9/27/21 Notes

Intro to C programming

Where did C come from?

- Derived from B by Ken Thompson (1972)
- Influenced by
  - CPL and BCPL
  - 8PDP-11 processor

Hello World!

```
# include <stdio.h>   ← standard I/O package
int main(void) {      ← no arguments
print ──→ printf("Hello World!\n");
    return 0;   ← 0 means success
}
```

Compile and run

```
                  same file
                  ↓
cc -o hello hello.c   ← compile
./hello   ← run
Hello, world!
```

Read the book!

Temperature

- Kelvin is the scale for science
  - 0K → All nuclear motion ceases (absolute zero)
- °C = K - 273.15

°F = °C * 9 ÷ 5 + 32

First Attempt

comment →

```
// Print a table of °F to °C, for 0 to 300

int main (void) {
    int fahr, celsius
    int lower = 0,   upper = 300,   step = 20;
    fahr = lower;
    while ( fahr <= upper) {
        celsius = (5.0 / 9.0) * (fahr - 32);
        printf ("%3.0f %6.1f \n", fahr, celsius);
        fahr = ~~the~~ fahr + step;
    }
    return 0;
}
```

%3d = digit

{ ; }

- C is a "curly brace" language
- {} groups statements
- {} is called a block
- A block introduces a local scope

While

- while () is the simplest loop
- top test loop

printf()

- just a function of standard I/O lib

for()

- better + easier to understand
- initilization is explicit
- test and increments are all visible at the top.

- Clarity above all

Declaring Variables

- you must declare var before you can use it
- declaring it means to specify its type.
- be concerned w/ scalar types.
    - char, int
    - float, double

Scope

- each pair of curly braces introduces a scope
- the scope of each variable tells us where that variable exists or is defined

Scoping Rules

- when you have a set of {..} you create a new scope
- create new local variable

So what happens:

- outer i gets hidden by inner i!

Copy stdin to stdout

```
int main (void) {
     int c;
     while ((c=getchar()) != EOF) {
          if (c == '\n') {
               lines +=1
          }
           putchar (c);
           printf ("%d lines copied.\n", lines);
           return 0;
        }
if ()
```

Do not try to be clever

Counting Coconuts
- inscribing a circle in a square
- shake coconut tree
- All coconuts fall inside the square
- π/4 falls inside circle

What is a language translator?
- program that maps an input language to an output

The need for language translators
- computers are a between of software and hardware
- Hardware functions are controlled by a compatible software

Compilation process of a C program

- compiling process is a sequence of 4 phases. input for each phase is the output

1. The Pre-Processor

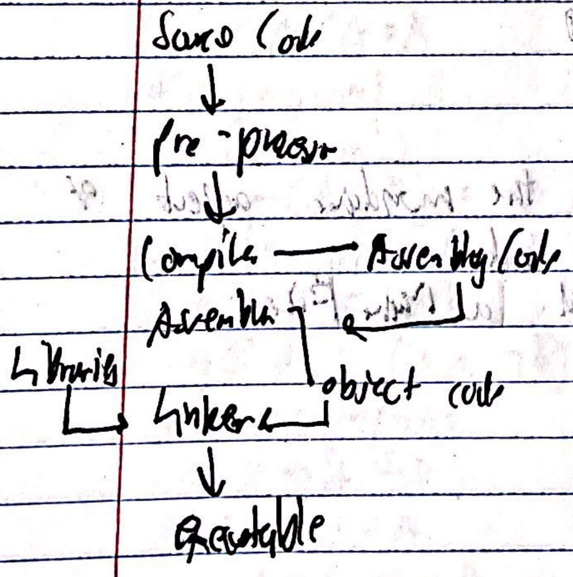
- Source code is passed into preprocessor
- Execute a preprocessor

2. Compiler

- Compiler convert source code to assembly

3. Lexical Phase

- Break down the source code from preprocessor into



Compilers vs. Interpreters

- Compiler
  - translator that takes a high-level prog. language, goes through a sequence of translations and outputs an executable
  - translates entire program/code at once
- Interpreter
  - a program

GCC vs. CC vs. Clang

- gcc
  - GNU C compiler
  - default on Linux
- cc
  - Unix/Linux environment variable that points to the default compiler
- clang
  - Default on Mac and Free BSD

Coming back to make

- the make utility automates the mundane aspects of building executables from source code
- "make" uses a special called a Make File