Computer Programming

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Digital

- Discrete resolution of information.
- Relating to or using signals or information represented by discrete values (digits) of a physical quantity.
- Involving or relating to the use of computer technology: "the digital revolution".

Digital Technology

http://static.freepik.com/free-photo/digital-technology-product-icon-vector-material_34-26168.jpg
http://artofdigital.net/wp-content/uploads/2012/07/digital-technology.jpg

Advantages of Digital

- Can be processed and transmitted more efficiently and reliably than analog data.
- Has a great advantage when storage is necessary.
- Noise (unwanted voltage fluctuations) does not affect digital data nearly as much as it does analog signals.

Digital Computer

- Finite Discrete states.
  - Decimal: 10 discrete states.
  - Binary: 2 discrete states.
  - Hexadecimal: ?
- Bit – **B**inary dig**IT**.
- Digital Computer work with Bits, since they represent yes-no, true-false (two states).
  - WHY?
    - Works with Signals represented by Voltage.

Activity Time

What is programming?

Programming Paradigm

- Sequential Programming (Von Neumann architecture)
- Procedural languages (Modular Programming)
- Object-oriented Programming
- Imperative Programming
- Functional Programming
- Logic Programming

Courtesy: Wikipedia

Translating Languages

English: Display the sum of A times B plus C.

C++: cout << (A * B + C);

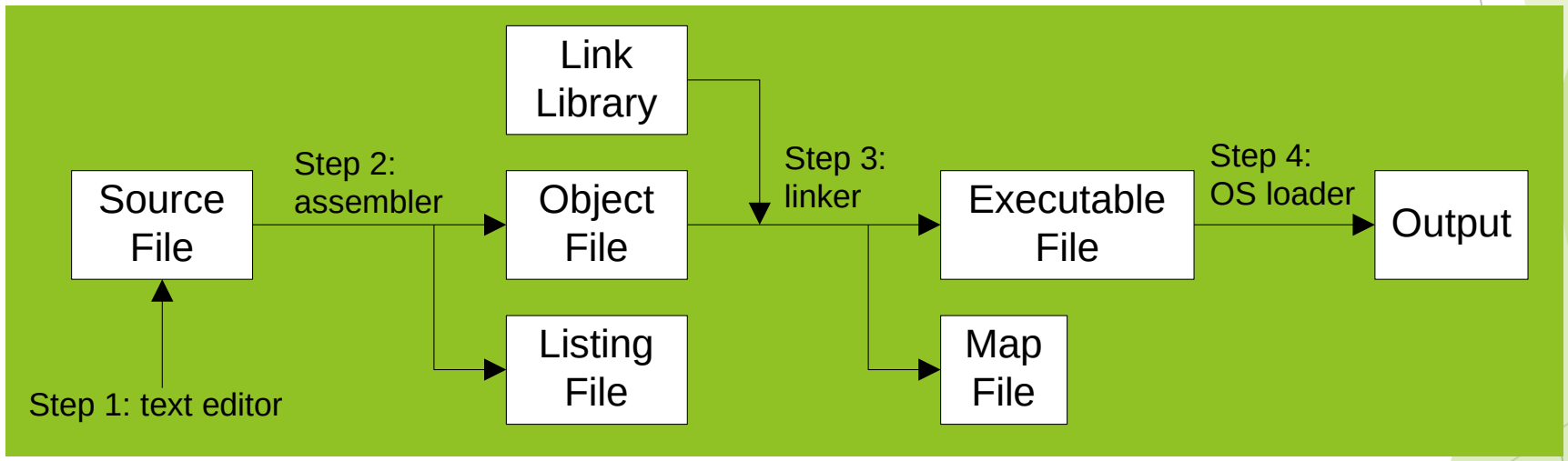
Assembly Language:

```
mov eax,A
mul B
add eax,C
call WriteInt
```


Intel Machine Language:

A1 00000000
F7 25 00000004
03 05 00000008
E8 00500000

Assemble-Link Execute Cycle

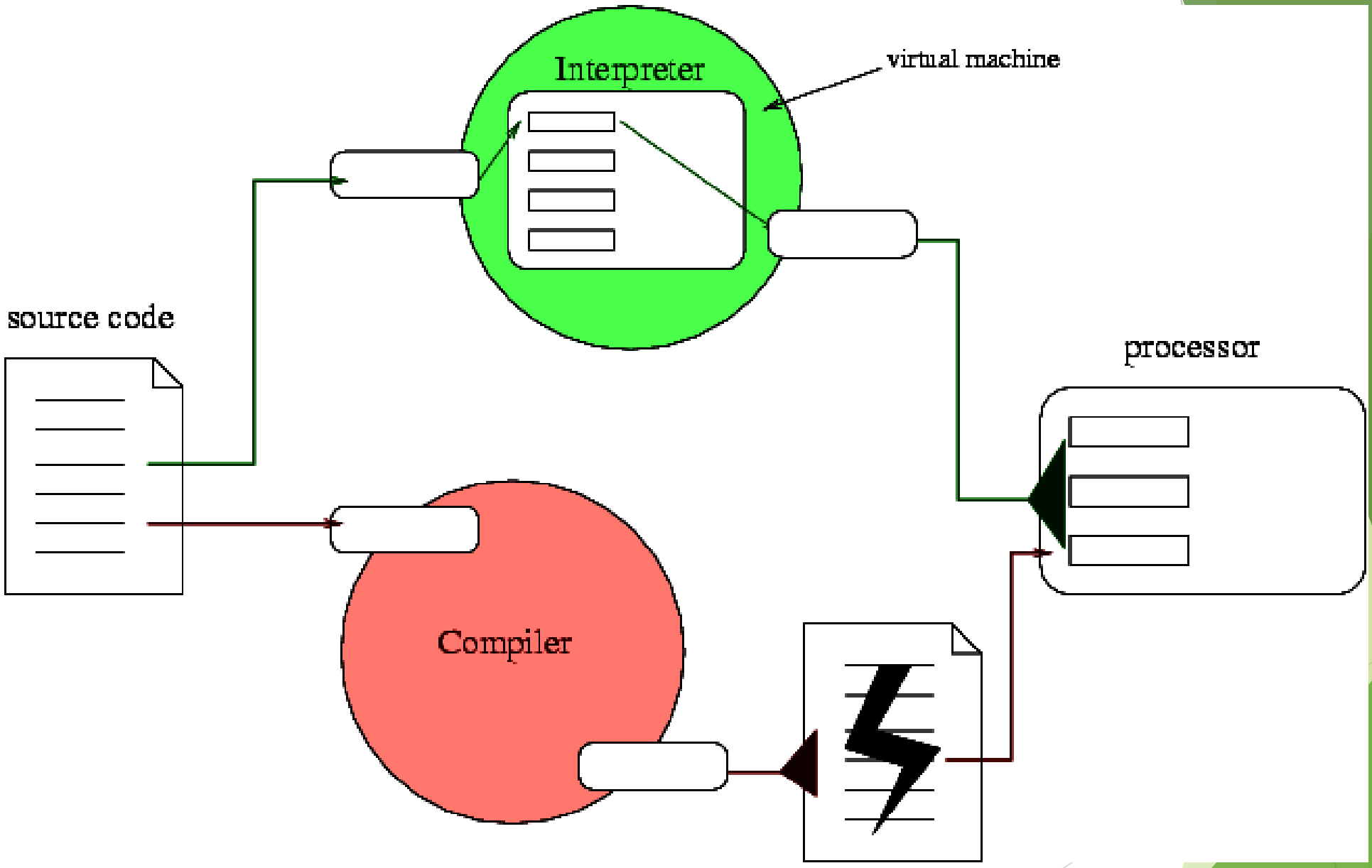


Activity Time

What is Interpreter?

