MATHEMATICS FOR PROGRAMMING

WHAT IS THIS COURSE?

- Some basic math and logic
- But why?
  - To "talk" to the Computers
  - Computer can understand "programs"
  - Writing programs requires some logic and reasoning
  - Good background in basic math will help
- How?
  - Concept
  - Examples
  - Practice, practice and practice!

FACULTY

Past:

- B.Sc. in Computer Science and Engineering (BUET)
- Lecturer, United International University (UIU)

Current:

PhD in Computer Science

National University of Singapore (NUS)

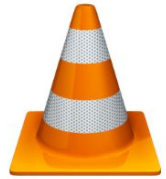
WHAT IS A COMPUTER?

- A machine that computes something
- Tasks:
  - Accept data/input
  - Process data
  - Produce output/result
  - Store result
- Usage:
  - Writing documents
  - Browse the internet
  - Send emails
  - Play games
  - And many more …!

COMPONENTS OF A COMPUTER

WHAT IS SOFTWARE?

- Computer programs
  - Set of instructions …
    in a way that the machine understands!!!
  - Associated data
  - Executes specific tasks



WHAT IS PROGRAMMING?

- Building software
- Writing instructions for the machine (in programming languages...)
  - "Coding", sounds familiar?
- Telling the computer how to perform a task

- How can you get into programming?
  - Knowing a general-purpose programming language. C, C++, Java, Python etc.
  - Basic mathematics and logic
    - To solve a problem and to design the solution before writing code

HOW MUCH MATH SHOULD I KNOW?

- Short answer: Not much!
  - School level mathematics are more than enough for a top programmer
  - +, – , / , x
  - % (mod), even-odd
  - Percentage
  - Coordinate system
  - Basic geometry
  - Number systems
  - But you must "understand" the concepts properly

HOW MUCH MATH SHOULD I KNOW?

- Long answer: It depends on what you are going to do in future!
  - Game development
    - 3D games and 3D graphics
    - Trigonometry, Linear Algebra, Matrices
  - Cryptography
    - Number theory
  - Machine Learning
    - Linear algebra, Calculus
    - Probability, Statistics
  - …
- How about libraries and black-boxes?

LET'S BEGIN WITH... NUMBER SYSTEMS

- Count from 0 to 12
- Easy, right?

$$1 \rightarrow 2 \rightarrow 3 \rightarrow 4 \rightarrow 5 \rightarrow 6 \rightarrow 7 \rightarrow 8 \rightarrow 9 \rightarrow 10 \rightarrow 11 \rightarrow 12$$

HOW ABOUT THIS?

- 000
- 001
- 002
- 003
- 004
- 005
- 006
- 007
- 008
- 009
- 010
- 011
- 012

$$0, 1, 2, 3, 4, 5, 6, 7, 8, 9 \rightarrow 10\ digits \rightarrow Decimal\ number\ system$$

HOW ABOUT 2 DIGITS?

- 000
- 001
- 010
- 011
- 100
- 101
- 110
- 111
- …

$$0, 1 \rightarrow 2\ digits\ \rightarrow Binary\ number\ system$$

SUMMARY

- Goal of the course
- Computer, software and programming
- Relevance of mathematical knowledge in programming
- Number system introduction