Internal Memory

* Computer’s internal memory is composed of memory locations, each with a unique numeric address
* Similar to collection of storage bins
* Each address can store one item at a time
* Each address can contain numbers, text, or program instructions
* To use a memory location, programmer must reserve the address, called *declaring*
* Declaring a memory location is done with an instruction that assigns a name, data type and (optional) initial value
* The name allows the programmer to refer to the memory location elsewhere in The program using a descriptive word, rather than the numeric address
* The data type indicates what type of information the address will store (e.g., number or text)
* How Data is stored in internal memory
  + Numbers represented in internal memory using binary (base 2) number system (two digits, 0 through 9)
  + We are used to the decimal (base 10) number system (ten digits, 0 through 9)
  + Character data is stored using ASCII codes based on data type
    - Eight-bit codes (bit=binary digit, 0 or 1)
    - Upper and lowercase versions have distinct codes
  + Computer distinguishes between numbers an ASCII codes based on data type
  + ASCII = American Standard Code for Information Interchange
* IP Address = Internet Protocol
* Min number of Bytes = (00000000)2 = (0)10
* Max number of Bytes = (11111111)2 = (255)10

Selecting a Name for a Memory Location

* Name (identifier) assigned to a memory location should be descriptive
* Should help the programmer/other programmers remember/understand the memory location’s purpose
* Should be as short as possible while still being descriptive (especially if referenced often)
* Short names are easier to read and result in more concise code
* Rules for memory location names in C++
  + Names must begin with a letter and contain only letters, numbers, and the underscore character
  + No punctuation marks, spaces, or other special characters (such as $ or %) are allowed
  + Cannot be a keyword (word that has special meaning in C++)
  + Names are case sensitive
    - Example: discount is different from DISCOUNT and from Discount
  + For two-word phrases, have 0 spaces, but show the difference between the two words with the first letter of the second word being capitalized
    - Example: First Name = firstName

Declaring a Memory Location

* Variables and named constants are declared using a statement (C++ instruction)
* A statement that declares a variable causes the computer to set aside a memory location with the given name, data type, and initial value
* Statements must follow correct syntax (rules of a programming language)
* In C++, all statements must end with a semicolon
* When declaring variables, a data type and name must be provided
* Syntax for declaring a variable in C++
  + datatype variableName [= initialValue];
* After variable is declared, you use its name to refer to it later in the program
* Initial value is optional but recommended
* If variable is not initialized, it contains the previous value of that memory location, which may be wrong type (called a garbage value)
* Syntax for declaring a named constant in C++
  + const

Different Data Types

* short – an integer
* int – an integer, whole numbers
* float – a real number with about 7 digits of precision
* double – a real number with 15 digits of precision
* bool – true or false
* char – one character only
* string – zero or more characters

C++ Terms

* Cout<<”” << - Displays whatever is inputted by the programmer in between the quotation marks to the user
* 1 bit is equal to 8 Bytes and vice versa