Activity Time

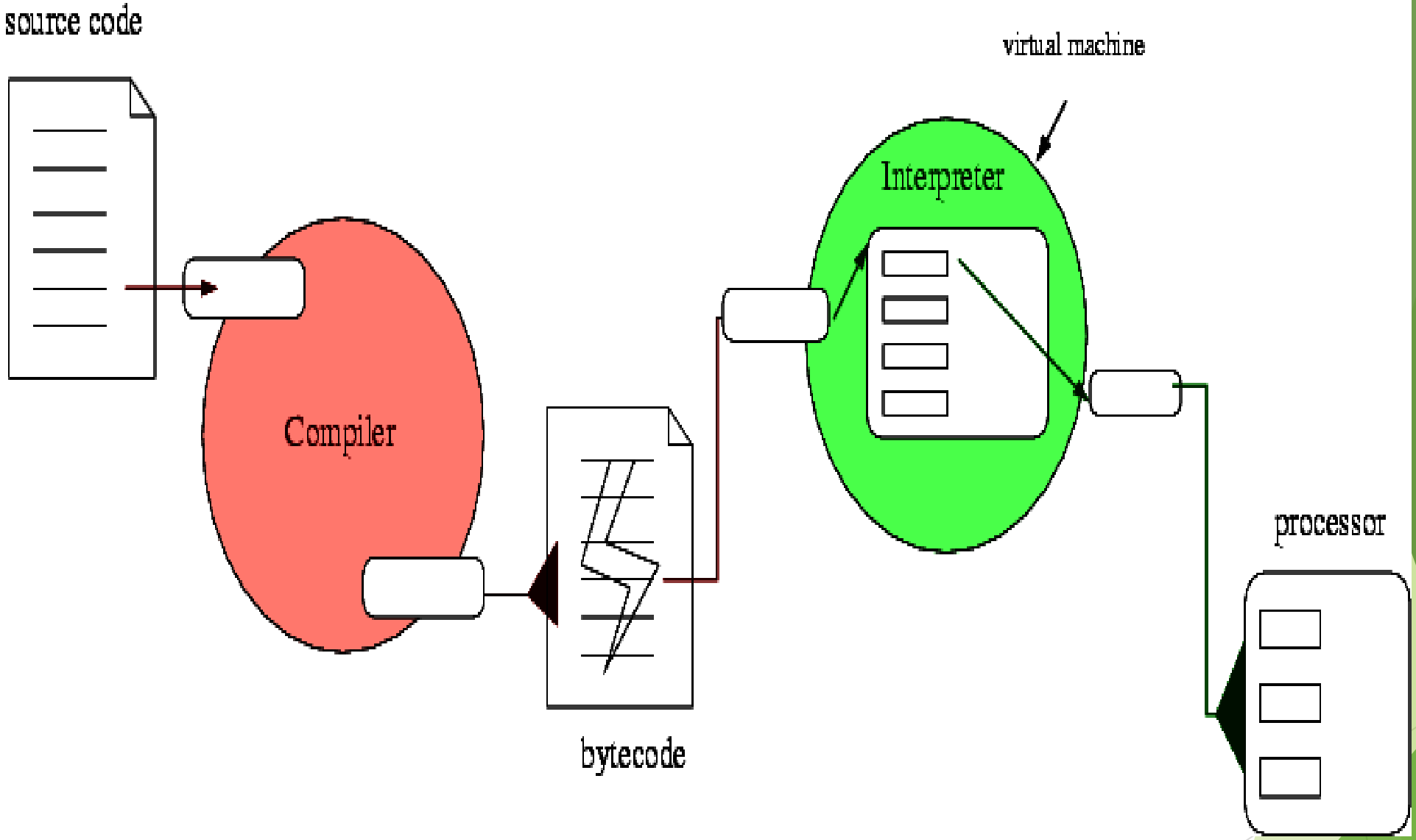
What is Compiler?



