exactly as defined above, using the algorithm shown below to test:

**for each value, say v in 0..5**

**print out the value of v and the value returned by the expression isOdd(i)**

Format the output so it looks as follows:

**0 false**

**1 true**

**2 false**

**3 true**

**4 false**

**5 true**

Note, and confirm, that the program is correctly identifying 1, 3, and 5 as odd numbers (i.e. prints true), and that 0, 2, and 4 are correctly identified as not being even numbers (i.e., prints false). Ensure that you have tested all your programs in this manner.

- Next, modify the programs to use the following algorithm:

```
for each value, say v in -5..5  
  print out the value of v and the value returned by the expression isOdd(v)
```

Run all programs and note down your results. You will have a total of 3x11 outputs. Three programs in three programming languages, each producing 11 outputs.

- Study the 33 cases closely and ensure that all outputs are correct. Guess what, they will not be! For the language whose program gave incorrect results, study the language reference(s) to investigate the cause.
- Redefine the function **isOdd()** to use the following algorithm:

```
function isOdd(n: integer) returns true/false  
  if (n % 2) does not equal 0  
    return true  
  else  
    return false
```

Test, using the algorithm from (5) again. Confirm that the results are correct!

- Write a short essay. The target audience of your essay should be seasoned computer science students (like yourselves). Your essay should serve as an informative tutorial that succinctly, and in an engaging manner, teaches the reader about the importance of language standards, compilers, pitfalls, traps, and safe coding techniques.

**Note:** You do not need to include all the details from this lab, only the most relevant ones. The essay should be no longer than 2-3 printed pages (12 pt font, single-line spacing, 1-inch margins all around).

**What to submit (for Assignment#5):**

- Your essay.
- An Appendix showing your answers to the three sets of outputs from (5) above.

A printout of the code in all languages.