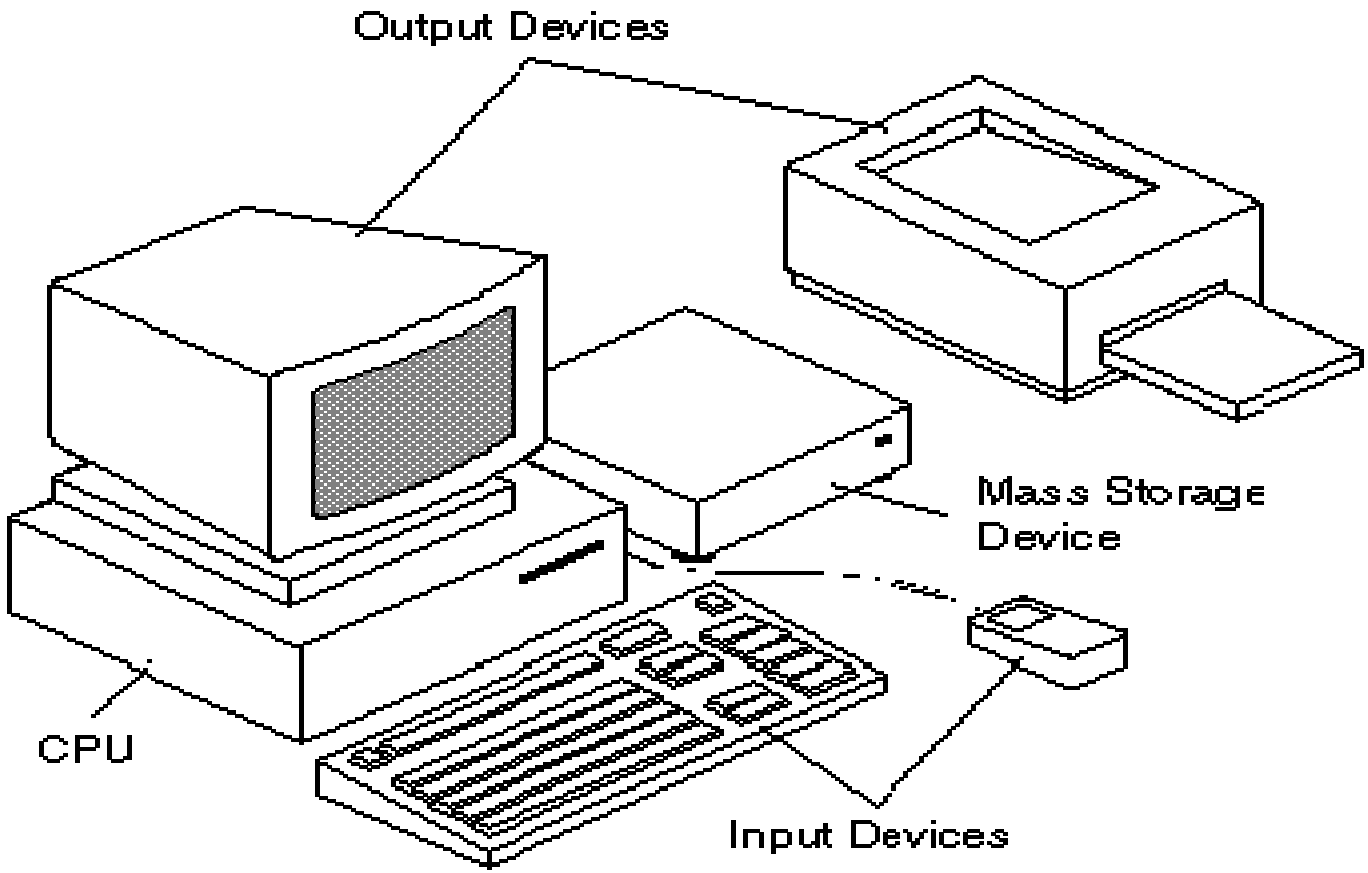
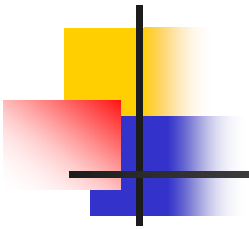
Introduction to Computer Programming using Fortran 77

