COMP3121 Notes

1 Week 1

1.1 Intro to Algorithms

What is an Algorithm?
A collection of precisely defined steps that can be executed mechanically (without intelligent decision-making).

Sequential Deterministic Algorithms:
Algorithms are given as sequences of steps, thus assuming that only one step can be executed at a given time.

Example: Two Thieves
Alice and Bob have robbed a warehouse and have to split a pile of items without price tags on them. Design an algorithm to split the pile so that each thief **believes** that they have got at least half the loop.

Solution:

   Alice splits the pile in two parts, so that she believes that both parts are equal
   Bob then picks the part that he believes is no worse than the other

Example: Three Thieves
Alice, Bob and Carol have robbed a warehouse and have to split a pile of items without price tags on them. How do they do this in a way that ensures that each thief **believes** they have gotten at least one third of the loot.

Solution:

   Alice makes a pile of $\frac{1}{3}$ called X
  if Bob agrees $X \leq \frac{1}{3}$ **then**
    Bob agrees to split the remainder with Carol
    if Carol agrees $X \leq \frac{1}{3}$ **then**
      Bob and Carol split the rest
    else
      Alice and Bob split the rest
    end if
  else
    Bob reduces pile until he thinks $X \leq \frac{1}{3}$ and Alice and Carol split the rest
  end if

When are proofs necessary?
We use proofs in circumstances where it is not clear that an algorithm truly does its job.

Proofs should <u>not be used to prove the obvious.</u>