define-struct

MzScheme extends Scheme with define-struct, e.g.:

(define-struct square (x y))
(define-struct piece (squares))

Semantics:

- Binds constructors (make-square, make-piece) that take arguments and make values.
- Binds predicates (square?, piece?) that take one argument and return #t only for values built from the right constructor.
- Binds accessors (square-x, square-y, piece-squares) that take one argument, return the appropriate field, and call error for values not built from the right constructor.
- Binds mutators (set-square-x!, set-square-y!, set-piece-squares!).

Data in Scheme

Recall ML's approach to each-of, one-of, and self-referential types.

Pure Scheme's approach:

- There is One Big Datatype with built-in predicates.
- Use pairs (lists) for each-of types.
- Primitives implicitly raise errors for "wrong variant"
- Use helper functions like caddr and your own.

We'll discuss advantages/disadvantages next week.

define-struct is special

define-struct creates a new variant for the One Big Datatype.

Claim: define-struct is not a function.

Claim: define-struct is not a macro.

It could be a macro except for one key bit of its semantics: Values built from the constructor cause every other predicate (including all built-in ones) to return #f.

Advantage: abstraction

Disadvantage: Can't write "generic" code that has a case for every possible variant in every Scheme program.
Idiom for ML datatypes

Instead of a `datatype` with $n$ constructors, you just use `define-struct` $n$ times.

That “these $n$ go together” is just convention.

Instead of `case`, you have a `cond` with $n$ predicates and one “catch-all” error case.