The Computer

- is a tool
- vary in size, shape, speed, capacity, and usage
- fast
- do only what it is instructed to do

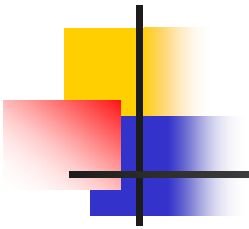
Computer Components





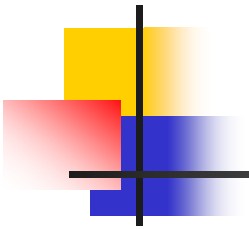
Computer Components

- Central Processing Unit (CPU)
  - the computer brain and main worker
- Memory
  - where the computer store needed information
- Input devices
  - devices to receive input from user (e.g., keyboard , mouse)
- Output devices
  - show results to the user (e.g., monitor , printer)



What does the Computer Understand ?

- The computer only understands **electrical signals**
- These electrical signals are interpreted as **ones** and **zeros**
- **Machine language** programs are programs that are written in ones and zeros

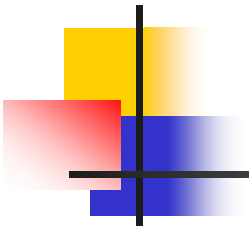


High Level Languages

- High Level Languages that are more sophisticated than machine language
  - easier to write, test, and fix
  - e.g., FORTRAN, PASCAL, C

- Compiler

  a compiler **translates** a program from a high level language to a machine language



Programs

- Program

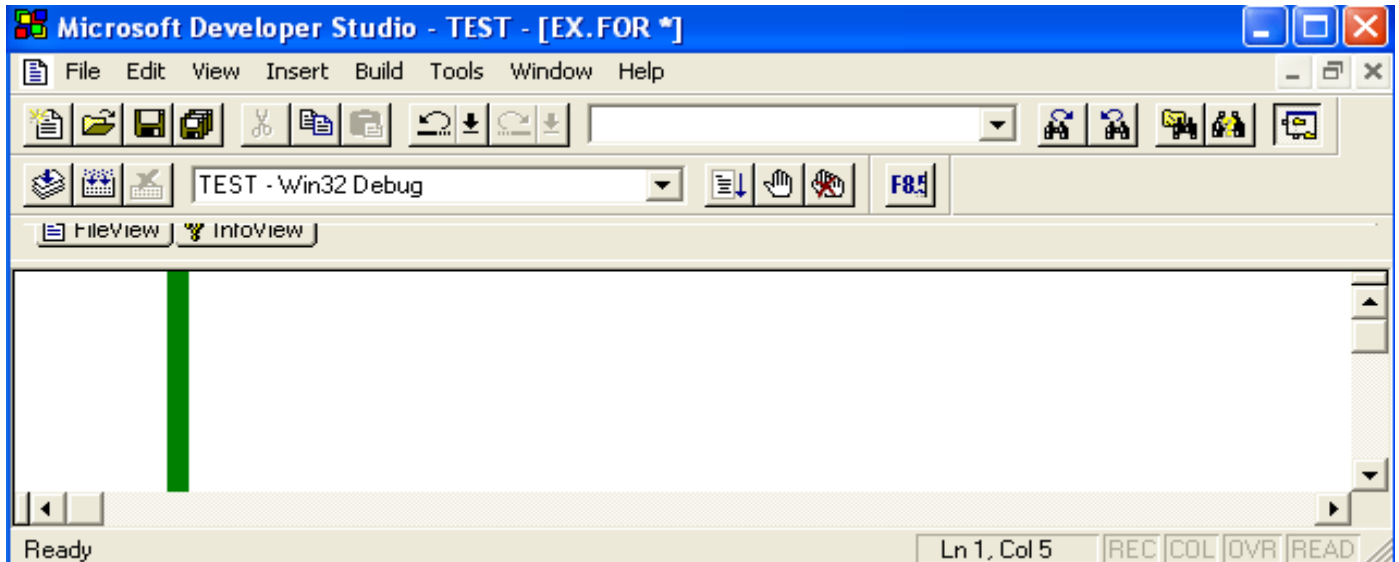
  a **solution to a given problem** written in a computer programming language

