



## 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

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## Announcements

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

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## What's The Plan? Algorithmic Thinking

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

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## Algorithm

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

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## Video

- Algorithms
  - <http://uweoconnect.extn.washington.edu/algorithmsdslft7/>

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## 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](#)

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## 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

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## Algorithms in our everyday lives

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

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## Video

- Algorithm example



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## Clicker questions

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## Algorithms in our everyday lives

- Always consider the audience
  - Is your friend familiar with North Seattle?
  - How much experience with baking does your friend have?
  - If you're going to add RAM to your laptop yourself, you're probably fairly technically competent

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## 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

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## How are algorithms organized?

**Awesome Oat Cake with Broiled Topping**

**Title**

**Ingredients**

**Steps**

**Servings**

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## How are algorithms organized?

- Title
- Ingredients
- Steps
  - Exceptions
- Servings

**Awesome Oat Cake with Broiled Topping**

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## How are algorithms organized?

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**Awesome Oat Cake with Broiled Topping**

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## 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

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## 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

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## Clicker questions

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## 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

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## Context matters—driving instructions

### Driving instructions

"From 45<sup>th</sup> go to University Avenue and turn right."

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

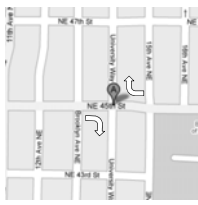


Diagram of approaching a street (the Ave) from different directions, giving the "turn right" instruction different meanings

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## Context matters—bread ovens

### Baking bread...

- The final baking step depends on the type of oven




Source: <http://www.leftoverqueen.com>

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 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*


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 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.



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 Algorithm: Input sp


- Algorithm for preparing a salad
  1. Input specified



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**Algorithm—Output**


- Algorithm for preparing a salad
  2. Output specified



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**Algorithm—Definiteness & Effectiveness**

- Algorithm for preparing a salad
  3. Definiteness
  4. Effectiveness



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**Algorithms--Finiteness**

- Algorithm for preparing a salad
  5. Finiteness



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**Clicker questions**

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**CD or DVD sorting in a rack**

- Exchange sort algorithm

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**Exchange Sort Algorithm**

- The Alphabetize CDs example illustrates the standard *Exchange Sort* algorithm
  - 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
  - We could use the same algorithm to sort on a different principle

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## Friday

- Learn the vocabulary on GoPost