COMP10001 Foundations of Computing
Introduction to Computing

Semester 2, 2016
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Lecture Agenda

- What did last year's students think? (SES)
- Will you fail this subject?
- What is a computer, and how do we talk to it?
- Python
- Grok
- Python basics

SES – Student Experience Survey

- At the end of each semester in each subject you will be asked to fill out an SES survey.
- Summary of last year's feedback:
    - Awesome subject. Andrew's awesome. Tim's awesome. Tutors are awesome. etc
    - This subject suddenly got hard at week 5.
    - This subject is too hard.
    - Grok is an amazing tool to help learn Python, and Chris is a sickdog.

Failure?

- Most of you have probably never contemplated (academic) failure.
- Lots of people fail first year uni subjects.
- Lots of people (say, 20%) may fail this course.
- It obviously has consequences, but is not the end of the world.
- Make a concious choice, either way.

Academic Honesty I

- In accordance with the University's Academic Honest and Plagiarism Policy (which you should familiarize yourself with!):

  https://academichonesty.unimelb.edu.au/

  all examinable work (Grok worksheet answers and all project work) that you submit for COMP10001 must be **your own individual work**

Academic Honesty II

- The only possible exception to this for COMP10001 is where you have been provided with “skeleton” code as part of a project, in which case you should clearly attribute the code in comments, e.g.:

```
#########################################################
# The following block of code was taken from the skeleton
# code provided by Chris Leckie

⋮

# End of provided skeleton code
#########################################################
```

Academic Honesty III

- Common causes of breaches in the past have been:
    - friends asking to look over your code to “get hints” for their own project
    - flatmates accessing your code via a shared desktop computer with saved login details
    - study groups where the facilitator has overstepped the line and provided sample code to help people along
    - posting project code to a discussion forum
    - getting someone to write their code for them

Academic Honesty IV

- Common attempts to escape undetected are:
  - changing the comments but not the code
  - changing variable names
  - rearranging blocks of code (sometimes breaking the logic in the process!)
- It is all too easy to automatically pick up on all of these, and many, many more, approaches using software plagiarism detection software … and we **do** check

A Sobering Statistic

- Last year, 42/280 COMP10001 students were required to attend hearings for plagiarism breaches.
- You will get caught. Severe cases can lead to 0/100 for the subject.
- Don't let your friends make a mistake.
- Never share any **examinable** code with your fellow students (not on the forums, not via email, not via shared machines, ...). Just say "no".

So What *is* Appropriate?

- You are encouraged to share/collaborate directly on code for any non-examinable items (notably the tutesheet questions and the practice project) ... and you will learn a lot from reading the code of others (including the sample solutions in the worksheets)
- You are very welcome to discuss with fellow classmates your *approach* to worksheet questions and the projects, in conceptual terms, or in terms of key data types or programming constructs used (just **not** with the aid of raw code)

Help...

- Office hours, tutors, demonstrators
- Online Help: beginning in Week 2 (next week) on certain evenings you can chat with a demonstrator.
- We will provide instructions via the LMS next week

A Word on the LMS

- We will post all code from lectures (other than snippets from the "console") on the LMS after each lecture; it is a good idea to look back over the code to ensure you fully understand it, and play around with it yourself

Moving on...

- Enough of the administrivia, let’s get started

What is a computer?

- A big grid/matrix of cells (memory locations)
- Can add, multiply and compare cells really fast (instructions)
- Can run a “program” (list of instructions = machine code)
- At the most basic level, computers use binary encodings (one or zero)
- Eg. to turn top left pixel on the screen red...

```
10010010 00000001 11111110000000000000000000000000
10001010 00000001 11010010010100101001010100001001
```

Obviously not human friendly

```
10010010 00000001 11111111000000000000000000000000
10001010 00000001 11010010010100101001010100001001
```

