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

FIT 100

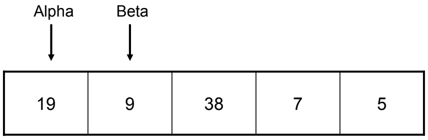
To specify algorithms, especially to a computer, we must be precise. To be precise, we need a language that is more exact than our own. A programming language offers this advantage. All programming languages have a basic set of features

What's Different About Programming Languages?

- The Alphabetize CD's algorithm (see FIT 9) 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



Alpha

Beta

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

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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

Also important:
Objects
Events

- We will cover the first several of these concepts today

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Variables

- CONCEPT: *Variable* is the term for a place in memory where the program can store, access, and restore information. Names are easier to reference than number sequences.

  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

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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, y83928 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!

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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 should 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 examples of declaring variables:
  - Dim num1 As Integer
  - Dim letter1 As String
  - Dim avgOfClass As Double
    - By the way, for Midterm 1, avgOfClass = 33.8 (out of 50!)

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 Class Demonstration

- We'll use VB6 syntax for this example…

```
Dim sleepy As Integer
Dim grumpy As Integer
Dim dopey As Integer
sleepy = 9
grumpy = 3
dopey = 7
sleepy = 12
grumpy = sleepy
dopey = grumpy
```

FIT 100 A Series of Assignments

- Now you work it out …

```
Dim rock As Integer
Dim paper As Integer
Dim scissor As Integer
rock = 9
scissor = 3
rock = 7
rock = scissor
scissor = 23
paper = scissor
rock = scissor + paper
rock = scissor /  paper
```

Question:

What's in rock?

What's in paper?

FIT 100 What is the Value of Dude?

```
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*?

FIT 100 Expressions

- CONCEPT: Expressions are a means of performing the actual computation in a program. They are formulae made from variables and operators, e.g. calculator operations: +, -, *, /, ^

❑ weeks = days / 7	divide value of days by 7
❑ totalAfterTax = totalPrice * 1.087	multiply the two values

- The Fundamental Rules of Assignment:
  - The general form of an assignment statement is <variable name> <assignment symbol> <expression>
  - The *flow of information* is always right - to – left
  - The expression is evaluated before the assignment is made
    - score = score + 3