## 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

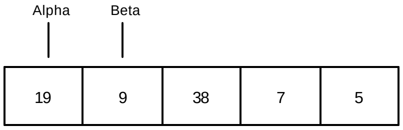
To specify algorithms, especially to a computer, we must be precise. To be precise, we need a language that is more exact than our own. A programming language offers this advantage. All programming languages have a basic set of features

## 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)

## What's Different About Programming Languages?

- 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



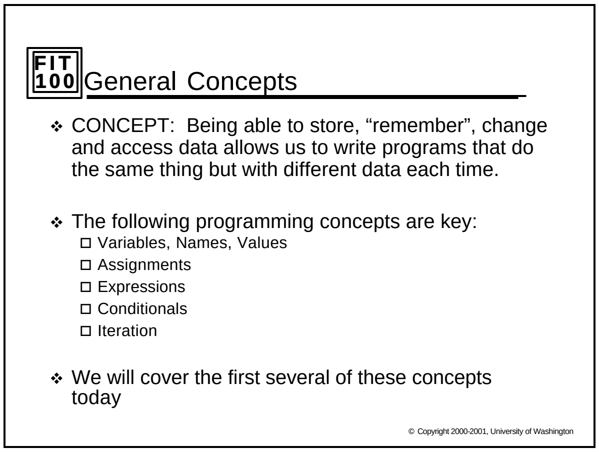
| | | | | |
|---|---|---|---|---|
| 19 | 9 | 38 | 7 | 5 |

## 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

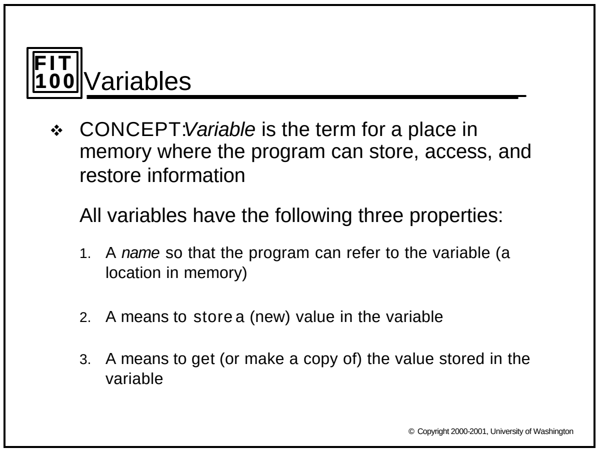
## Order Matters

- 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

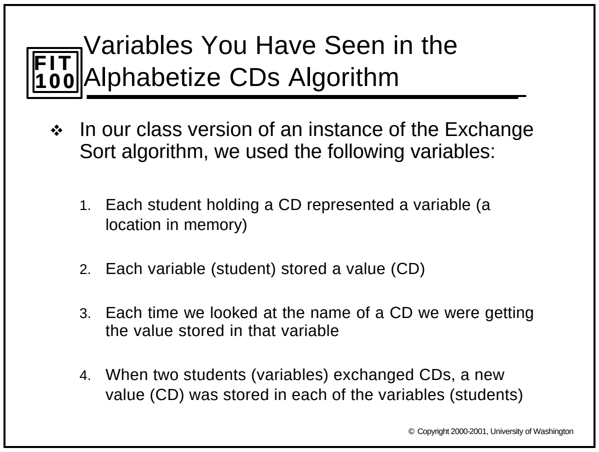


## Variables

- 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:

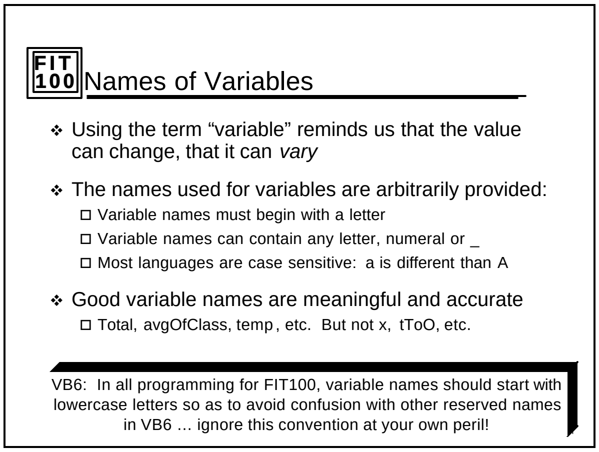
  1. A *name* so that the program can refer to the variable (a location in memory)
  2. A means to store a (new) value in the variable
  3. A means to get (or make a copy of) the value stored in the variable



## 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, tToO, 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!

## FIT 100 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, 36452729
  - □ 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

## FIT 100 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

## FIT 100 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

## FIT 100 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
scissor = 23
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.

```
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