HDCC105
September 26, 2011
ALGORITHMS
or "How the World Works"
Algorithm – a generic definition

A predetermined set of instructions for solving a specific problem in a limited number of steps.

(Webster's dictionary)
Algorithms around you...
“Customers anxious to get taco fixes were waiting outside the Taco Bell doors as early as 7 a.m. Wednesday—three hours before the doors were set to open.”
Jennifer Allora & Guillermo Calzadilla

Algorithm, 2011

http://youtu.be/1IEK0w5N3Js
"The word *music* had a much wider meaning to the Greeks than it has to us. In the teachings of Pythagoras and his followers, music was inseparable from *numbers*, which were thought to be the key to the whole spiritual and physical universe. So the system of musical sounds and rhythms, being ordered by numbers exemplified the harmony of the cosmos and corresponded to it" (Grout, 1996; italics added)
Lejaren Hiller

http://www.youtube.com/watch?v=QbKUyWAGxso
What types of algorithms are there?

- Slow versus fast?
- Natural versus contrived?
- Easy to implement versus difficult?
- Fun to perform?
Algorithms take many forms...

while there is music playing {
    pick a random number between 1 and 4 depending on the number...
    1: do a basic figure
    2: do a promenade figure
    3: do a turning figure
    4: do a figure that stalls you
}
Algorithms can reflect context

while there is music playing {
    if the floor is clear ahead {
        flip a coin
        if it was heads then do a basic figure
        otherwise do a promenade figure
    }
    otherwise if we are at a corner
        do a turning figure
    otherwise it must be crowded
        so do a figure that stalls you
}
When we talk about the runtime of an algorithm, it is usually expressed as a function of the size of the input.

For example,
- to sort \( n \) objects into ascending order, it could take \( O(n \log n) \) computer operations
- given \( n \) cities, it could take \( O(2^n) \) computer operations to work out how to visit each of them exactly once while driving as little shortest a distance as possible
Comparative Graph of Runtime Growth

$2^n$

$10n$

$log_2 n$
Does not compute?

Do you think there are problems that a computer cannot solve?