Computer Science 1000: Part #1

Introduction

WHAT IS COMPUTER SCIENCE?

WHAT IS AN ALGORITHM?

THE STRUCTURE OF THIS COURSE

What is Computer Science?

- Is Computer Science . . .
  - . . . the study of computers?
  - . . . the study of how to write computer programs?
  - . . . the study of the uses and applications of computers and software?
  - . . . all of the above?
- It's actually all of the above, and much more.

What is Computer Science? (Cont'd)

According to Gibbs and Tucker (1986), the fundamental task of Computer Science is the design and development of algorithms for solving important problems. This includes:

- Studying the behaviour of algorithms to determine if they are correct and efficient;
- Designing and building computer systems hardware that is able to execute algorithms;
- Designing programming languages and translating algorithms into these languages so that they can be executed by the hardware; and
- Identifying important problems and designing correct and efficient algorithms to solve these problems.

What is an Algorithm?

- An **algorithm** is a well-ordered sequence of unambiguous and effectively computable operations that produces a result and halts in a finite amount of time.

- Let's develop an algorithm for the problem of determining if a value X is or is not in a list $L_1, L_2, \ldots, L_n$ of $n > 1$ values (**List Search**), e.g., is the value 5 in the list of values [3, 1, 19, 24, 5, 7, 4]?

What is an Algorithm? (Cont'd)

Is this an algorithm for the list search problem?

Step   **Operation**
1. Get values for X and list L
2. If the current element in L is X then
3.   Print the message "found"
4. Advance the current element
5. Repeat
6. Stop

What is an Algorithm? (Cont'd)

Is this an algorithm for the list search problem?

Step   Operation
1   Get values for X and list L
2   Set the value of FOUND to NO
3   While (FOUND = NO) do steps 4 through 7
4   If the current element in L is X then
5   Set the value of FOUND to YES
6   Print the message "found"
7   Advance the current element
8   Stop

Is this an algorithm for the list search problem?

Step   Operation
1   Get values for X and list L
2   Set the value of IND to 1 and FOUND to NO
3   While (FOUND = NO) do steps 4 through 7
4   If L_{IND} is X then
5   Set the value of FOUND to YES
6   Print the message "found"
7   Set the value of IND to IND + 1
8   Stop

Is this an algorithm for the list search problem?

Step Operation

1   Get values for X and list L
2   Set the value of IND to 1 and FOUND to NO
3   While (FOUND = NO) do steps 4 through 7
4   If L_{IND} is X then
5   Set the value of FOUND to YES
6   Print the message "found"
7   Set the value of IND to IND + 1
8   If (FOUND = NO) then
9   Print the message "not found"
10   Stop

What is an Algorithm? (Cont'd)

Is this an algorithm for the list search problem?

Step	Operation
1	Get values for X, list L, and n
2	Set the value of IND to 1 and FOUND to NO
3	While both (FOUND = NO) and (IND $\leq$ n) do steps 4 through 7
4	If L_{IND} is X then
5	Set the value of FOUND to YES
6	Print the message "found"
	Else
7	Set the value of IND to IND + 1
8	If (FOUND = NO) then
9	Print the message "not found"
10	Stop

What is an Algorithm?
Why Bother?

IF WE CAN SPECIFY AN ALGORITHM
TO SOLVE A PROBLEM,
WE CAN AUTOMATE ITS SOLUTION!!!

The Structure of this Course

Level 1 The Algorithmic Foundations of
        Computer Science
         [Weeks 1 and 2]

Level 2 The Hardware World [Weeks 3–5]

Level 3 The Virtual World [Weeks 6, 7, and 13]

Level 4 The Software World [Weeks 9–11]

Level 5 Applications [Week 12]

Welcome to Computer Science Boot Camp

"ARE YOU READY???"