1. What is "Programming Language"?

- Language: English, Korean, Japanese,
- Programming Language: FORTRAN, C, COBOL,....
 - Machine Language -> Assembly Language -> HLL -> Very HLL

2. Why study "Programming Language Concept"?

- Helps to make the program that can be executed efficiently
- Helps to learn a new PL easily
 - Imperative Language : von-Neumann Computer
 - Declarative Language : Prolog, LISP, ...

3. What will we study in this Class?

- Data: integer, char, float, array, structure, ...
- Control: if_then_else, for_loop, while_loop, switch, ...
- Subprogram: procedure vs. function, parameter passing, ...
- Object-Oriented Programming Concepts: abstract data type, object, message, inheritance, polymorphism, ...
- C++: a Better C + OOP

C-like Language Program

```
main() {
                                                 Which CPU?
   int i, j, k;
                                                      ✓ 16-bit CPU
  char a, b;
                                                      ✓ 32-bit CPU
   float f = 0.0;
                                                             16bit cpu에서는 word 가 2byte (int가 2byte)
                                                                          65536 면 오버플로우
                                                 Loop Control
   i = 65536; /* 2^{16} = 65536 */
                                                      ✓ Pre test
   for (i=100; i>100; i++) {
                                                      ✓ Post test
    f = f + i; c언어는 pretest loop라서 조건을 먼저 확인하고 참이면 돌아가는데, 어떤 언어는 do while 처럼 먼저 돌고 그 다음부터 조건을 확인하는 게 있음
    f = f + f;
                         코션 compiler generated type conversion - Operator Overloading
              원래 float + int는 안되는데 컴파일러가 int를 float로 바꿔서 해중
   i = 100; j = 200;
                                                 Inconsistent Type
   swap(i, j);

√ (warning) Error

✓ Coercion

       float 더하기 할 때도 +를 쓰고 int 더하기 할 때도 +를 쓰는데, 기계어에서는 명령이 다름
                 그래서 컴파일러는 피연산자를 보고 판단함 (operator overloading)
swap (a, b) {
                                                 Parameter Passing
   int temp;
                                                      ✓ Pass by value
  temp = a ;

√ Pass by reference

                          c 처럼 call by value면 값이 안바뀌고
                      iava 처럼 call by reference 면 값이 바뀐다
  a = b;
                                                      ✓ Pass by name
  b = temp ;
```

Concept of Programming Languages Preliminaries - Why Study PL? - Evaluation Criteria - Design Trade-offs Basic Features (Variable, Expression, and Control) **Statement-Level Control Structures Expression & Assignment** Names, Binding, **Data Types** Type Checking, Scope - Primitive Types - Arithmetic Exp. - Compound Stmt, Selection Stmt - Variables, Binding - Ordinal Types - Overloaded Op. - Iterative Stmt, uncond. Branching - Type Checking - Array, Record - Type Conversion - Guarded Commands - Scope, Lifetime - Union, Set, Pointer - Assignment Stmt **Subprograms Subprograms** Implementing Subprogram **Parameter Passing** - FORTRAN 77 Overloaded Subpam, Generic Subpra - Algol-like Lang. **Advanced Features** Concurrency **Exception Handling Abstract Data Type** - Concepts - Coroutine - Abstraction PI/I, Ada, C++ - Semaphore, Monitor - Encapsulation, Abstract Data Type **Mesage Passing** Non-Imperative Languages **Object-Oriented** Logic **Functional Programming Programming Programming**

Concepts of PL

Languages

Languages

Languages