**Introduction to Computers and the Fortran Language**

The computer was the most important invention of the twentieth century. Considering their importance in our lives, it is almost impossible to believe that the first electronic computers were invented just about 75 years ago.

A computer is a machine that stores information and can perform mathematical calculations much faster than humans. A program tells the computer what sequence of calculations is required, and which information to perform the calculations on.

Computers can store huge amounts of information, and with proper programming, they can make that information instantly available when it is needed.

It is important to realize that computers do not think as humans understand thinking. They merely follow the steps contained in their programs.

OBJECTIVES

* Know the basic components of a computer.
  + The Computer
    - The CPU: is the heart of any computer.
      * control unit:
        + controls all of the other parts of the computer;
        + interprets the instructions of the computer program;
        + fetches data values from the main memory and stores them in the memory registers and sends them to output devices or main memory.
        + ahead in the program to see what data will be needed and pre-fetches it from the main memory into the memory cache so that it can be used with minimal delay.
        + copies the results of calculations from the cache back to the main memory when they are no longer needed.
      * arithmetic logic unit (ALU):
        + performs the actual mathematical calculations.
      * internal memory.
        + consists of a series of memory registers used for the temporary storage of intermediate results during calculations, plus a memory cache to temporarily store data that will be needed in the near future.
      * Modern CPUs have become dramatically faster by incorporating multiple ALUs running in parallel. They also incorporate larger memory caches on the CPU chip.
    - Memory
      * Cache:
        + is memory stored on the CPU chip itself.
        + can be accessed very rapidly.
      * Main
        + consists of separate semiconductor chips connected to the CPU by conductors called a memory bus.
        + It is very fast, and relatively inexpensive compared to the memory on the CPU itself.
        + Data that is stored in the main memory can be fetched for use in a few nanoseconds or less.
        + is used to temporarily store the program currently being executed by the computer and the data that the program requires.
        + is volatile, meaning that it is erased whenever the computer’s power is turned off.
        + is relatively expensive, so we only buy enough to hold all of the programs actually being executed at any given time.
      * secondary
        + consists of devices that are slower and cheaper than main memory.
        + They can store much more information for much less money than main memory.
        + nonvolatile, meaning that they retain the programs and data stored in them whenever the computer’s power is turned off.
        + are normally used to store programs and data that are not needed at the moment, but that may be needed sometime in the future.
    - Input and Output Devices
      * input devices:
        + the keyboard: we can type programs or data into a computer with them.
        + the mouse.
        + touchscreens,
        + scanners,
        + microphones,
        + cameras.
      * Output devices: permit us to use the data stored in a computer.
        + Displays
        + printers.
        + Plotters
        + speakers.
* Understand binary, octal, and hexadecimal numbers.
  + Data Representation in a Computer
    - The Binary Number System
    - Octal and Hexadecimal Representations of Binary Numbers
    - Types of Data Stored in Memory
* Learn about the history of the Fortran language.
  + 1.3 The Computer Languages
  + 1.4 The History of the Fortran Language
  + 1.5 The Evolution of Fortran
* 1.6 Summary
  + 1.6.1 Exercises