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Programming Languages Basics

1. What is the difference between machine language and assembly language?

Machine language consists of sequence of binary digits (0s and 1s). This is the only language the CPU understands. On the other hand, assembly language allows a programmer to type a program as readable text for a human, using names and symbols to tell the computer what they want it to do. This makes assembly language much less tedious than programming directly in binary code.

2. In what way(s) are high-level languages an improvement on assembly language?

They are easier to learn and understand for humans. You can work on the hardware without getting all the way down into the bits (avoid programming in Assembly language).

3. In what circumstances does it still make sense to program in assembler?

When optimization is of the essence, or when you want to debug in a really low level to finally understand what's wrong with your program. It also is useful when you want to learn how to think and understand how a machine works, where you can get a different perspective of how some things work.

4. Why are there so many programming languages?

There are five main reasons, which are:

(1) Evolution – we've learned better ways of doing things over time.

(2) Socioeconomic factors: proprietary interests, commercial advantage.

(3) Orientation towards special purposes

(4) Orientation towards special hardware

(5) Diverse ideas about what is pleasant to use.

5. What makes a programming language successful?

A successful programming language has the following characteristics:

- Easy to learn.
- Easy to express things, easy use once fluent, powerful.
- Easy to implement.
- Possible to compile code very good.
- Backing a powerful sponsor.
- Wide dissemination at minimal cost.

6. Name 2 languages in each of the following categories:

- Von Neumann
  (1) Fortran
  (2) C
- Functional
  (1)Haskell
  (2)Mercury
- Object-oriented
  (1) Simula
  (2)Smalltalk
- Logic languages
  (1) Prolog
  (2) Answer Set Programming (ASP)
- Concurrent languages
  (1) Alef
  (2) Join Java

7. What distinguishes declarative languages from imperative languages?

Delcarative languages are used for functional programming (Scheme, ML, pure Lisp, FP) and for logic, constrained-based programming (Prolog, VisiCalc, RPG). While imperative languages are used in von Neuman arquitectures (Fortran, Pascal, Basic, C), Object-Oriented Programming (Smalltalk, Eiffel, C++), and some of them are scripting languages (Perl Python, JavaScript, PHP).

8. What organization spearheaded the development of Ada?

U.S. Department of Defense.

9. What is generally considered the first high-level programming language?

FORTRAN.

10. What was one of the first functional languages?

LISP.

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