http://www.pasteur.fr/formation/infobio/python/images/compiler_interpreter.png

Activity Time

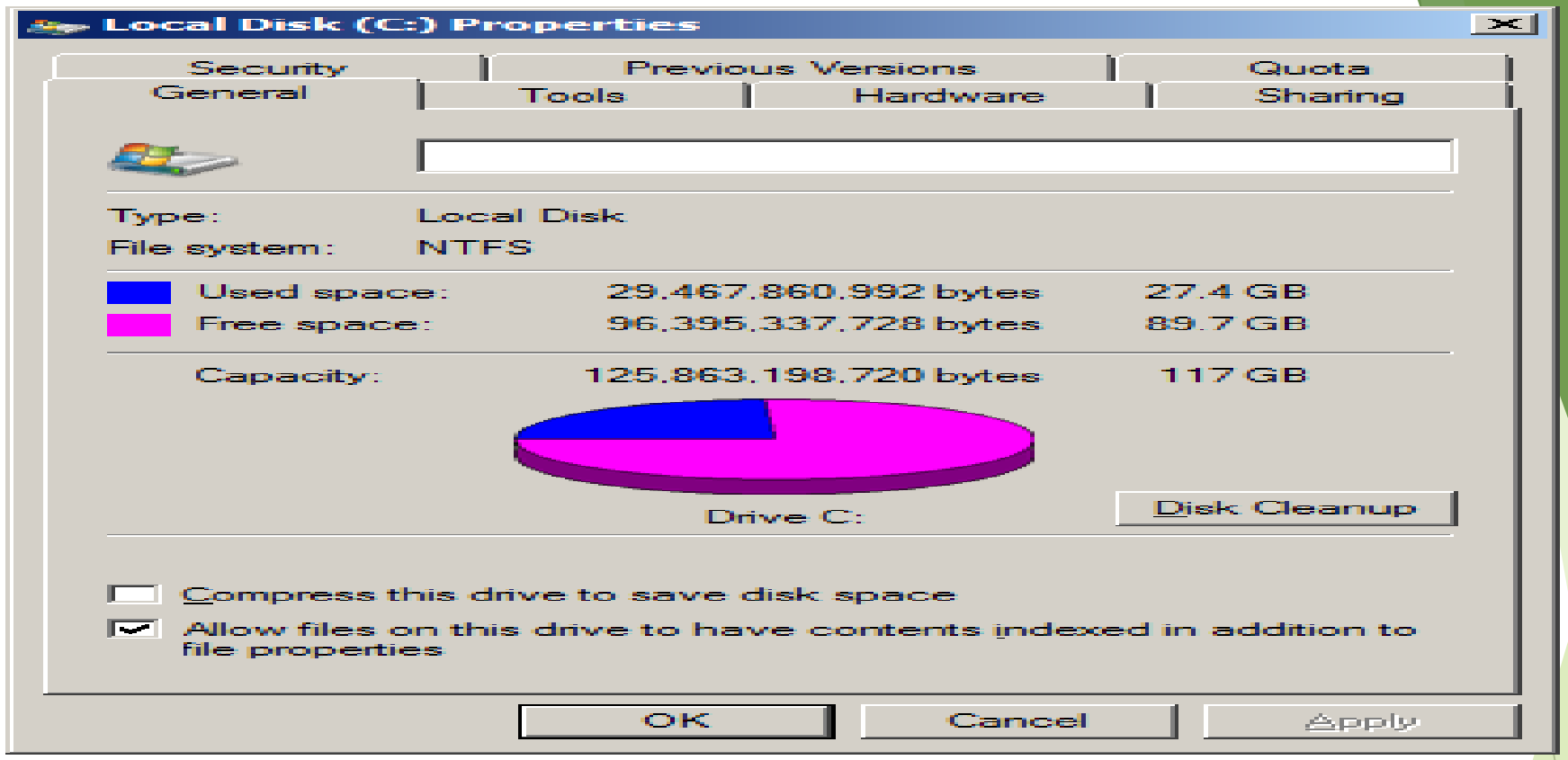
What is Assembler?



http://www.pasteur.fr/formation/infobio/python/images/bytecode.png

Activity Time

What is Storage?



