Writing Down Large Lists

What does the list containing 0 to 10 look like?

\[
(\text{cons } 0 \ (\text{cons } 1 \ (\text{cons } 2 \ (\text{cons } 3 \ (\text{cons } 4 \ (\text{cons } 5 \ (\text{cons } 6 \ (\text{cons } 7 \ (\text{cons } 8 \ (\text{cons } 9 \ (\text{cons } 10 \ \text{empty})))))))))))
\]

Here’s a shorthand:

\[
(\text{list } 0 \ 1 \ 2 \ 3 \ 4 \ 5 \ 6 \ 7 \ 8 \ 9 \ 10)
\]

The list operator takes any number of arguments and constructs a list

Still, DrRacket prints 11 conses
Printing Large Lists

If you change DrRacket’s language level to

**Beginning Student with List Abbreviations**

then DrRacket prints using the shorthand

\[
\begin{align*}
> \ (\text{list} & \ 0 \ 1 \ 2 \ 3 \ 4 \ 5 \ 6 \ 7 \ 8 \ 9 \ 10) \\
\text{(list} & \ 0 \ 1 \ 2 \ 3 \ 4 \ 5 \ 6 \ 7 \ 8 \ 9 \ 10) \\
> \ (\text{cons} & \ 1 \ (\text{cons} \ 2 \ (\text{cons} \ 3 \ \text{empty})))) \\
\text{(list} & \ 1 \ 2 \ 3)
\end{align*}
\]
When to Change Language Levels

1. You’re not tempted to write examples like this:
   
   ```scheme
   (check-expect (feed-fish (cons 1 (cons 2 empty)))
                      2 3)
   ```

2. Your eyes hurt when you see
   
   ```scheme
   (cons 1 (cons 2))
   ```
   
   because it isn’t a **list-of-num**

3. When you see
   
   ```scheme
   (list 1 2 3)
   (cons 1 (cons 2 (cons 3 empty)))
   ```
   
   you recognize instantly that they’re the same

   Don’t switch until you understand how **list-of-...** functions match the shape of the data definition
Even Shorter

When you’re ready, there’s an even shorter shorthand!

'(1 2 3)

is the same as

(list 1 2 3)

The apostrophe above doesn’t make a symbol—it makes a list because it precedes a parenthesis

Furthermore, the apostrophe gets distributed to everything inside:

'(apple banana)

is the same as

(list 'apple 'banana)

For consistency, '1 is the same as 1
Even Shorter

Here’s a \texttt{list-of-lon} using the shorthand:

\[
'(\text{list} \ (1 \ 2 \ 3) \ (2 \ 4 \ 6 \ 8) \ (3 \ 9 \ 27))
\]

which is the same as

\[
\text{list} \ (\text{list} \ 1 \ 2 \ 3) \ (\text{list} \ 2 \ 4 \ 6 \ 8) \ (\text{list} \ 3 \ 9 \ 27)
\]

which is the same as

\[
\text{cons} \ (\text{cons} \ 1 \ (\text{cons} \ 2 \ (\text{cons} \ 3 \ \text{empty})))
\]
\[
\text{cons} \ (\text{cons} \ 2 \ (\text{cons} \ 4 \ (\text{cons} \ 6 \ (\text{cons} \ 8 \ \text{empty}))))
\]
\[
\text{cons} \ (\text{cons} \ 3 \ (\text{cons} \ 9 \ (\text{cons} \ 27 \ \text{empty})))
\]
\[
\text{empty})
\]