61A Lecture 24

Announcements

Scheme

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- "The greatest single programming language ever designed."

  -Alan Kay, co-inventor of Smalltalk and OOP (from the user interface video)

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Scheme Interpreters

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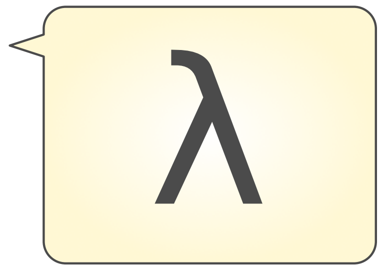

Two equivalent expressions:

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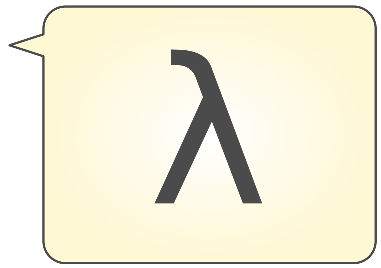

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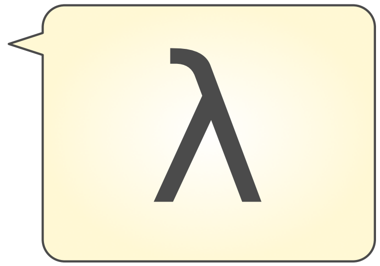

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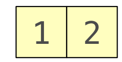

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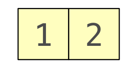

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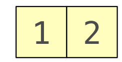

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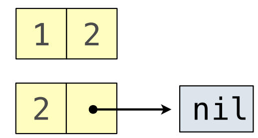

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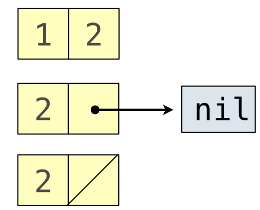

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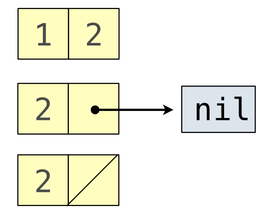

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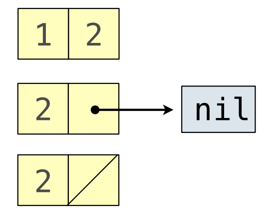

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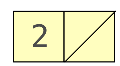

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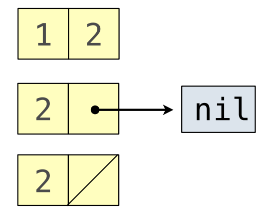


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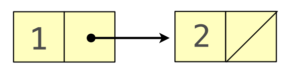

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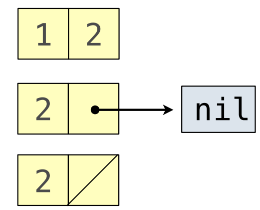


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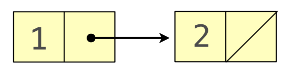

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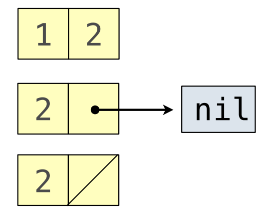


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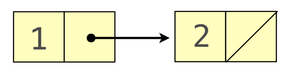

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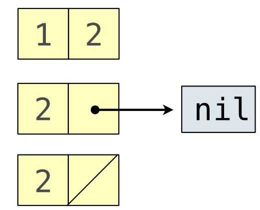


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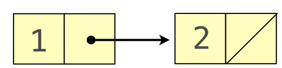

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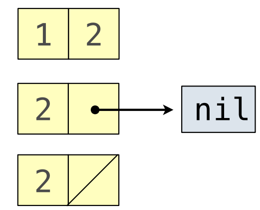


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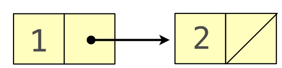

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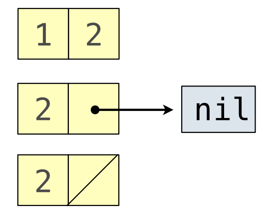

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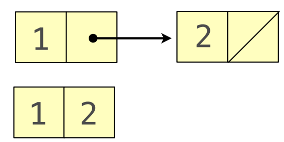

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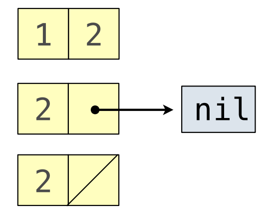


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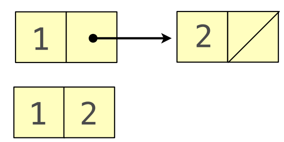

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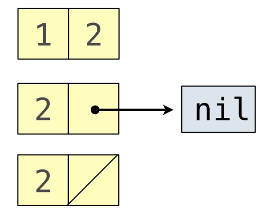


