

Nature of programming languages:

(A) Fundamental operations of a computer are inclusive of numerical addition, comparison, ~~etc~~ and both the retrieval and storing of data.

(B) Compound operations are operations that use loops, or other similar iteration tools.

Examples:

$15 + 23 = 27 \rightarrow$ Fundamental operation

Store email to memory \rightarrow ~~Compound~~ ^{Fundamental} operation.

or

Storing 1, 3, 5, ... 99 \rightarrow Compound operation

Comparing Array 1 and Array 2 \rightarrow compound operation

(C) Essential features of a programming language:

- Fixed vocabulary
- unambiguous / universal meaning
- consistent grammar / syntax

(d) higher level programming languages are programming languages that resemble natural language making it easier for any programmer to understand and learn examples can be ~~the~~ Python, Java, etc.

(e) low level languages are machine friendly, making them difficult to understand and interpret by humans.

(f) Why we need higher level programming languages

- Higher level code is easier to write, where singular commands can carry out multiple tasks at once, which would have otherwise had to have been written manually.

example: Output ARRAY

in ~~machine~~ lower level languages I would need a loop to do the same operation.

- Higher level languages introduce more sophisticated concepts, such as Object oriented programming ~~language~~ that make programming easier, quicker, and more reliable.

- Higher level tools have (often have) debugging tools, automated error checking, etc.

- High level code also supplies Libraries.

Translating higher level language to machine executable code:

In order for computers to understand

(G) higher level programming languages, we use one of the 3 following devices

- Interpreters: Interpreters read 1 command at a time and executes them ~~immediately~~ immediately. If there are errors in the program, the program will run and fail in the middle. Interpreters provide less debugging help than compilers.

- Compilers: Compilers read the entire program translates the higher level code into to lower level machine code, if there aren't any errors found. If there are errors compilers often point to the line / location of the first identified error.

- Virtual machines: