

Computer Science Fundamentals - What are the Important Erkenntnisse?

By Henry van Wagenberg
Based on Research in February & March 2018

#1 Many concepts are cracks at solutions to the question: "How can we translate between humans and 0s + 1s better?"

So many of the techniques that have appeared in the readings in the last Sprint have dealt with ways to transfer between human and 0 and 1.

Assembly

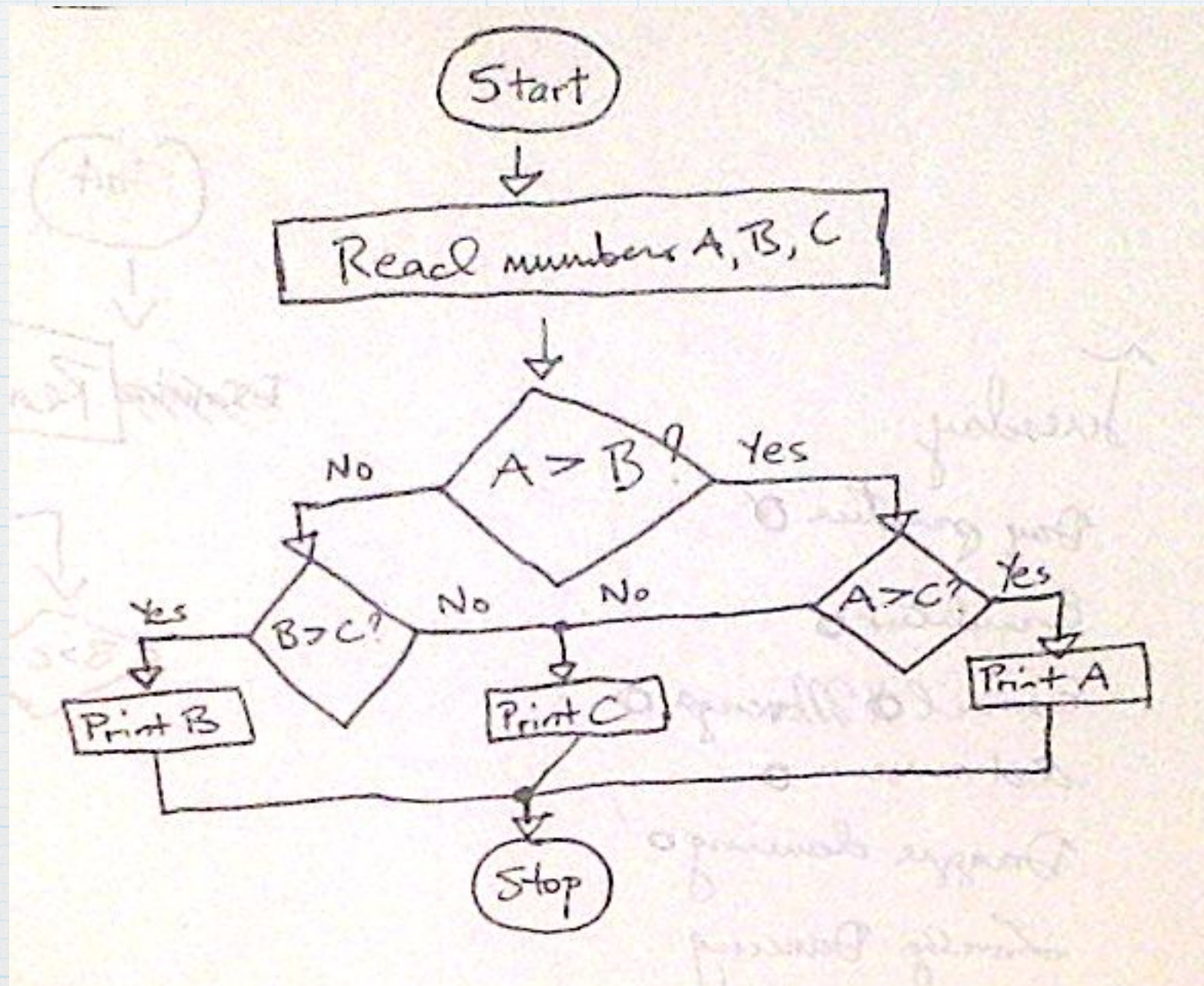
Bits and Bytes

Source Code "Building from Source"

Compiling = Translating to Binary

Decompiling = Translating to Source

#2 Flow Charts & Visualization



#3 Logic is Helpful Both in Philosophy & in Computers

Conditional Operator: $A \rightarrow B$
Biconditional Operator: $A \leftrightarrow B$
Truth Tables

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Table 1.1 Logical operations for 4 possible values of A and B.

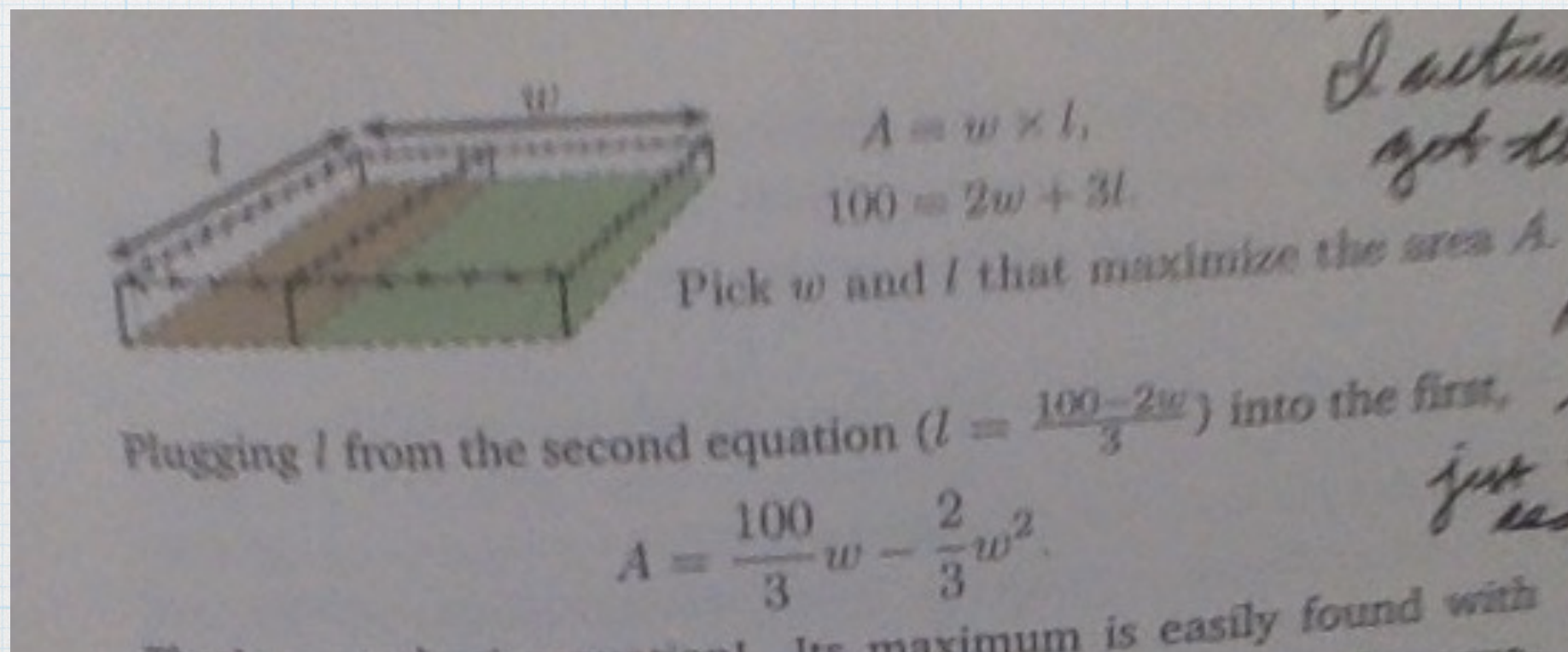
A	B	$\neg A$	$A \rightarrow B$	$A \leftrightarrow B$	$A \text{ AND } B$	$A \text{ OR } B$	$A \text{ XOR } B$
✓	✓	✗	✓	✓	✓	✓	✗
✓	✗	✗	✗	✗	✗	✓	✓
✗	✓	✓	✓	✗	✗	✓	✓
✗	✗	✓	✓	✓	✗	✗	✗

#3 Mathematically Described Models are a Great Bag of Tricks, “Stand on The Shoulders of Giants”

The quadratic formula
Problem solving with models

“A model is a set of concepts that represents its problems and its characteristics.”

Logic, e.g. conditionals, as a model of speech and observation of nature (cause and effect; determinism)



#4 A Computer is made up in principle of two parts: a CPU and Memory

If you think of a 19th-century piano-playing machine: the "head" that reads the paper card is the CPU; the paper card is the memory.

#5

RAM : Hard Drive

::

Ruby program running and it's state : SQL
database

#6 Number of Operations Determines (Non-Linear) Time Complexity

e.g. $T(n) = n(2) + n - 2$

This equation is the result of looking at our loop:

```
function selection_sort(list)
  for current <- 1 ... list.length - 1
    smallest <- current
    for i <- current + 1 ... list.length
      If list[i] < list [smallest]
        smallest <- i
    list.swap_items(current, smallest)
```

It's simply based on loops and counting

**Conclusion: Very powerful stuff;
confidence-boosting and seeing how
it's all connected /built from to simple
ideas**