

# *Essentials of Programming Languages* Language

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The *Essentials of Programming Languages* language in DrRacket provides a subset of functions and syntactic forms of `racket`—mostly the ones that correspond to `r5rs` forms. See below for a complete list. The language is intended for use with the textbook [EoPL].

```
#lang eopl      package: eopl
```

The following bindings are re-provided from `racket`:

|                               |                                 |                          |
|-------------------------------|---------------------------------|--------------------------|
| <code>make-parameter</code>   | <code>*</code>                  | <code>inexact?</code>    |
| <code>parameterize</code>     | <code>/</code>                  | <code>zero?</code>       |
| <code>print-struct</code>     | <code>abs</code>                | <code>positive?</code>   |
| <code>unquote</code>          | <code>gcd</code>                | <code>negative?</code>   |
| <code>unquote-splicing</code> | <code>lcm</code>                | <code>odd?</code>        |
| <code>quote</code>            | <code>exp</code>                | <code>even?</code>       |
| <code>quasiquote</code>       | <code>log</code>                | <code>quotient</code>    |
| <code>if</code>               | <code>sin</code>                | <code>remainder</code>   |
| <code>lambda</code>           | <code>cos</code>                | <code>modulo</code>      |
| <code>letrec</code>           | <code>tan</code>                | <code>floor</code>       |
| <code>define-syntax</code>    | <code>not</code>                | <code>ceiling</code>     |
| <code>delay</code>            | <code>eq?</code>                | <code>truncate</code>    |
| <code>let</code>              | <code>make-string</code>        | <code>round</code>       |
| <code>let*</code>             | <code>symbol-&gt;string</code>  | <code>numerator</code>   |
| <code>let-syntax</code>       | <code>string-&gt;symbol</code>  | <code>denominator</code> |
| <code>letrec-syntax</code>    | <code>make-rectangular</code>   | <code>asin</code>        |
| <code>and</code>              | <code>exact-&gt;inexact</code>  | <code>acos</code>        |
| <code>or</code>               | <code>inexact-&gt;exact</code>  | <code>atan</code>        |
| <code>cond</code>             | <code>number-&gt;string</code>  | <code>sqrt</code>        |
| <code>case</code>             | <code>string-&gt;number</code>  | <code>expt</code>        |
| <code>do</code>               | <code>rationalize</code>        | <code>make-polar</code>  |
| <code>begin</code>            | <code>output-port?</code>       | <code>real-part</code>   |
| <code>set!</code>             | <code>current-input-port</code> | <code>imag-part</code>   |

|                    |                       |             |
|--------------------|-----------------------|-------------|
| #!/module-begin    | current-output-port   | angle       |
| #!/app             | current-error-port    | magnitude   |
| #!/datum           | open-input-file       | input-port? |
| #!/top             | open-output-file      | read        |
| #!/top-interaction | close-input-port      | read-char   |
| #!/require         | close-output-port     | peek-char   |
| #!/provide         | with-output-to-file   | eof-object? |
| #!/expression      | flush-output          | char-ready? |
| syntax-rules       | string-length         | write       |
| ...                | string-ci<=?          | display     |
| cons               | string-ci>=?          | newline     |
| car                | string-append         | write-char  |
| cdr                | string-fill!          | load        |
| pair?              | string->list          | string?     |
| map                | list->string          | string      |
| for-each           | vector-length         | string-ref  |
| caar               | vector-fill!          | string-set! |
| cadr               | vector->list          | string=?    |
| cdar               | list->vector          | substring   |
| cddr               | char-alphabetic?      | string-copy |
| caaar              | char-numeric?         | string-ci=? |
| caadr              | char-whitespace?      | string<?    |
| cadar              | char-upper-case?      | string>?    |
| caddr              | char-lower-case?      | string<=?   |
| cdaar              | char->integer         | string>=?   |
| cdadr              | integer->char         | string-ci<? |
| cddar              | char-downcase         | string-ci>? |
| cdddr              | call-with-output-file | vector?     |
| caaaaar            | call-with-input-file  | make-vector |
| caaaadr            | with-input-from-file  | vector      |
| caadar             | apply                 | vector-ref  |
| caaddr             | symbol?               | vector-set! |
| cadaar             | null?                 | char?       |
| cadadr             | list?                 | char=?      |
| caddar             | list                  | char<?      |
| cadddr             | length                | char>?      |
| cdaaar             | append                | char<=?     |
| cdaadr             | reverse               | char>=?     |
| cdadar             | list-tail             | char-ci=?   |
| cdaddr             | list-ref              | char-ci<?   |
| cddaar             | memq                  | char-ci>?   |
| cddadr             | memv                  | char-ci<=?  |
| cdddar             | member                | char-ci>=?  |
| cdddr              | assq                  | char-upcase |
| =                  | assv                  | boolean?    |
| <                  | assoc                 | eqv?        |

