



Syntax

Implementations are in .ml files, interfaces are in .mli files.
Comments can be nested, between delimiters (*...*)
Integers: 123, 1_000, 0x4533, 0o773, 0b1010101
Chars: 'a', '\255', '\xFF', '\n' Floats: 0.1, -1.234e-34

Data Types

unit void, takes only one value: ()
int integer of either 31 or 63 bits, like 42
int32 32 bits Integer, like 42l
int64 64 bits Integer, like 42L
float double precision float, like 1.0
bool boolean, takes two values: true or false
char simple ASCII characters, like 'A'
string strings, like "Hello" or foo|Hello|foo
bytes mutable string of chars
'a list lists, like head :: tail or [1;2;3]
'a array arrays, like [[1;2;3]]
t₁ * ... * t_n tuples, like (1, "foo", 'b')

Constructed Types

type record = new record type
 { field1 : bool; immutable field
 mutable field2 : int; } mutable field
type enum = new variant type
 | Constant Constant constructor
 | Param of string Constructor with arg
 | Pair of string * int Constructor with args
 | Gadt : int -> enum GADT constructor
 | Inlined of { x : int } Inline record

Constructed Values

```
let r = { field1 = true; field2 = 3; }  
let r' = { r with field1 = false }  
r.field2 <- r.field2 + 1;  
let c = Constant  
let c = Param "foo"  
let c = Pair ("bar",3)  
let c = Gadt 0  
let c = Inlined { x = 3 }
```

References, Strings and Arrays

```
let x = ref 3    integer reference (mutable)  
x := 4          reference assignation  
print_int !x;    reference access  
s.[0]          string char access  
t.(0)          array element access  
t.(0) <- x     array element modification
```

Imports — Namespaces

```
open Unix            global open  
let open Unix in expr    local open  
Unix.(expr)          local open
```

Functions

```
let f x = expr            function with one arg  
let rec f x = expr        recursive function  
                          apply: f x  
let f x y = expr         with two args  
                          apply: f x y  
let f (x,y) = expr        with a pair as arg  
                          apply: f (x,y)  
List.iter (fun x -> expr) l    anonymous function  
let f= function None -> act    function definition  
              | Some x -> act    [by cases]  
                          apply: f (Some x)  
let f ~str ~len = expr       with labeled args  
                          apply: f ~str:s ~len:10  
                          apply (for ~str:str): f ~str ~len  
let f ?len ~str = expr       with optional arg (option)  
let f ?(len=0) ~str = expr    optional arg default  
                          apply (with omitted arg): f ~str:s  
                          apply (with commuting): f ~str:s ~len:12  
                          apply (len: int option): f ?len ~str:s  
                          apply (explicitly omitted): f ?len:None ~str:s  
let f (x : int) = expr       arg has constrained type  
let f : 'a 'b. 'a*'b -> 'a    function with constrained  
                          = fun (x,y) -> x            polymorphic type
```

Modules

```
module M = struct .. end        module definition  
module M: sig .. end= struct .. end    module and signature  
module M = Unix            module renaming  
include M                  include items from  
module type Sg = sig .. end    signature definition  
module type Sg = module type of M    signature of module  
let module M = struct .. end in ..    local module  
let m = (module M : Sg)        to 1st-class module  
module M = (val m : Sg)        from 1st-class module  
module Make(S: Sg) = struct .. end    functor  
module M = Make(M')            functor application
```

Module type items: val, external, type, exception, module, open, include, class

Pattern-matching

```
match expr with  
  | pattern -> action  
  | pattern when guard -> action    conditional case  
  | _ -> action                    default case
```

Patterns:
| Pair (x,y) -> variant pattern
| { field = 3; _ } -> record pattern
| head :: tail -> list pattern
| [1;2;x] -> list pattern
| (Some x) as y -> with extra binding
| (1,x) | (x,0) -> or-pattern
| exception exn -> try&match

Conditionals

Do NOT use on closures

Structural	Physical	
=	==	Polymorphic Equality
<>	!=	Polymorphic Inequality

Polymorphic Generic Comparison Function: compare

	x < y	x = y	x > y
compare x y	negative	0	positive

Other Polymorphic Comparisons: >, >=, <, <=

Loops

```
while cond do ... done;  
for var = min_value to max_value do ... done;  
for var = max_value downto min_value do ... done;
```

Exceptions

```
exception MyExn            new exception  
exception MyExn of t * t'    same with arguments  
exception MyFail = Failure    rename exception with args  
raise MyExn                raise an exception  
raise (MyExn (args))        raise with args  
try expr                  catch MyExn  
  with MyExn -> ...        if raised in expr
```

Objects and Classes

```
class virtual foo x =        virtual class with arg  
  let y = x+2 in            init before object creation  
  object (self: 'a)         object with self reference  
    val mutable variable = x    mutable instance variable  
    method get = variable        accessor  
    method set z =            mutator  
      variable <- z+y  
    method virtual copy : 'a    virtual method  
      initializer            init after object creation  
    self#set (self#get+1)  
  end  
class bar =                non-virtual class  
  let var = 42 in         class variable  
  fun z -> object         constructor argument  
  inherit foo z as super    inheritance and ancestor reference  
  method! set y =         method explicitly overridden  
    super#set (y+4)        access to ancestor  
  method copy = {< x = 5 >}    copy with change  
end  
let obj = new bar 3        new object  
obj#set 4; obj#get        method invocation  
let obj = object .. end    immediate object
```

Polymorphic variants

```
type t = [ `A | `B of int ]    closed variant  
type u = [ `A | `C of float ]  
type v = [ t | u ]            union of variants  
let f : [< t ] -> int = function    argument must be  
  | `A -> 0 | `B n -> n            a subtype of t  
let f : [> t ] -> int = function    t is a subtype  
  | `A -> 0 | `B n -> n | _ -> 1    of the argument
```