A Question

What are the five largest cities in the United States?

(Write down your answers in order on a piece of scratch paper)

The answer

Cities, by population
1. New York (8M)
2. Los Angeles (3.7M)
3. Chicago (2.9M)
4. Houston (2M)
5. Philadelphia (1.5M)

(Seattle is #24 at 560K)

What We Do Best And What Computers Do Best Are VERY DIFFERENT Things

- People are extremely good at:
  - Resolving ambiguity
  - Taking context (the particular situation) into account when processing information

- Computers are very good at:
  - Following explicit instructions over, and over, and over….
  - Never tiring of the same old routine

- Computer are NOT very good at:
  - Resolving ambiguity
  - Figuring out the “right” meaning based on a particular situation

So if we want to tell a computer what to do, we must do so precisely and unambiguously

The Basics of Programming

To specify algorithms, especially to a computer, we must be precise. To be precise, we need a language that is more exact than our own. A programming language offers this advantage. All programming languages have a basic set of features.
What’s Different About Programming Languages?

- The Alphabetize CD’s algorithm we did in class was precise enough for a person to execute successfully, but computers must have greater precision.

- Programming languages are formal notations specifically designed for specifying algorithms — that means each “word” or “sentence” in a programming language has one and only one interpretation.

- The programming language we will study this quarter is Visual Basic 6.0 (VB6).

Programming involves two critical and interrelated tasks:
- Figuring out/understanding intuitively what steps need to be taken
- Figuring out how to specify those steps precisely

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Introduction to Programming Concepts

- There are just a few general concepts that apply to virtually all programming languages.

- Once you have been exposed to them, you will practice your language proficiency using the Visual Basic IDE.

- In this environment you will take the general concepts you know and by adding other language features, implement programs with varying levels of complexity that become more involved over time.

Order Matters

- CONCEPT: Programming languages execute instructions in order (unless told to do otherwise…we’ll get to that point later).

- The first things listed in a program get done first.

- Each instruction is executed one at a time — then the computer goes on to execute the next instruction.

- Remember your web pages? The computer (browser) executed the HTML code in the order you wrote the statements.
General Concepts

- CONCEPT: Being able to store, “remember”, change and access data allows us to write programs that do the same thing but with different data each time.

- The following programming concepts are key:
  - Variables, Names, Values
  - Assignments
  - Expressions
  - Conditionals
  - Iteration

- We will cover the first several of these concepts today

Variables

- CONCEPT: Variable is the term for a place in memory where the program can store, access, and restore information.

  All variables have the following three properties:
  1. A name so that the program can refer to the variable (a location in memory)
  2. A means to store a (new) value in the variable
  3. A means to get (or make a copy of) the value stored in the variable

Variables You Have Seen in the Alphabetize CDs Algorithm

- In our class version of an instance of the Exchange Sort algorithm, we used the following variables:
  1. Each student holding a CD represented a variable (a location in memory)
  2. Each variable (student) stored a value (CD)
  3. Each time we looked at the name of a CD we were getting the value stored in that variable
  4. When two students (variables) exchanged CDs, a new value (CD) was stored in each of the variables (students)

Names of Variables

- Using the term “variable” reminds us that the value can change, that it can vary

- The names used for variables are arbitrarily provided:
  - Variable names must begin with a letter
  - Variable names can contain any letter, numeral or _
  - Most languages are case sensitive: a is different than A

- Good variable names are meaningful and accurate
  - Total, avgOfClass, temp, etc. But not x, ITtoO, etc.

VB6: In all programming for FIT100, variable names should start with lowercase letters so as to avoid confusion with other reserved names in VB6... ignore this convention at your own peril!
Values of Variables

- Values refer to the information stored in the variable (location in memory)
- Variables can take on different types of values
  - Whole numbers or integers: 2, -9, 3645279
  - Character sequences or strings: "2", "dog", "die90wk", " 
  - Decimal numbers or doubles: 2.3, 3.14159, -666.99
- In most programming languages, each variable can only hold one type of value. This is to:
  - Let the computer know how much memory will be needed to store
  - Allow the computer to help detect errors in the code. For example, when the program tries to put the wrong sort of value in a variable, the programmer receives an error message

Declaring Variables

- Variable declaration tells the computer:
  - That you want a location in memory (the variable)
  - The way in which you will refer to that location in memory throughout your program (the variable name)
  - What type of information you will store in that location in memory, so the computer will know how much space to set aside (the variable type)
- VB6 - some example of declaring variables:
  - Dim num1 As Integer
  - Dim letter1 As String
  - Dim avgOfClass As Double

Assigning Values to Variables

- CONCEPT: Computers must be told what value to assign to variables
- CONCEPT: The general form of an assignment statement is
  <variable name> <assignment symbol> <expression>
  - Each language may use a different assignment symbol: = :=
  - Assignment means "gets", "becomes" or "is assigned" and we read it left to right: A = B A is assigned B
  - All three components must always be present
- CONCEPT: Fundamental property of Assignment
  The flow of information is always right to left
- VB6: Some examples of variable assignment
  - destination = "Chicago"
  - changedVariable = value

A Simple Example Using Variables

- We’ll use VB6 syntax for this example...
  Dim rock As Integer
  Dim paper As Integer
  Dim scissor As Integer
  rock = 9
  scissor = 3
  rock = 7
  rock = scissor
  paper = scissor

Question: What’s in rock? What’s in paper?
What is the Value of Dude?

Take out a piece of scratch paper. See if you can answer the questions below.

```vbnet
Dim dude As Integer
dude = 0
dude = dude + 1
dude = dude + 1
dude = dude + 1
```

Questions:
1. What value does the variable `dude` contain at the end of this code?
2. What is this code doing?
3. What would be a better variable name for `dude`?

For Friday

Quiz 2!!!
 Covers Lecture, Lab and FIT 7-11