

week2

Tommy  
MacWilliam

Functions

Scope

Magic  
Numbers

Arrays

main

Crypto

Practice  
Problems

# week2

Tommy MacWilliam

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# Announcements

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Problems

- ▶ Office hours! <https://www.cs50.net/ohs/>
- ▶ Walkthrough! <https://www.cs50.net/psets/>
- ▶ CS50 Help! <https://help.cs50.net>

# Today

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Problems

- ▶ functions
- ▶ scope
- ▶ magic
- ▶ arrays
- ▶ main
- ▶ crypto

# Hi!

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Problems

- ▶ I'm Tommy!
- ▶ Computer Science, 2013
- ▶ Gov minor (for the lulz)

# I live here

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# I've worked here

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charles river analytics

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# And here

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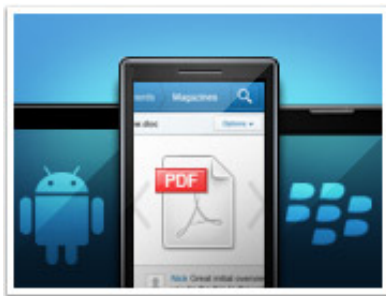
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# Functions

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- ▶ block of code aimed at a **single** task
- ▶ takes input → does stuff → generates output



# Functions

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- ▶ DRY: **Don't Repeat Yourself**
  - ▶ functions are reusable
- ▶ break up large code chunks
  - ▶ make a big problem into a series of smaller problems
- ▶ organize your code

# Functions

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```
int function(int argument1, int argument)
{
    // do stuff
    // return something
}
```

# Functions

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- ▶ type: any variable type, like `float`, `int`, or `string`
- ▶ name: contains letters, numbers, and underscores
  - ▶ good practice: start function names with a verb
- ▶ argument list: comma-separated inputs to the function

# Functions

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- ▶ example time!
  - ▶ `func1.c`, `func2.c`, `func3.c`

# Variable scope

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- ▶ global variables: accessible by all functions
  - ▶ defined outside of `main`
- ▶ local variables: accessible by a single block
  - ▶ defined within a block, only accessible in that block

# Variable scope

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Problems

- ▶ what if a global and a local have the same name?
  - ▶ local variable will always be used instead
- ▶ any function can use/modify a global variable
  - ▶ this is where things can get confusing

# Variable scope

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- ▶ example time!
  - ▶ `scope.c`

# Magic Numbers

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Problems

- ▶ seemingly random constants within your program
  - ▶ `http://thedailywtf.com/Articles/Magic-Number-7.aspx`
- ```
for (int i = 0; i < 4; i++)  
{  
    // next week, you will be sad because  
    // you don't know what 4 is anymore  
}
```



# Magic Numbers

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Problems

- ▶ bad plan.
- ▶ `#define` is your friend
  - ▶ `#define CONSTANT 4`
- ▶ gives meaning to your constants
- ▶ easily changeable throughout your program

# Magic Numbers

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- ▶ constants created using `#define` are NOT variables
- ▶ compiler (that make thing) literally replaces `CONSTANT` with 4

# Arrays

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Problems

- ▶ list of elements of the same type
- ▶ elements accessed by their **index** (aka position)
  - ▶ index starts at 0!
- ▶ `int array[3] = {1, 2, 3};`
- ▶ `array[1] = 4;`

# Arrays

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**Arrays**

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- ▶ example time!
  - ▶ `array1.c`, `array2.c`

# Multi-dimensional Arrays

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Problems

- ▶ can also have arrays of arrays!
- ▶ multi-dimensional: creates a grid instead of a list
- ▶ needs multiple indices: `int grid[3][5];`
  - ▶ 3 rows, 5 columns

# Multi-dimensional Arrays

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Problems

```
int grid[2][3] = {{1, 2, 3}, {4, 5, 6}};
```

|      |   | Columns |   |   |
|------|---|---------|---|---|
|      |   | 0       | 1 | 2 |
| Rows | 0 | 1       | 2 | 3 |
|      | 1 | 4       | 5 | 6 |

# Multi-dimensional Arrays

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**Arrays**

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- ▶ example time!
  - ▶ `array3.c`

# main

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Problems

- ▶ main is a **function** that takes 2 arguments
  - ▶ argc: number of arguments given
  - ▶ argv[]: array of arguments



# main

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▶ example time!

▶ `args.c`

# Cryptography

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Problems

- ▶ term review:
  - ▶ cleartext: the message you want to encrypt
  - ▶ ciphertext: the message after you encrypt it
  - ▶ key: what to use when encrypting the message

# Caesar

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Problems

- ▶ change each character by same amount
  - ▶ key is a single number

# Caesar

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Problems

► key = 5, message = "hello"

|   |   |   |   |   |
|---|---|---|---|---|
| H | E | L | L | O |
| + | + | + | + | + |
| 5 | 5 | 5 | 5 | 5 |
| ↓ | ↓ | ↓ | ↓ | ↓ |
| M | J | Q | Q | T |

# Vigenere

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Problems

- ▶ change each character by a different amount
  - ▶ key is a word

# Vigenere

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Practice

Problems

- key = “not”, message = “here”

|   |   |   |   |
|---|---|---|---|
| H | E | R | E |
| + | + | + | + |
| N | O | T | N |
| ↓ | ↓ | ↓ | ↓ |
| U | S | K | R |

# Let's work together

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Problems

- ▶ output the first 10 even numbers
  - ▶ we need loops and functions
- ▶ calculate the Fibonacci sequence

# Feedback

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- ▶ how was section today?
  - ▶ `http://tommymacwilliam.com/cs50/feedback`