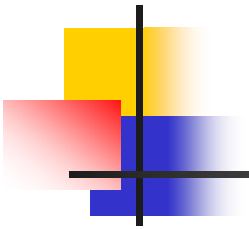
- Software

  the **collection of programs** that run in a computer and determine the operations that are valid in the computer

FORTRAN Programs

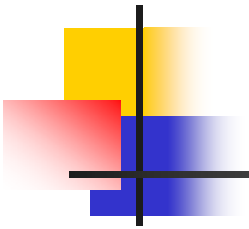
- All statements have a specific structure
- Each line (80 columns)
- Program statements from columns **7 - 72**
  - program statements have to be valid FORTRAN statements
- Statement number from columns **1 - 5**
- Column **6** (continuation if any)
- * or C in column **1** denote a comment line
- FORTRAN compiler ignores columns **73 - 80**





Writing a Program

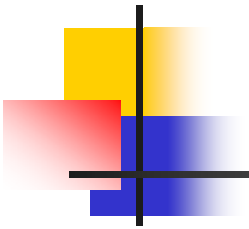
- **Understand** the problem
- **Analyze** the problem and **break** it into smaller pieces
- Write **step by step** solution
- Write the **code** (the actual program in a computer language)
- **Test** that the program works
  - fix errors that you discover during testing



Exercises

1. Indicate the following statements as either TRUE or FALSE:

1. Syntax errors are detected during compilation.
2. A compiler is a hardware component that translates programs written in a high level language to a machine language.
3. The input unit is the part of the computer that controls all the other parts.
4. The last statement in a FORTRAN program should be the END statement.
5. FORTRAN is a high level language.
6. A comment statement is used for documentation purposes.
7. Dividing by zero will cause a compilation error.
8. If a FORTRAN statement exceeds column 72, then '+' at column # 6 in the next line can be used to continue the statement on that line.
9. A computer is a machine used to solve problems only.
10. A compiler checks the syntax of the program and converts the program into machine language
11. A program is a set of computer instructions.
12. One can use as many 'STOP' and 'END' statements as he/she wishes in a single program.



Exercise

2. Which of the following statement(s) is/are correct according to FORTRAN:

   A. Only column 1 is used for the statement label.

   B. Column 6 is used for comment.

   C. Column 1-5 is used for the statement label.

   D. Column 7 is used for the continuation line.

   E. Characters C or * in Column 1 is used to comment a line.

Exercise

3. For each item of list (A) , choose the correct definition from list (B):

List A	List B
Assembler	1. A machine that converts an assembly language program into machine language.
	2. The physical components of a computer.
Compiler	3. A machine that converts a high level language program into machine language.
	4. A fundamental computer component that controls the operations of the other parts of the computer.
Software	5. Programs used to specify the operations in a computer.
	6. A fundamental computer component that performs all arithmetic and logic operations.
Hardware	7. A program that converts an assembly language program into machine language.
	8. A program that converts a high level language program into machine language.

Exercise

4. For each term in list (A) , choose the correct definition from list (B):

List A	List B
A program	1. is a FORTRAN statement that indicates the logical end of the program.
	2. is a machine that can solve all problems.
A Computer	3. translates programs written in an assembly language to machine language.
	4. is a machine that uses instructions given by the user to solve a problem.
END	
	5. is a sequence of instructions which, when performed, will do a certain task.
STOP	6. is a FORTRAN statement that indicates the physical end of a program.