CS50 Section 0: The Basics of C and CS

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About Me

```
Typedef struct node {
  char[] name = "Ashin";
  char[] concentration = "Applied Math";
  int year = 3;
  char[] house = "Pfoho";
}TF;
```

Section Overview

4:37 Review of Last Week's Lectures

5:00 Extensions on Material

5:30 Questions/Week Ahead

NO laptops in Section.

Ironic, I know.

Course Expectations

Weekly Problem Sets, Quiz 0, Quiz 1, Final Project

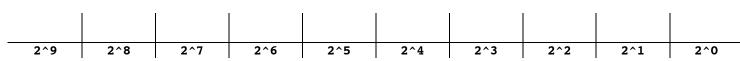
Resources

Lecture, Videos, Scribe Notes, Section, Section Notes, CS50 Support, Walkthroughs, TF/CA, OH, VOH, cs50.net, Readings...

Review of Week 0, Week 1, Week 2

What is Computer Science? What is programming?

Algorithms: Binary Conversion / Why do we even care?



Construct an algorithm that will convert a number from Base 10 to Base 2.

Homework: Given a Base 2 value, compute its Base 10 representation. Now extend your algorithm to convert any Base A value to Base B. Assume $A,B \in [2,10]$.

C Syntax

Libraries - Remember #include <[library_name].h>
Don't forget the ; after each line
Every { needs a }, every (needs a)
 INDENT

How to Make a Program (Flowchart)

Getting Machines to Do Your Bidding

Primitive Types

- Variables

int val = 3;
int val2 = val * 2;
printf("%d", val2);

Operator Precedence / Logic

- Arithmetic: +, -, *, /, %
- Relational: ==, !=, >, <, >=, <=
- Logical: !, &&, ||
- Assignment: =, +=, -=, *=, /=, %=
- Decrement/Increment: ++, --
- Casts

De Morgan's Laws

!(A && B) == !A | | !B!(A | | B) == !A && !B

Control Structures: If/Else == Switch

Datatypes (Bytes), Range: Int (4), -2^31 to 2^31-1 Char (1), 0 to 255, or -128 to 127 Float (4), Double (8), Long (4), Long Long (8), -2^63 to 2^63-1 Short (2), -2^15 to 2^15 - 1 Unsigned int (4), 0 to 2^32-1

If(condition) {DO THIS;}
Else if(condition2) {DO THIS;}
Else if(condition3) {DO THIS;}
...
Else {THIS IS DONE;}

Loops = {"For", "While", "Do-While"}

- Initialization
- Condition
- Update

For	While	Do-While

Nesting

User Input

- #include <cs50.h>
- Get[type]()

User Output

- printf("TEXT TO BE DISPLAYED",,,...);
 - o Formatting codes

This is CS50 [Section]. Welcome.

VL50 LXVMBHG 1: VKRIMHZKTIAR

Ashin Shah (ashah@fas) 09.26.2010

BinaryConvertAlgorithm

```
Section Agenda
Grading
                                                          4:37 Functions, Variable Scope
Correctness, Style, Design
                                                          5:00 Arrays
                                                          5:25 Cryptography
Questions?
                                                          5:50 Questions/Week Ahead
                                          Functions
double sin_times_cos(double x, double y) {
                                                             3 Purposes of Functions
   return sin(x) * cos(y);
}
                                                                 1.
                  ANATOMY OF A FUNCTION
                                                                 2.
double accumulate interest(double balance, double rate);
                                                                 3.
double accumulate interest(double balance, double rate) {
                                                                        Parts of a Function
   double accrued; double updated;
                                                                     (A) RETURN
                                                                     (B) DEFINITION
                                                                     (C) FUNCTION NAME
   accrued = balance * rate; updated = balance + accrued;
                                                                     (D) LOCAL VARIABLES
                                                                     (E) RETURN TYPE
                                                                     (F) PARAMETER LIST
   return updated;
                                                                     (G) DECLARATION
                                                                     (H) FUNCTION CALL
                                                                     (I) BODY
```

ELSEWHERE, WITHIN THE MAIN METHOD

}

double money = accumulate_interest(3000.0, 1.2);

More on Variables

Variable Scope: LOCAL vs. GLOBAL?

```
M.A.G.I.C. - DON'T DO IT #DEFINE constants
```

```
int
main(int argc, char *argv[]) {
    string tf_array[30];
    . . .

    // populate the array

    // print out the contents of the array
    for (i = 0; i < 30; i++) {
        printf("%s\n", tf_array[i]);
    }
}</pre>
```

(J) HEADER

Arrays

```
int votes[3];
                                                                             Some key properties of C arrays:

    Zero-indexed

votes[0] = 10;
                                                                                · Access beyond bounds
// stuffing the ballot box
                                                                                • Array names are not variables
votes[1] = 0;
votes[2] = 0;
Array Initialization
int num_days_in_month[12] = { 31, 28, 31, 30, 31, 30, 31, 30, 31, 30, 31 };
string four_elements[] = { "fire", "water", "wind", "earth" };
bool truth_table[2][3] = { { true, true, true }, { true, true } };
#define CLASS_SIZE
#define EMPTY 0
                                           int
void init_array(int array[], int size);
                                           main() {
                                                 int i;
                                                 int scores_array[CLASS_SIZE];
                                                 init_array(scores_array, CLASS_SIZE);
                                                 // populate the array
                                                 for (i = 0; i < CLASS_SIZE; i++) {
                                                      printf("Enter score for student %d: ", i);
                                                      scores_array[i] = GetInt();
                                                 }
                                           }
                                           void init_array(int array[], int size) {
                                                 int i;
                                                 // initialize all cells to 0
                                                 for (i = 0; i < size; i++) {
                                                      array[i] = EMPTY;
                                                 }
```

Cryptography

What is cryptography?

```
Caesar Ciphers
```

$$c_i = (p_i + k) \mod 26$$

The Vigenere Cipher

$$c_i = (p_i + k_i) \mod 26$$