

# F28PL1 Programming Languages

## Tutorial 7

1) Identify the types of the following functions:

- a) `fun a 0 = [] |  
a n = (n*n)::(a (n-1))`
- b) `fun b 0 = [] |  
b n = (real n)::(b (n-1))`
- c) `fun c [] = [] |  
c (h::t) = (not h)::(c t)`
- d) `fun d [] = [] |  
d (h::t) = (size h)::(d t)`
- e) `fun e [] = "" |  
e (_::t) = "."^(e t)`
- f) `fun f [] = 0 |  
f (h::t) = h+(f t)`
- g) `fun g [] = [] |  
g (h::t) = (h,size h)::(g t)`
- h) `fun h [] = [] |  
h (hh::tt) = (real hh, hh)::(h tt)`
- i) `fun i [] = [] |  
i (h::t) = (h,h)::(i t)`
- j) `fun j _ [] = 0.0 |  
j 1 (h::_) = 2.0*h |  
j n (_::t) = j (n-1) t`
- k) `fun k _ [] = 0 |  
k 1 (h::_) = floor h |  
k n (_::t) = k (n-1) t`
- l) `fun l _ [] = [] |  
l 1 (h::t) = (2*h)::t |  
l n (h::t) = h::(l (n-1) t)`

2) Write the following functions. Identify the type in each case:

- a) return a list of the first n integer cubes in descending order
- b) return a list of the first n powers of 2 in descending order
- c) return a list of the first n values of the integer to integer function f in descending order
- d) define the function from a) using the function from c)
- e) define the function from b) using the function from c)

f) return a list of tuples of integers and their squares for the first n integers using the function from c)

g) find the ith element in a list

```
- find 3 ["a","b","c","d"];  
> "c" : string
```

h) delete the ith element in a list

```
- delete 3 ["a","b","c","d"];  
> ["a","b","d"] : string list
```

i) put value v before the ith element in a list

```
- before 3 "c" ["a","b","d"];  
> ["a","b","c","d"] : string list
```

j) put value v after the ith element in a list

```
- after 2 "c" ["a","b","d"];  
> ["a","b","c","c","d"] : string list
```

k) replace the ith element in a list with v

```
- replace 3 "c" ["a","b","e","d"];  
> ["a","b","c","d"] : string list
```

l) merge two ordered integer lists:

```
- merge [1,3,4,6,7] [2,5,8];  
> [1,2,3,4,5,6,7,8] : int list
```