COMP10001 Foundations of Computing
Introduction to Computing

Semester 2, 2018

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Lecture Agenda

- What did last year's students think? (SES)
- Will you fail this subject?
- Academic Integrity
- Tips for doing well

- What is a computer, and how do we talk to it?
- Python & Grok
- Python basics

We Need You!

- We need 2 volunteers to act as "student representatives" for the subject, with the following responsibilities:
  - keep finger on pulse of student body
  - (possibly) act as go-between between students and teaching staff
  - attend a Staff–Student Liaison Committee meeting later in the semester to report on any issues with the subject, and run a feedback session immediately beforehand to poll the student body
- Email us if interested (we'll take first two!):
  - `comp10001s2-lecturers@lists.unimelb.edu.au`

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. Lecturers are awesome. Tutors are awesome. etc
  - Grok is even awesomer.
  - This subject suddenly got hard at week 5.
  - This subject is very challenging and rewarding OR too hard.

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 conscious choice, either way.

Academic Integrity I

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

  https://academicintegrity.unimelb.edu.au/

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

Academic Integrity 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 / Nic Geard
#
# End of provided skeleton code
############################################################
```

Academic Integrity 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 online for feedback from others
  - getting someone to write their code for them
  - using online code editors (not Grok) that make code visible to others

Academic Integrity 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

Sobering Statistics

- First semester:
  - 120/1000 COMP10001 students were required to attend hearings for plagiarism breaches
- Attempts at plagiarism get caught, and lead to un-fun academic integrity hearings
- Don't fall into any traps, and 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)

Secret to Subject Success

- Balanced workload of 10–13 hours per week, e.g.:
  - Workshop (2 hours attendance + 2 hours follow-up)
  - Lectures (3 hours attendance + 3 hours review)
  - Study (2 hours review/reading/study group)
  - Form an informal study group and copiously share ideas, and **non-examinable** code
- Attend, listen, ask, and share, but above all do, do, do!

More Tips I

- Lectures and workshops start 5 mins later and end 5 mins earlier than advertised
- All lectures will be recorded (audio and screen scrape) ... but try to come along to ask questions and get the full lecture experience
- Expect things to move faster and marks to be harder to get than in high school
- When learning programming, constant "practice" is the key to success

More Tips II

- If you need help, avail *yourself* of the various sources of assistance; don't expect us to come chasing you
- If you email Nic or Chris, start the subject line with COMP10001, and we can take ≤ 48 hours to reply; use the subject email:
  - `comp10001s2-lecturers@lists.unimelb.edu.au`
- As above, never share any **examinable** code with your fellow students
- Read carefully the **Academic Integrity** section on the **Subject Overview** page of the LMS

Help

- Tutors, demonstrators, office hours
- Online help: beginning in Week 2 (next week) on certain evenings you can chat to a tutor or demonstrator
- We will provide more information on this next week

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 (one or zero)
- E.g. to turn top left pixel on the screen red ...

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

Obviously not human friendly

- 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 the top left of the screen red!

There are Lots of Programming Languages

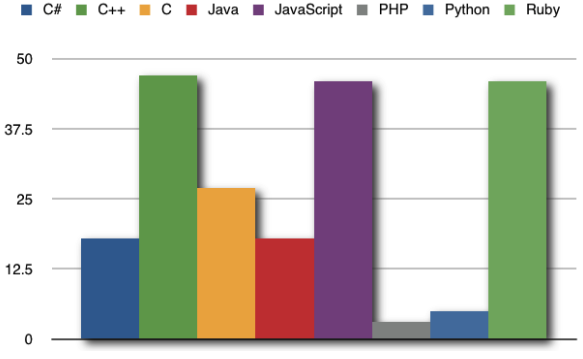
- `http://en.wikipedia.org/wiki/List_of_programming_languages`
- We will use Python 3.6
- You just write it like a text file, and the Python "interpreter" turns it into machine code for you

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/course/unimelb-foundations-2018-s2/`
- All you need to access the system is a browser, an internet connection and your unimelb 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

-  Beware, in Python2, $10/3 \neq 10.0/3.0$

Class Exercise

- Armed just with these operators, let's explore the limitations of what we can do.
- Is it possible to:
  - numerically "break" Python?
  - calculate $n!$ $(= n \times (n-1) \times ...2 \times 1)$ for an arbitrary n?
  - calculate the ith Fibonacci number?

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)