ANALYSIS OF ALGORITHMS

COMS2015

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COURSE STRUCTURE

- Lectures every Tuesday

- Labs and tutorials on Thursday and Friday

- Tutorials and labs will be mixed, and will be concurrent with Computer Networks

- Course will follow the structure laid out in the book

WHAT IS THIS COURSE ABOUT?

- Fundamentally a course on problem solving

- Logic Puzzle 1 – Egg drop

  You have two eggs of equal strength, and have access to a 100 storey building. You want to find out which floor is the highest one from which eggs can be dropped without breaking them. Can you come up with a strategy?

  Now, try to do it using the least number of egg drops.

WHAT IS THIS COURSE ABOUT?

- Fundamentally a course on problem solving

- What constitutes a good solution to a problem?

  - Correctness

  - Efficiency

  - Generality

- Can we ensure these properties hold?

PROBLEM SOLVING

- Correctness
  - Proof Techniques
- Efficiency
  - Complexity Analysis
- Generality
  - Solve abstract rather than concrete problems

COURSE OUTLINE

- Complexity Analysis

- Graphs

- Problems
  - Scheduling
  - Matching
  - Path Planning
  - Project Planning
  - Fault Tolerance

COMPLEXITY ANALYSIS

- Relates problem size (n) to computation time
  - Why?
- Generally care about performance for large n
  - Why?
  - How does this affect analysis?
- How do we model:
  - Uncertainty?
  - Data characteristics?
- What data structures should we use? How do they affect complexity?
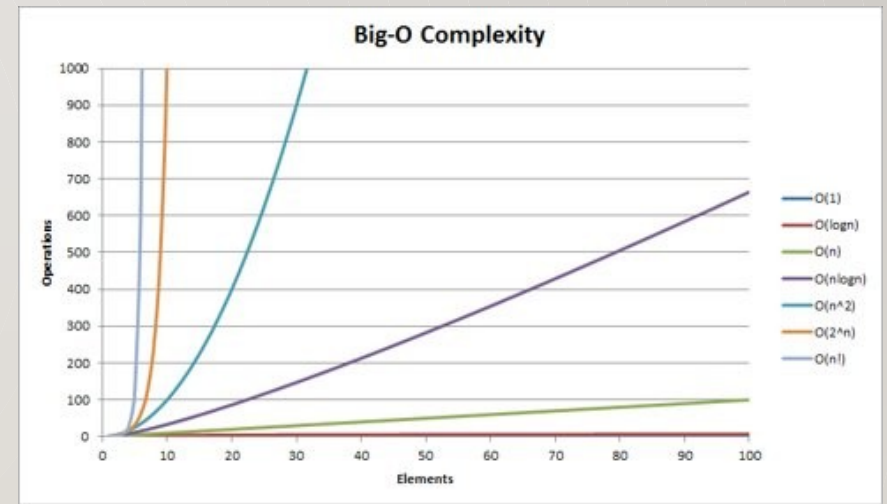
GRAPHS

- Made up of vertices (nodes) and edges
- What do they help with?
  - Examples of abstract solution
    - Colouring
    - Fault tolerance
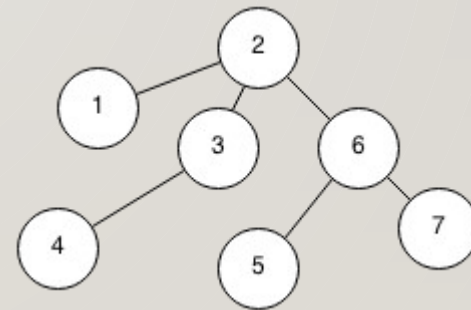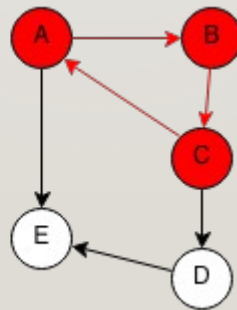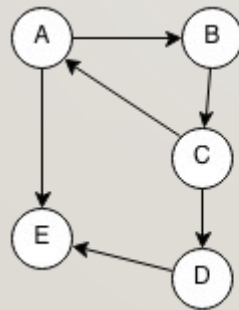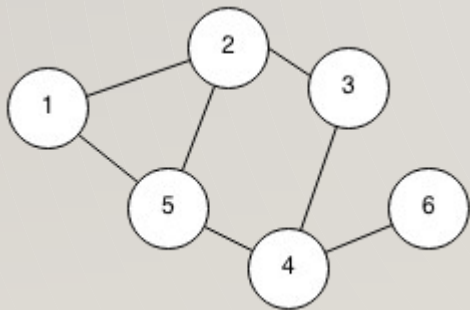
IMPLEMENTATION

- You will be required to submit some of your tutorials online
- Labs will require you to implement solutions every week
  - Not a programming course, but lots of programming required
- Snake Assignment (http://snake.ms.wits.ac.za)
  - Competitive
  - Modified every year
  - Mark allocation
  - Templates provided for Java

TASK FOR NEXT WEEK

- Read Chapters 1 and 2

- Pay particular attention to Chapter 2

- If you don't fully understand them, that's ok, but read them anyway, as I will gloss over a lot of it in the next lecture assuming you have read it.