

# Class 2 - Lists and ADT's

## Summary

An ADT hides the implementation. A list ADT can contain many different elements and has different methods to operate on those methods.

### Abstract data Types

#### List ADT's:

- $L = \{l_1, l_2, l_3, l_4\}$  is a list of length 4
- Anything can be on the list
- In a particular setting, may be restricted (strongly typed language)
- Basic operations:  $\text{first}(L)$  -> the first element of  $L$   $\text{rest}(L)$  -> a list just like  $L$  with  $\text{first}(L)$  removed  $\text{add}(x, L)$  -> a list with  $x$  followed by contents of  $L$

*d*

eg.) input a list  $L$  of numbers

```
sum <- 0
while 1 is not empty {
  sum <- sum + first(L)
  L <- rest(L)
}
// here: sum is the sum of elements that were in L
```

Need operation:  $\text{empty}(L)$  -> true if  $L$  is empty, false otherwise

eg.) input a list  $L$

```
L2 <- a new empty list
while L is not empty {
  L2 - add(first(L), L2)
  L <- rest(L)
}
// here: L2 is the reverse of L's initial contents
//      add() adds to the front
```

Other list operations:

- Get or set the  $i$ th element
- Insert  $x$  at location  $i$
- Delete the  $i$ th element
- Find  $x$  in  $L$
- $\text{append}(L_1, L_2)$  -> list with contents of  $L_1$  followed by contents of  $L_2$
- $\text{map}(F, L)$  -> list consisting of  $f(x)$  for each  $x$  in  $L$  eg  $\text{map}(\text{square}, [1,2,3]) = [1,4,9]$