A Question

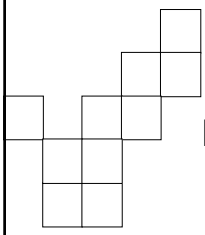
What are the five largest cities in the United States?

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

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*



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 (see FIT 9) was precise enough for a person to execute successfully, but computers must have greater precision
  - English is too ambiguous and imprecise
- 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 terms are precise and unambiguous!
- The programming language we will study this quarter is JavaScript-a scripting language

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

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 Java Script in your web pages
- Because there is, literally, hundreds of ways to arrive at the same end product, we'll show you a few paths to get you started.

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

Also important:
Objects
Properties
Events

- 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. 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

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.

Values of Variables

- Values refer to the information stored in the variable (location in memory)
- Variables can take on different *types* of values
  - Numbers: 2, -9, 36452729, 2.3, 3.14159, -666.99
  - Character sequences or strings: "2", "dog", "die90wk", " "
  - Boolean Values: True or False
- 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.

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*)
    - JavaScript often determines type by the value stored
- Java Script - some examples of declaring variables:
  - var fname; // declare a variable called name
  - var fname, address, city; // declare 3 variables: fname, // address, city

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

Assigning Values to Variables

- CONCEPT: Fundamental property of Assignment
  The *flow of information* is always right - to – left
- JavaScript: Some examples of variable assignment (placing a value in its container)
  - var myAge = 33; // declare a variable and
    // assigns it the value 33
  - destination = "Chicago"; // assign the value "Chicago" to the
    // variable destination
  - avgOfMidterm = 27; // assigns value of 27 to the variable
  - avgOfClass = avgOfMidterm;
    // assigns whatever value is in the
    // variable avgOfMidterm to the variable
    // avgOfClass

A Series of Assignments

- Now you work it out …

```
var rock;
var paper;
var scissor;
rock = 2;
scissor = 8;
rock = 4;
rock = scissor;
scissor = 19;
paper = scissor;
rock = scissor + paper;
rock = scissor /  paper;
```

Question:

What's in rock?

What's in paper?

What is the Value of Dude?

```
var dude = 0;      //you can also declare variables and
                   // assign them values at the same time
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*?

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
  - FullName = “Grace ” + “ Whiteaker”; // add 2 strings together-
    // this is called
    // concatenation
    // result: “Grace Whiteaker”
    // stored in FullName

Expressions and Assignment

- 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; // if the value in score before this
      // line of code was 5, the 5 is added
      // to 3 and then stored back into
      // score, eliminating the previous
      // value