|     |            |                  |
|-----|------------|------------------|
| >   | procedure? | equal?           |
| <=  | number?    | force            |
| >=  | complex?   | call-with-values |
| max | real?      | values           |
| min | rational?  | dynamic-wind     |
| +   | integer?   | eval             |
| -   | exact?     |                  |

```
(define-datatype id predicate-id
  (variant-id (field-id predicate-expr) ...)
  ...)
```

Defines the datatype *id* and a function *predicate-id* that returns *#t* for instances of the datatype, and *#f* for any other value.

Each *variant-id* is defined as a constructor function that creates an instance of the datatype; the constructor takes as many arguments as the variant's *field-ids*, and each argument is checked by applying the function produced by the variant's *predicate-expr*.

In DrScheme v209 and older, when constructor-based printing was used, variant instances were printed with a *make-* prefix before the variant name. Thus, for compatibility, in addition to *variant-id*, *make-variant-id* is also defined for each *variant-id* (to the same constructor as *variant-id*).

```
(cases datatype-id expr
  (variant-id (field-id ...) result-expr ...)
  ...)
(cases datatype-id expr
  (variant-id (field-id ...) result-expr ...)
  ...
  (else result-expr ...))
```

Branches on the datatype instance produced by *expr*, which must be an instance of the specified *datatype-id* that is defined with *define-datatype*.

```
sllgen:make-string-scanner
sllgen:make-string-parser
sllgen:make-stream-parser
sllgen:make-define-datatypes
sllgen:show-define-datatypes
sllgen:list-define-datatypes
```

Defined in the textbook's Appendix B [EoPL]. However, the DrRacket versions are syntactic forms, instead of procedures, and the arguments must be either quoted literal tables or identifiers that are defined (at the top level) to quoted literal tables.

```
| sllgen:make-rep-loop : procedure?
```

Defined in the *EoPL* textbook's Appendix B [EoPL] (and still a function).

```
| eopl:error : procedure?
```

As in the book.

```
| (eopl:printf form v ...) → void?  
  form : string?  
  v : any/c  
(eopl:pretty-print v [port]) → void?  
  v : any/c  
  port : output-port? = (current-output-port)
```

Same as `scheme/base`'s `printf` and `pretty-print`.

```
| ((list-of pred ...+) x) → boolean?  
  pred : (any/c . -> . any)  
  x : any/c  
(always? x) → boolean?  
  x : any/c  
(maybe pred) → boolean?  
  pred : (any/c . -> . boolean?)
```

As in the book [EoPL].

```
| empty : empty?
```

The empty list.

```
| (time expr)
```

Evaluates `expr`, and prints timing information before returning the result.

```
| (collect-garbage) → void?
```

Performs a garbage collection (useful for repeatable timings).

```
| (trace id ...)  
| (untrace id ...)
```

For debugging: `trace` redefines each `id` at the top level (bound to a procedure) so that it prints arguments on entry and results on exit. The `untrace` form reverses the action of `trace` for the given `ids`.

Tracing a function causes tail-calls in the original function to become non-tail calls.

```
| (provide provide-spec ...)
```

Useful only with a module that uses `eopl` as a language: exports identifiers from the module. See `provide` from `racket` for more information.

```
| eopl:error-stop : (-> any/c)
```

Defined only in the top-level namespace (i.e., not in a module); mutate this variable to install an exception-handling thunk. Typically, the handler thunk escapes through a continuation.

The `eopl` library sets this variable to `#f` in the current namespace when it executes.

```
| (install-eopl-exception-handler) → void?
```

Sets an exception handler to one that checks `eopl:error-stop`.

The `eopl` library calls this function when it executes.

## Bibliography

[EoPL] “*Essentials of Programming Languages*, Third Edition,” MIT Press, 2008.  
<http://www.eopl3.com/>