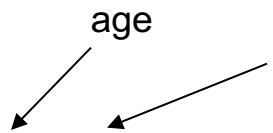
ML – Tuples & Lists

- ML groups information using tuples
- You can think of tuples as records of values that describe a particular object

Examples:



- val joe = (32,185,"married","pilot");

val joe = (32,185,"married","pilot") : int * int * string * string

tuple type

- val circle = ((2.5,3.6),5.0);

xy-coord.

val circle = ((2.5,3.6),5.0) : (real * real) * real

ML – Tuples & Lists

- We can extract specific values from tuples using projections
- e.g., to retrieve the i^{th} value from tuple X:
  #i X

```
- val joe = (32,185,”married”,”pilot”);
- val age = #1 joe;
- val profession = #4 joe;
```

```
-val circle = ((2.5,3.6),5.0);
- val radius = #2 circle;
- val x = #1 (#1 circle);
- val y = ?
```

ML – Tuples & Lists

- ML supports another kind of tuple called a list
- A list is a tuple where all elements are of the same type

```
- val oddlist = [ 1, 3, 5, 7, 9 ];

val oddlist = [ 1, 3, 5, 7, 9 ] : int list
```

different from tuples!

```
- val nested = [(1,2),(3,4)];
- val nested = [[1,2],[3,4]];
- val nested = [[1,2],[3,4,5]];
- val nested = [(1,2),(3,4,5)];
```

what is the type of these constructions?

ML – Tuples & Lists

- There exists a special list → the empty list: [ ] or nil

```
- val mylist = [ ];

val mylist = [ ] : 'a list
```

means empty list type

ML – List Operators

- **null** – tests whether a list is empty

```
- null([ ]);
val it = true : bool

- null([1,2,3]);
val it = false : bool
```

ML – List Operators

- @ - concatenates two lists

```
- [1,2,3] @ [4,5,6];
val it = [1,2,3,4,5,6] : int list

- [“not”] @ [“married”];
val it = [“not”,”married”] : string list
```

ML – List Operators

- **::** - (cons operator) glue elements together to form a list
- the last elements has to always be a (empty) list

```
- 1::2::3::[ ];
val it = [1,2,3] : int list
```

What is the domain of the :: operator?

ML – List Operators

- **hd** – (head operator) return the first element of a list

```
- hd([“one”,”two”,”three”]);
val it = “one” : string

- hd([true]);
val it = true : bool

- hd([ ]);
>>??
```

ML – List Operators

- **tl** – (tail operator) return the list without its first element

```
- tl([“one”,”two”,”three”]);
val it = [“two”, “three”] : string list

- tl([true]);
val it = [ ] : bool list

- tl([ ]);
>>??
```

ML – List Operators

(a) - val x = [“hello”] @ [“there”];

(b) - val x = [“hello” ^ “there”];

(c) - val joe = (32, 185, “married”,”pilot”);
- val jack = (29, 160, “not married”, “cook”);
- val people = [joe, jack];

(d) - val l = [[1,2,3],[“one”,”two”,”three”]];

(e) - val x = [1,2,3];
- val h = hd(x);
- val t = tl(x);
- val l = h :: t;
l?

(f) – val y = 1::2::3;