

Programming language features

	Traditional, “static”	Static o-o	Scripting, “dynamic”	Mixed
Examples	C, Fortran	C++	Python, Ruby	Java, OCaml
Objects?				
Automatic mem. mgt.?				
Static types?				
Tagged values?				

Tuples

- Create “struct” by putting expressions in parentheses separated by commas:
 - `(3, 5.0): int * float`
 - `(3, "abc", true): int * string * bool`
- Exercise — fill in types:
 - `('a', 'b') :`
 - `('a', "a", 'a') :`
 - `(5, ("a", 'a')) :`
- Exercise — create a value of the given type:
 - `_____ : int * (int * float) * string`

Tuples (cont.)

- Use functions `fst` and `snd` to get elements of a pair. *Only works for pairs.* (We'll see how to deal with bigger tuples in next class.)
- Exercise: Write a function to add the elements of an `int * int` pair:
 - `let addelts p =`

Lists (cont.)

● Exercise — fill in types (or flag error):

- `['a'; 'b'] :`
- `['a'; 'b'; "c"] :`
- `[4; int_of_string "34"] :`
- `[[4]; [5]; []] :`
- `[(1, 2); (3, 4)] :`
- `[(1, 2); (3, 4, 5)] :`
- `[(1, [3]); (4, [5; 6])] :`

Lists (cont.)

- Exercise — create a value of the given type (other than the empty list):

- : int list
- : (int list) list
- : (int * string) list
- : (string list) list
- : (int * string list) list
- : ((int * string list) list) list

Lists (cont.)

- Exercise: Write a function to compute the sum of the first two elements of an int list: `addfirsttwo [5; 3; 2; 6] = 8`. You can assume the list is of length at least 2:
 - `let addfirsttwo lis =`
- Exercise: Write a function to compute the sum of the *lengths* of the first two elements of an (int list) list: `addfirsttwolengths [[5; 3]; [2]; [6; 2; 5; 3]] = 3`. You can assume the list is of length at least 2:
 - `let addfirsttwolengths lis =`

Polymorphic functions (cont.)

Ex: Write the polymorphic types of the following functions. (You can write either 'a, 'b, etc. or α , β , as you prefer.)

```
let mktriple p = (fst p, snd p, 3)
```

```
let pair_of_first p = (fst p, fst p)
```

```
let double_first lis = [hd lis; hd lis]
```

```
let pair2list p = [fst p, snd p]
```

```
addfirsttwolengths (defined above)
```