- Easier (assembly language)

```
LDC r1 0xFF000000
STO r1 #D2529509
```

- Even better (Python-like)

```
screen[0,0] = (255,0,0,0)
```

- Best? (Siri)

```
Make the pixel at (0,0) red, please.
```

There are lots of programming languages

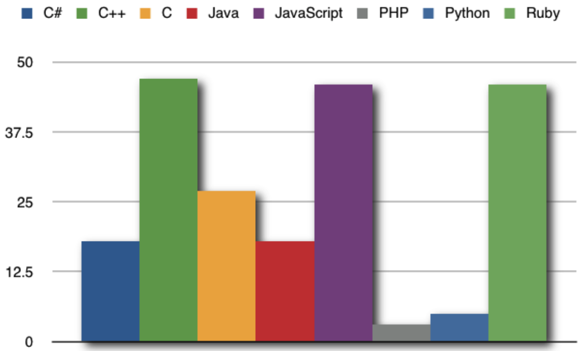
- `http://en.wikipedia.org/wiki/List_of_programming_languages`
- `http://www.windley.com/archives/2003/05/computer_langua.shtml`
- We will use Python 3.4
- You just write it like a text file, and the python "interpreter" turns it into machine code for you, and then executes the machine code.

A Message from the Python Creator

"Actually, my initial goal for Python was to serve as a second language for people who were C or C++ programmers, but who had work where writing a C program was just not effective." — Guido van Rossum (the Benevolent Dictator for Life)

And Another Thing ...

The relative proportion of profanities per line in code written in different languages:



Source(s):

`http://ilovecharts.tumblr.com/post/3463898034/amount-of-profanity-in-git-commit-messages-per`

Install Python!

- Get a copy of python for your own machine at home — there are free versions for Windows, MacOS and Linux
  - `http://www.python.org/download/`
- Advanced Python Distribution (for scientific experimentation)
  - `http://www.enthought.com/products/edudownload.php`
- Even as an app for your Android phone...

Python2 and Python3

- Python underwent a number of non-backwards-compatible changes from version 2 of Python ("Python2") to version 3 of Python ("Python3")
- A lot of code you will find on the web is Python2, which will mostly work in Python3, but there are some gotchas.
- We will use this symbol when the difference is present:

Grok Learning

- Grok Learning is the web-based programming environment we will be using for the duration of this subject:
  - `https://groklearning.com/login/`
- All you need to access the system is a browser, an internet connection and your Grok account
- Different modes of working in Grok:
  - code, run, mark
  - terminal

Python Basics

To start out, let's use Python as a glorified calculator:

- basic arithmetic: `+` (addition) `-` (subtraction) `/` (division) `*` (multiplication)
- also: `**` (exponent), `%` (modulo), `//` ("floor" division)
- Python uses "BODMAS" to associate operands by default, which you can override with "parentheses":
  - `1 + 2 * 3` vs. `(1 + 2) * 3`
- special character `_` stores the value of the last calculation

Class Exercise

- Armed just with these operators, let's explore the limitations of what we can do; is it possible to:
  - calculate $n!$ $(= n \times (n-1) \times ...2 \times 1)$ for an arbitrary n?
  - calculate the ith Fibonacci number?
  - numerically "break" Python?
- Beware, in Python2, $10/3 \neq 10.0/3.0$

Sequences of Items

- One construct that pervades computing is a "sequence" (or "iterable" in Python-speak), i.e. the decomposition of an object into a well-defined ordering of items
    - text as sequences?
    - sounds as sequences?
    - images as sequences?
- Manipulation of objects tends to occur via "iteration" over iterables

What do we mean by “Iteration”?

- According to Wikipedia:

  “**Iteration** *is the act of repeating a process with the aim of approaching a desired goal, target or result. Each repetition of the process is also called an* **iteration**, *and the results of one iteration are used as the starting point for the next iteration.*”

Lecture Summary

- Computers speak binary, but we don't
- High level programming languages make life easier
- We will use Python inside Grok

Examinable material:

- Python basics (simple arithmetic)