Some quotes….

I really hate this damned machine
I wish that they would sell it.
It never does quite what I want
But only what I tell it.

~Anon

These machines have no common sense; they have not yet learned to think, and they do exactly as they are told, no more and no less. This fact is the hardest concept to grasp when one first tries to use a computer.

~Donald Knuth

Announcements

• Ian King returns on Friday
• History of Computing, Part 2

What's The Plan?
Algorithmic Thinking

Step-by-step directions for whatever someone, or the computer, needs to do

Algorithm

• A precise, systematic method for producing a specified result
• In real life we do this all the time:

What is an algorithm?

• Algorithm is a procedure and sequence of actions to accomplish some task. The concept of an algorithm is often illustrated by the example of a recipe, although many algorithms are much more complex; algorithms often have steps that repeat (iterate) or require decisions (such as logic or comparison). In most higher level programs, algorithms act in complex patterns, each using smaller and smaller sub-methods which are built up to the program as a whole.

Source: Computer User's online dictionary

Video

• Algorithms
  • [http://uwecconnect.extn.washington.edu/algorithmsdef17/](http://uwecconnect.extn.washington.edu/algorithmsdef17/)
Algorithms in our everyday lives

- Directions to our home, workplace, or the shopping mall to meet friends
- Recipes
- Patterns
  - For sewing clothes or soft furnishings
  - For knitting or crochet
- Plans for building furniture
- Owners’ manuals

Each algorithm
- Solves a problem
- Can be repeated over and over
  - With the same results

Video

- Algorithm example

Clicker questions

Language in Algorithms

- Natural language
  - For people, we use a natural language like English
  - Ambiguity is common in natural language

- Programming Language
  - Formal languages designed to express algorithms
  - Precisely defined; no ambiguity
<table>
<thead>
<tr>
<th>Title</th>
<th>Ingredients</th>
<th>Steps</th>
<th>Servings</th>
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</thead>
</table>

- Title
- Ingredients
- Steps
- Exceptions
- Servings

Title

Ingredients

Steps

Servings

10/28/2009 D.A. Clements, UW Information School
### The Five Essential Properties of Algorithms

1. **Input specified**
   - Data to be transformed during the computation to produce the output
   - Must specify type, amount, and form of data

2. **Output specified**
   - Data resulting from the computation—intended result
   - It is possible to have no output

### Five Essential Properties (cont’d)

3. **Definiteness**
   - Specify the sequence of events
   - Details of each step, including how to handle errors

4. **Effectiveness**
   - The operations are do-able

5. **Finiteness**
   - Must eventually stop

### Context matters—sorting names

- Program can fulfill five properties of an algorithm, be unambiguous, and still not work right because it is executed in the wrong context
  - e.g., last name in Western countries means family name; in Asian countries it may mean given name

### Context matters—driving instructions

- Assumes you are traveling in a specific direction.
- If you are not, the directions will fail.

### Context matters—bread ovens

- The final baking step depends on the type of oven

Source: [http://www.leftoverqueen.com](http://www.leftoverqueen.com)
Context Matters—electric ovens

Context Matters—brick ovens

Context matters—bread machine

Program vs. Algorithm

- A program is an algorithm that has been customized to
  - solve a specific task
  - under a specific set of circumstances
  - using a specific language
- Algorithm is general
- Program is specific

A practice algorithm…

- Grab a piece of paper
- In the next few slides, I'll name the property of an algorithm and you can fill in the blanks for making a salad.

Algorithm: Input sp

- Algorithm for preparing a salad
  1. Input specified
Algorithm—Output specified

1. Algorithm for preparing a salad
2. Output specified

Algorithm—Definiteness & Effectiveness

1. Algorithm for preparing a salad
2. Definiteness
3. Effectiveness

Algorithms--Finiteness

1. Algorithm for preparing a salad
2. Finiteness

Clicker questions

CD or DVD sorting in a rack

1. Exchange sort algorithm

Exchange Sort Algorithm

1. The Alphabetize CDs example illustrates the standard Exchange Sort algorithm
2. The idea of comparing pairs of items chosen in a particular way, exchanging them if they are out of order, and continuing to sweep through the items
3. We could use the same algorithm to sort on a different principle
Friday

- Learn the vocabulary on GoPost