1001ICT Introduction To Programming 2015-2
Laboratory 4

School of Information and Communication Technology
Griffith University
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<td>Goals</td>
<td>In this laboratory you will write programs that use variables, constants and functions.</td>
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<td>Marks</td>
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<td>Robot</td>
<td>CalibotNXT2</td>
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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 up to section 11 of the lecture notes.
- Browse the console and nxt environment documentation available at http://www.ict.griffith.edu.au/arock/itp/students/mash/ and in the lecture notes.
- You can experiment and create the programs before your class.

2 Pre-laboratory questions (0.5 marks)

Answer the following in the spaces provided, before your laboratory class.

1. For each of the following quantities, which numeric data type would be the *best* choice: `int`, `long`, `float` or `double`?

   (a) the number of music tracks stored on a smart phone with more than 50 GB of storage: ________

   (b) the exact total number of bytes of music information stored on the device: ________

   (c) the fraction of the music tracks on the device that are instrumental (i.e. without words): ________

   (d) the exact number of people in Australia that own a smart phone: ________

   (e) the percentage of Australians that own a smart phone: ________

   (f) the exact number of people in the whole world that own a smart phone: ________

2. Consult the documentation for the console environment to answer these questions:

   (a) i. What method do you use to read a whole number (less than 1 billion) typed by the user? ________
ii. Is it a procedure or a function? ________________

(b) i. What method do you use to read a fractional number typed by the user? ________________

ii. Is it a procedure or a function? ________________

(c) The mathematical constant \( \pi \) is predefined in all environments with what name? ________________

3. Consult the documentation for the \texttt{nxt} environment to answer these questions:

(a) i. What method do you use to set a rotation sensor to zero? ________________

ii. Is it a procedure or a function? ________________

(b) i. What method do you use to get the value from a rotation sensor? ________________

ii. Is it a procedure or a function? ________________

3 Activities

All programs must have:

- header comments showing the name of the file, the author’s name, and the purpose of the program; and

3.1 MaSH \texttt{nxt} program 1 (1 mark)

- Write a program that drives the calibot forward until dark paper is reached, but then makes it reverse direction and return to its original starting point, as in this movie.

- Important: When using most sensors, it is usually a good idea to have the robot wait for half a second, between setting up the sensors and using them. This allows the sensor to stabilise.

3.2 MaSH console program 1 (0.5 marks)

- Write a program that reads a fractional number and prints it out again, rounded to 2 decimal places. Use a \texttt{format()} function.

- The program should look like this when it runs:

```java
$ java Format
Enter a fractional number: 3.14159
Rounded: 3.14
$
```

- Submit the program to the MaSH Online judge, with the command \texttt{mashj 0002-format Program.mash}.

3.3 MaSH console program 2 (1 mark)

- This problem will be revealed during the laboratory class.

- The program must show the units for inputs and outputs.

3.4 MaSH \texttt{nxt} program 2 (no marks, just kudos)

- Extend MaSH \texttt{nxt} program 1 so that when it has finished moving forward, it displays the distance travelled in rotation sensor counts, and in centimetres. The numbers should be labelled so the user can see which number is which.
3.5 MaSH console program 3 (no marks, just kudos)

- Write a program that reads a whole number of seconds and prints how many whole hours, minutes, and left-over seconds that represents.

- The program should look like this when it runs:

```bash
$ java Seconds
Total seconds: 10000
Hours: 2
Minutes: 46
Seconds: 40
$
```

- (MaSH Online Judge problem-id: 0003-hms)

4 After the Laboratory

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

- Please answer these feedback questions.
  - What was the most difficult aspect of this laboratory?
  - Did you find an error in these lab notes?