What is Software?

List of Instructions → Makeup → Program

Program → Collection of Programs → Software
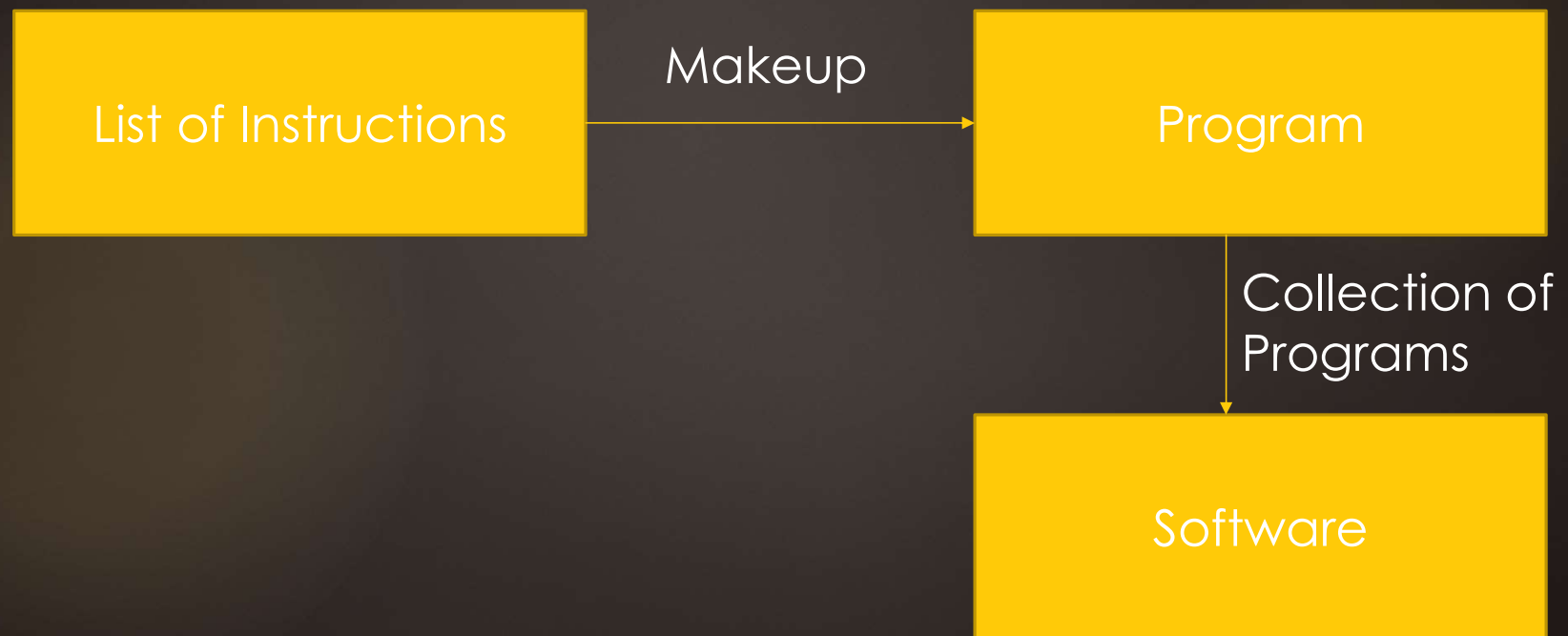
Languages to write computer programs

Computer Programs can be written in **low level language or high level language**

A person who write computer programs is called **programmer**

Most programmers use **high level language** to write programs

High Level languages

High Level Languages allow the programmers to just focus on the problem to be solved, and they don't need to worry about the knowledge of hardware.

High Level Languages are portable

Example of a code snippet written in high level language to add two numbers:

Sum := FirstNumber+ SecondNumber

High Level Languages

- ❑ C++, Delphi, Java, Python, Pascal, Visual Basic are the examples of High Level Language
- ❑ Once you learn concepts of programming, you can easily switch between the languages

Advantages of High Level Languages

They use very easy statements so that programmer can easily write the programs

Read and Understand the program as it is closer to human language

Low Level Languages

- ▶ Low Level Languages are closer to the understanding of Computers
  - ▶ Machine Language
  - ▶ Assembly Language

Machine Language (Low Level)

❑ Programmers don't write in machine code, as it is very difficult to understand and is very complicated.

❑ Code Snippet to add two numbers using Machine Language

1	12	0001	00010010
4	13	0100	00010011
0	1A	0000	00011010
Hexadecimal		**Binary**	

Figure 7.3

Assembly Language (Low Level)

▶ Use **Mnemonics** for writing code

```
LDA     First
ADD     Second
STO     Sum
```

Simple Quiz!

▶ Which type of language is Java

▶ How do programmers write code in Assembly Language

What do you think how programming is going to transform your life?

Concept of Translators

- Programmers write code in high level

- Computers understand Machine code

- There is the need for translation High Level language to Machine Code

Compiler

- ▶ Translates a program written in high level language into machine code at once

- ▶ Compiled program can be reused without recompilation

- ▶ C++ uses compiler

  - ▶ GCC (GNU Compiler Collection)

Compiler

The high-level program statement

```
Sum := FirstNumber + SecondNumber
```

becomes the following machine code instructions when translated

```
0001    00010010
0100    00010011
0000    00011010
```

Interpreter

Interpreter reads one statement at a time from the program written in high level language, performs action, and does the same with the next statement.
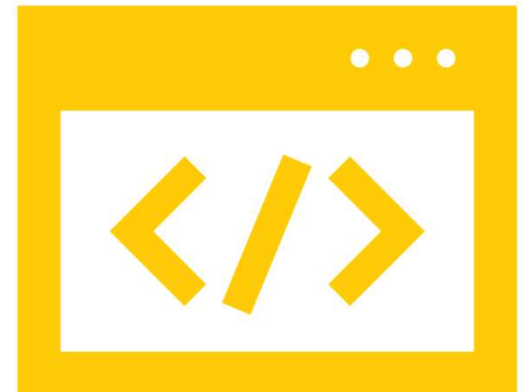
Python, perl, ruby use interpreter

Assembler

❑ It translates program written in assembly language into machine code, so that it can be directly used by a computer to perform a required task.

❑ It works like a compiler for assembly language.

Simple Quiz #02

▶ Which Language Translator you think is fast?

▶ Which Language Translator are you going to use for the course?

What happens when things go wrong?

- ❑ Programmers being humans make errors
- ❑ There are two main types of errors:
  - ❑ **Syntax Errors**
    - ❑ Grammatical rules of Language are violated
    - ❑ Easy to identify
  - ❑ **Logical Errors**
    - ❑ Human Error, Program will not perform what it is desired to do
    - ❑ Like giving the sign of addition when actually wanted to perform subtraction