

Computer Programing

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Session: Representing Characters, Strings, Booleans



- Architecture of a simple computer
- Representing integers and floating point numbers

Overview of This Lecture



- A computer's internal representation of
 - Characters
 - Strings
 - Booleans
- C++ declarations of above data types
- Putting things together: Our first simple C++ program

Recap from Earlier Lecture



• Snapshot:



• How do we represent characters/strings using 0's and 1's?

Representing Characters



- Character
 - For purposes of this course, a character is a byte
 - 2⁸ characters:

00000000 (decimal 0) through 11111111 (decimal 255)

Each character (A, 0, p, ...) is an unsigned 8-bit integer
 ASCII encoding: 'A' = 65, 'B' = 66, '0' = 48, '. ' = 46, '(= 32)

• Characters can be compared and sorted like integers

Blank space character

Characters in C++



- char data type
- unsigned char is an unsigned 8-bit integer
- C++ declaration: char userInput, unsigned char numChild
- Constant characters
 - Can be specified as unsigned integers in 0 through 255
 const char userInput = 89; const char defaultOutput = 0x4e;
 - Can be specified as character symbol within ' ' const char userInput = 'Y'; const char defaultOutput = 'N';





\0

t

Special end-of-string

character

:

U

n

p

 A string is a sequence (array) of characters terminated by a special end-of-string character

V

e

G

• String "Give input: " is



- string as a whole can also be used
 - Recall Dumbo's program: Output "Give input: ";
 - C++ program: cout << "Give input:";

Strings in C++



• Can be declared as an array of characters



Can we store "Give input: " (12 characters) in myString ?

NO! We need space for '\0' at the end

To store a 12 character string, the array size must be 13 or more

• Can be declared as string data type (preferred choice)

string myOtherString("Give input: ");

Not just an array of characters, has several attributes we'll use later





- Sequence of characters enclosed in ""
 "Give input: ", "The output is: ", "Hello world!!!"
- const string myMessage("Hello world!!!")
 - Value is "Hello world!!!"
 - Cannot be changed during program execution





- Like integers where only 0 or non-0 values are relevant
 - 0 means false, non-0 means true
 - 37 means true, 103 also means true !!!
- Earlier versions of C++ used int to store booleans
- A separate datatype **bool** exists in C++ (preferred choice)
 - Uses a form of int internally to store 0 and non-0 values
- C++ declaration: **bool flag**;
- Boolean constants in C++: true, false
 - const bool trueValue = true;

Putting It All Together



- C++ program:
 - Read two numbers from keyboard, add and display on console

```
int main() {
 int A, B, C;
 cout << "Give two numbers: ";
 cin >> A >> B;
 C = A + B;
 cout << "Sum is: " << C;
 return 0;</pre>
```

Dumbo's program: Use locations A, B, C; Output "Give two numbers: "; Input A; Input B; C = A + B; Output "Sum is: "; Output C; Report job as done;





- Representation of characters and strings
 - Declaration in C++
- Representation of booleans
 - Declaration in C++
- From Dumbo's program to a C++ program