1001ICT Introduction To Programming 1 2013-2
Laboratory 8

School of Information and Communication Technology
Griffith University

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When	Teaching week 9
Goals	In this laboratory you will write programs with selections, loops, type casts, and/or methods.
Marks	5
Robots	Cyclops-NXT
Props	Bollard, Debris
Tracks	Enclosure Track

1 Preparation

Before your lab class:

- Print these lab notes. You need to refer to them *a lot* before the lab class and during it.
- Read sections 18 to 20 of the lecture notes.
- Browse the `console` and `nxt` environment documentation available at `http://www.ict.griffith.edu.au/arock/itp/students/mash/`.
- You can start work before your lab class. If you can't write the complete programs, you could at least create the program files, with header comments, imports, and `main` method.

2 Pre-laboratory questions (1 mark)

Answer the following questions in the space provided, *before your laboratory class.*

1. Where will you find a *formal* parameter list in a program?

2. Where will you find an *actual* parameter list in a program?

3. How many letters are in the English alphabet? _____

4. Why is 13 the special number that makes the ROT13 algorithm work for both encoding and decoding?

5. What is the type of this Java expression: `'b' - 'a'`? _____

6. What is the value of this Java expression: `'b' - 'a'`? _____

7. What method in the `console` environment reads a whole line of text? _____

3 Activities

All programs must:

- have header comments showing the name of the file, the author's name, and the purpose of the program;
- be written with at least a `main` method; and
- use constants for motor and sensor ports; and
- be neatly indented.

3.1 MaSH console program 1 (1 mark)

- Make a new version of the program that prints a square that prints with alternating characters:

```
$ java Square2
Enter the size: 5
XOXOX
OXOXO
XOXOX
OXOXO
XOXOX
$
```

- Hint: This program is easy if you can tell whether a number is odd or even. There's an example program in the lecture notes that does that.

3.2 MaSH console program 2 (1.5 marks)

- ROT13 is a simple algorithm to encode text so that it is hard to read, but easy to decode with the the same algorithm. It is commonly used on forums to obfuscate spoilers, answers, and material that might be offensive to some users.
- The algorithm for both encoding and decoding is to replace every letter with the letter that is 13 places later in the alphabet, reverting to the start, A, as needed. Characters that are not letters are not changed.
- Examples:
  - `a` → `n`
  - `A` → `N`
  - `c` → `p`
  - `M` → `Z`
  - `n` → `a`
  - `p` → `c`
  - `?` → `?`
- Write a function that encodes one character using ROT13.
- Write a function that encodes a whole string using ROT13.

- Write a main method that reads a string typed by the user; then prints it encoded with ROT13; and then prints it decoded again with ROT13. Example:

```
$ java Rot13
String: The password is "Swordfish".
Encoded: Gur cnffjbeq vf "Fjbeqsvfu".
Decoded: The password is "Swordfish".
$
```

- Hints:
  - The `ToUpperCase` example from lecture notes section 20.13 is a good example with similar functions for one character and then a whole string.
  - Use `%`.

3.3 MaSH nxt program 1 (1.5 marks)

- Write a program that makes the robot keep moving, backing off and turning away from obstacles, and turning away from the dark boundary, as in this movie.
- Hint: When moving forward, the robot needs to be waiting for either running into an obstacle or dark paper, as in last week's laboratory.

3.4 MaSH console program 3 (no marks, just kudos)

- Make your ROT13 program into a filter. That is, make it read all of standard input, line by line, printing out each line encoded. This program can then be used to en/decode whole files.

3.5 MaSH console program 4 (no marks, just kudos)

- Write a filter that removes all tabs from a file, while preserving its layout as you see it in your editor.
- Hint: A tab character will always be translated into at least one space, and as many more as needed to make the next character be at a column number that is a multiple of the tab width setting of your editor (counting columns from zero).

4 After the Laboratory

- Organize the work you have done into folders on your network drive.