Advanced Student Language

A <defn> is one of

(define <var> <exp>)
(define (<var> <var> ... <var>) <exp>)
(define-struct <var> (<var> ... <var>))

An <exp> is one of

<var>
<con>
<prim>
(<exp> <exp> ... <exp>)
(cond [<exp> <exp>] ... [<exp> <exp>])
(cond [<exp> <exp>] ... [else <exp>])
(and <exp> ... <exp>)
(or <exp> ... <exp>)
(local [<defn> ...] <exp>)
(lambda (<var> ... <var>) <exp>)
(set! <var> <exp>)
(begin <exp> ... <exp>)
Mini Racket

A `<defn>` is one of

```
(define <var> <exp>)
(define <var> (lambda (<var>) <exp>))
```

An `<assign>` is

```
(set! <var> <exp>)
```

An `<exp>` is one of

```
<var>
<num>
(+ <exp> <exp>)
(- <exp> <exp>)
(* <exp> <exp>)
(<var> <exp>)
```
Implementing Aquariums in Advanced Student
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Represent fish, as opposed to stuffing real fish into DrRacket
Implementing Mini Racket in Advanced Student
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Implementing Mini Racket in Advanced Student

Represent Mini Racket expressions, as opposed to typing *real* expressions into DrRacket
Representing Mini Racket Expressions

An \texttt{<exp>} is one of
\begin{itemize}
  \item \texttt{<var>}
  \item \texttt{<num>}
  \item \texttt{( + <exp> <exp> )}
  \item \texttt{( - <exp> <exp> )}
  \item \texttt{( * <exp> <exp> )}
  \item \texttt{( <var> <exp> )}
\end{itemize}

We can’t simply write

\[( + \ 1 \ 2 )\]

to represent a Mini Racket addition expression
Representing Mini Racket Expressions

An <exp> is one of

<var>
<num>
(+ <exp> <exp>)
(- <exp> <exp>)
(* <exp> <exp>)
(<var> <exp>)

We can write

(make-plus 1 2)
Representing Mini Racket Expressions

An `<exp>` is one of

- `<var>`
- `<num>`
- `( +  <exp>  <exp> )`
- `( -  <exp>  <exp> )`
- `( *  <exp>  <exp> )`
- `( <var>  <exp> )`

To represent the `<var> x`:

'x
Representing Mini Racket Expressions

An `<exp>` is one of

- `<var>`
- `<num>`
- `( +  `<exp>`  `<exp>` )`
- `( -  `<exp>`  `<exp>` )`
- `( *  `<exp>`  `<exp>` )`
- `( `<var>`  `<exp>` )`

To represent the `<num>` 5:

```
5
```
Representing Mini Racket Expressions

An `<exp>` is one of

- `<var>`
- `<num>`
- `(+ `<exp>` `<exp>`)`
- `(- `<exp>` `<exp>`)`
- `(* `<exp>` `<exp>`)`
- `(<var>` `<exp>`)`

To represent the application `(f (+ 1 2))`

`(make-app 'f (make-plus 1 2))`
Representing Mini Racket Expressions

Data definition:

; An expr is either
;   - sym
;   - num
;   - (make-plus expr expr)
;   - (make-minus expr expr)
;   - (make-times expr expr)
;   - (make-app sym expr)