The OCaml Language

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|]`
t_1 * ... * 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 constrainted type
`let f : 'a 'b. 'a*'b -> 'a`	function with constrainted
`= 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 1^{st}-class module
`module M = (val m : Sg)`	from 1^{st}-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 =`	
`variable <- z+y`	mutator
`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