A program is a sequence of expressions and statements.

**Expression Forms**

**Literal Value**

- function-name : function by name from a definition or from our language
- #true #false : boolean
- list literal-value-etc : list
- \texttt{; inserted/pasted image}
- \texttt{\textasciitilde characters\ldots} : text

**Variable Reference**

- variable-name : variable by name from a definition or from our language

**Function Call**

- (function-name argument-expression etc) : except lists

**Definition of Variable or Function**

- (define variable-name value-expression)
- (define (function-name parameter-name etc) ; "header"
  body-expression)

**Assertion / Test**

- (true condition-expression)
- (false condition-expression)

**Reveal Algebraic Evaluation**

- (step expression) : description below assumes no error occurs

- \ldots (function-name literal-value etc) \ldots : except literal lists

- For a function from a definition: copy its body and substitute the arguments in place of the parameter names wherever the names occur in the body.

- For combine or map : match its rule's first pattern to determine \( f \ a \ b \ c \ldots \); then substitute those into its rule's second pattern (the "template").

- \texttt{(map \( f \) \texttt{(list} \( a \) \( b \) \( c \) \texttt{etc})
  \rightarrow \texttt{(list} \( f \ a \) \( f \ b \) \( f \ c \) \texttt{etc})

- \texttt{(combine} \( f \) \texttt{(list} \( a \) \( b \) \( c \) \texttt{etc})
  \rightarrow \texttt{(} \( f \ a \) \( f \ b \) \( f \ c \texttt{etc})

- For any other function from our language: substitute directly computed value.

- \texttt{variable-name} ...

  \texttt{+ literal-value}

  Substitute the value that was computed when the variable was defined.

**Equality Predicate**

- (true (same? \( + \ 1 \ 1 \)) \rightarrow (false (same? \( + \ 1 \ 3 \))

**Type Predicates**

- (true (function? \texttt{flip}) \rightarrow (true (list? (list "z" \( \wedge \))

**Function Predicates**

- (true (unary? \texttt{flip}) \rightarrow (false (binary? \texttt{flip})

**List Functions**

- (same! (list \( \texttt{filled-triangle 9} \) \( \texttt{zero?} \) \( + \ 2 \ 3 \) "hi")
  \rightarrow \texttt{(list} \( \#true \ 5 \) "hi")

- (same! (map \texttt{− \texttt{(list 3 1 7)} \texttt{(list} \( -3 \texttt{-} \texttt{-1} 7\))
  \rightarrow \texttt{(combine} \texttt{+ \texttt{(list 3 1 7)} \texttt{)}

- (true (empty? \texttt{list}))
  \rightarrow \texttt{(length \texttt{(list} \( \#true \ 5 \) "hi") \texttt{4) }}

- (true (first \texttt{(list} \( \#true \ 5 \) "hi") \texttt{)}
  \rightarrow \texttt{(rest} \texttt{(list} \( \#true \ 5 \) "hi") \texttt{)}

- (true (reverse \texttt{(list} \( \#true \ 5 \) "hi") \texttt{(list} "hi" \( \#true \texttt{)})

**Image Functions**

- (true (mirror \( \texttt{triangle} 9 \) \( \texttt{circle} 9 \) \( \texttt{square} 9 \)
  \rightarrow \texttt{(triangle} 9 \) \texttt{circle} 9 \texttt{square} 9 \)

- (true (width \( \texttt{oval} 9 \)) \texttt{(height} \( \texttt{oval} 9 \)
  \rightarrow \texttt{(width} \( \texttt{oval} 9 \)) \texttt{(height} \( \texttt{oval} 9 \))

**Numeric Functions**

- (true (zero? \texttt{0})) \rightarrow (false (positive? \texttt{-3})

**Text Functions**

- (true (positive? \texttt{12})) \rightarrow (false (positive? \texttt{0}))

- (true (text-length "one") \texttt{3}) \rightarrow (true (text->image "Hi") Hi!)

- (true (text-join "Hi" = \texttt{human!}) \texttt{"Hi human!"}) \rightarrow (true (text-list "Hi") \texttt{(list}\texttt{"Hi" \texttt{Hi} \texttt{Hi} \texttt{)})