Bit	=	1 binary digit
Byte	=	8 Bits
Kilobyte (KB)	=	1,024 Bytes
Megabyte (MB)	=	1,024 Kilobytes
Gigabyte (GB)	=	1,024 Megabytes

http://www.centerpointaudio.com/Images/Sd-Data%20Measurements.png

Exercise

Write Pseudocode or make flowchart

Ask user if they want to perform mul or div
for input int a and b

Perform dry run for div and mul, when:
a = 10 and b = 3

Calculate a/b and a*b without using divide (/) and multiply (*) operators
(only use +, -, mod)

Introduction to C

- C evolved from two previous languages, BCPL and B.
- The C language was evolved from B by Dennis Ritchie at Bell Laboratories and was originally implemented in 1972.
- Many of today's leading operating systems are written in C and/or C++.

Why C

- Creates a complete easy-to-understand picture of processes in the source code
- C is mostly hardware independent
- t’s possible to write C programs that are portable to most computers.
- C is widely used to develop systems that demand performance, such as operating systems, embedded systems, real-time systems and communications systems
- Many of the backend technicalities of computers are easy to grasp while writing a code in C.

Installation of C tools

- C Compiler
- There are many

High-Level Programming Languages

- Single statements could be written to accomplish substantial tasks.
- Translator programs called compilers convert high-level language programs into machine language.
- High-level languages allow you to write instructions that look almost like everyday English and contain commonly used mathematical notations.
- For example, here's a section of a high-level language's program

```
grossPay = basePay + overTimePay
```

High-Level Programming Languages

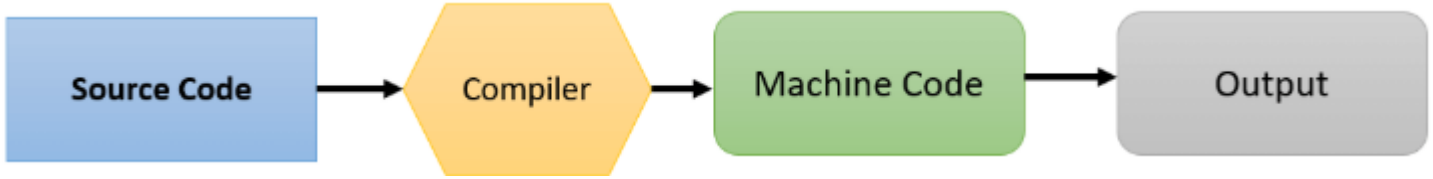
- Some of the well-known high level programming languages are:
  - C
  - C++
  - Java
  - Python
  - Etc..

Translator Programs

- Different type of programming languages construct their translator softwares.
- These softwares help a high-level language's code to be translated into machine code for the machine to execute.
- Usually, a translator software is known as a compiler, however, there are two different types of translator programs
  - Compiler
  - Interpreter

Compiler

- A tool that converts the source code written in high-level programming language into executable machine code



- Compiler transforms code written in a high-level programming language into the machine code, at once, into an executable machine code before program runs

Interpreter

- The interpreter converts the source code line-by-line during RUN Time.

- Interpreter allows evaluation and modification of the program while it is executing.
- Interpreters work slowly when compared to Compilers

Syntax

- The grammar of a programming language is referred to as Syntax.
- A collection of the rules which shows how to write instructions in a particular programming language is known as Syntax.
- If the syntax is not correct in a source code, the code will throw an error.
- Keywords:
  - The words/phrases whose meanings are pre-defined by the programming languages.

Syntax

- Consider the following English sentences
  - *This is a book* (grammatically correct as it follows language's rules)
  - *Booka is this* (grammatically incorrect as it does not follow language's rules)
  - Similarly, if a particular instruction in a programming language follows the syntax (grammar) of the language then it is said to be correct.