Chapter 1
Introduction to C
The Abacus

- The abacus, a simple counting aid, may have been invented in Babylonia (now Iraq) in the fourth century B.C.
Jacquard Loom
The ENIAC
The size of a cell phone built with Vacuum Tubes
The IBM 360
The PDP-8
The Microprocessor

- A computer chip that contains on it the entire CPU
  - Mass produced at a very low price
  - Computers become smaller and cheaper
- Intel 4004 – the first computer on a chip, more powerful than the original ENIAC.
- Intel 8088 – used in IBM PC
Famous Quotes about Computers

- “I think there is a world market for maybe five computers.” – Thomas Watson, chairman of IBM, 1943
- “There is no reason anyone in the right state of mind will want a computer in their home.” – Ken Olson, President of Digital Equipment Corp, 1977.
Hardware

- **Hardware** – the physical devices that make up a computer (often referred to as the computer system)
Hardware Core

- CPU (Central Processing Unit)
  - *CPU (machine) cycle* – retrieve, decode, and execute instruction, then return result to RAM if necessary
  - CPU speed measured in gigahertz (GHz)
    - GHz – number of billions of CPU cycles per second

- RAM (Random Access Memory)
  - Also called Memory, Main Memory, or Primary Storage
  - Measured in gigabytes (GB, billions of bytes) today
  - Byte → Character
  - RAM is volatile
    - Temporary storage for instructions and data
Capacity of Secondary Storage Devices

- **Kilobyte (KB or K)** – about 1 thousand bytes
- **Megabyte (MB or M or Meg)** – about 1 million bytes
- **Gigabyte (GB or Gig)** – about 1 billion bytes
- **Terabyte (TB)** – about 1 trillion bytes
Software

- Programs – instructions that tell the computer what to do
- Categories
  - **Application software** - enables you to solve specific problems or perform specific tasks.
  - **System software** - handles tasks specific to technology management and coordinates the interaction of all technology devices
  - **Utility software** - provides additional functionality to your operating system software
System Software

- Operating System
  - UNIX / Linux
  - Windows
  - MAC OS
  - Palm OS
  - Android

- Language Translators
  - C, C++, Basic, Java, ...

- Device Drivers
C Programming Language

- Developed at AT&T Bell Labs in early 1970s
- Unix also developed at Bell Labs
  - All but core of Unix is in C
- Standardized by American National Standards Institute (ANSI)

Because C is a hardware-independent, widely available language, applications written in C can run with little or no modifications on a wide range of different computer systems.
C Development Environment

- **Editor**: Programmer creates program in the editor and stores it on disk.
- **Preprocessor**: Preprocessor program processes the code.
- **Compiler**: Compiler creates object code and stores it on disk.
- **Linker**: Linker links the object code with the libraries, creates an executable file and stores it on disk.
Execution Environment

Optionally under control of a Debugger

Phase 5:
Loader puts program in memory.

Phase 6:
CPU takes each instruction and executes it, possibly storing new data values as the program executes.
IDE

- Integrated Development Environment
  - Editor
  - Compiler
  - Debugger
- Ex:
  - MS Visual C++
  - Xcode
Best Programming Language?

```c
#include <stdio.h>
#define IN 1 /* inside a word */
#define OUT 0 /* outside a word */

/* count lines, words, and characters in input */
main()
{
    int c, nl, mw, nc, state;
    state = OUT;
    nl = mw = nc = 0;
    while ((c = getchar()) != EOF) {
        ++nc;
        if (c == 'n')
            ++nl;
        else if (state == OUT) {
            state = ID;
            ++mw;
        }
        };
    printf("%d %d %dn", nl, mw, nc);
}

#include <stdio.h>
#define IN 1 /* inside a word */
#define OUT 0 /* outside a word */

/* count lines, words, and characters in input */
main()
{
    int c, nl, mw, nc, state;
    state = OUT;
    nl = mw = nc = 0;
    while ((c = getchar()) != EOF) {
        ++nc;
        if (c == 'n')
            ++nl;
        else if (state == OUT) {
            state = ID;
            ++mw;
        }
        };
    printf("%d %d %dn", nl, mw, nc);
}
```

God's Programming Language
Chapter 1
Introduction to C