

Type Systems

What is a type system?

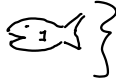
- each variable is labeled with a type
- use the types to make compilation easier
- use the types to make resulting program behave better
- rules about how types can interact

What is a type?

- describes the behaviors of a value and meaning
- a type is a set of values

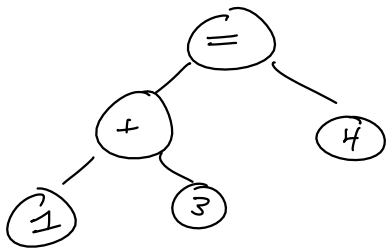
What is a set?

- a collection of unique values

{ 3, "fish",  }

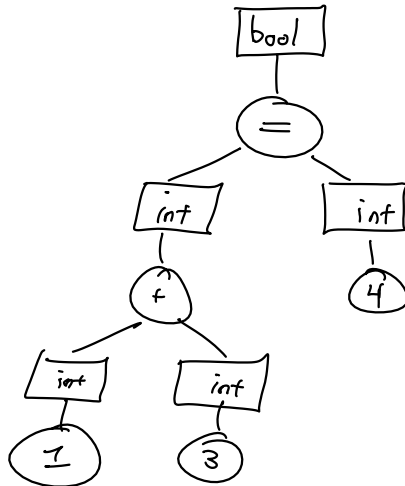
$$\text{int} = \{ 0, 1, -1, 2, -2, \dots, 2^{63}-1, -2^{63} \}$$

C code: `int x=5;` \leftarrow `int x;` `x=5;`
 find enough space to store an int; call that space "x"
 I promise only to put in that space things in the set of int
 store 5 in location named "x"

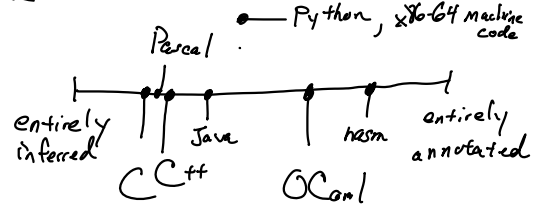


```

mov rax, 1
mov [rbp-8], rax
mov rax, 3
add rax, [rbp-8]
mov [rbp-8], rax
mov rax, 4
cmp rax, [rbp-8]
...
    
```



$$\left(\left(\left(3 : \text{int} \right) + \left(1 : \text{int} \right) \right) : \text{int} \right) = \left(4 : \text{int} \right) : \text{bool}$$



let a : int = true in a + 1