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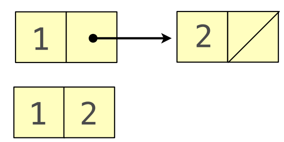

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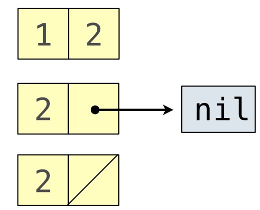


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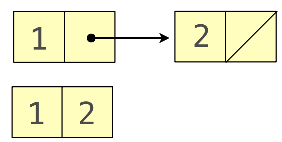

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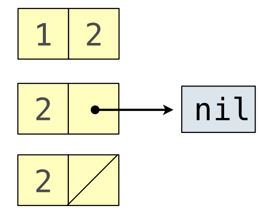


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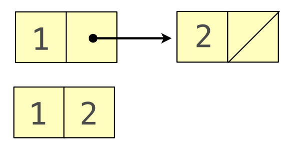

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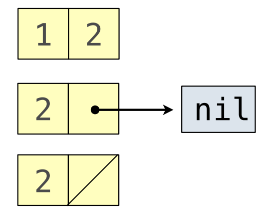


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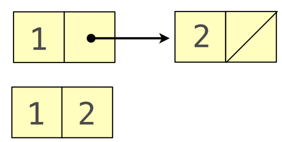

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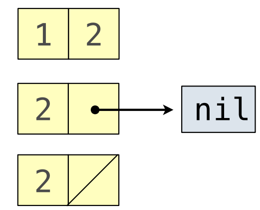


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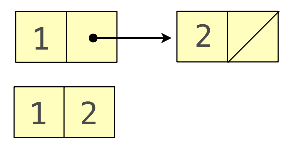

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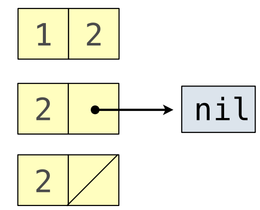


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2
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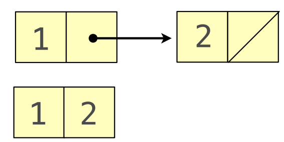

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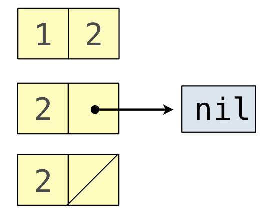


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> (cons 1 (cons 2 (cons 3 (cons 4 nil))))
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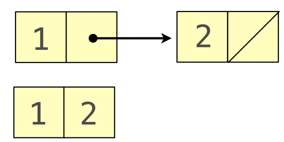

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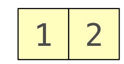

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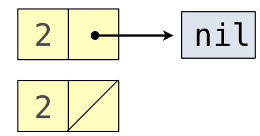


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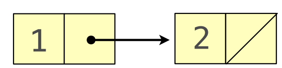

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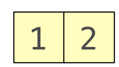

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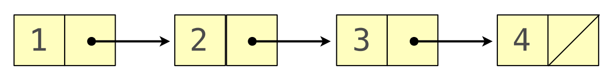

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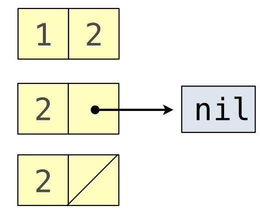


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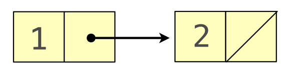

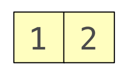

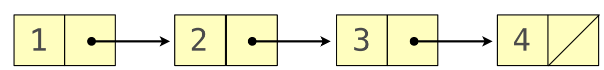

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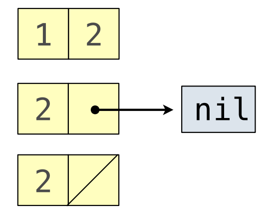


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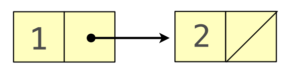

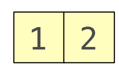

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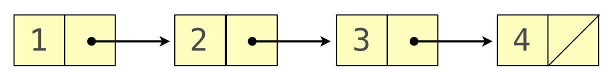

(Demo)

Symbolic Programming

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Symbols normally refer to values; how do we refer to symbols?

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```
> (define a 1)
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> (define b 2)
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```

Symbols are now values

Quotation can also be applied to combinations to form lists.

```
> (car '(a b c))
a
> (cdr '(a b c))
(b c)
```

Scheme Lists and Quotation

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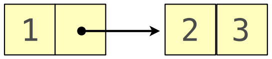

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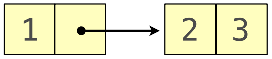

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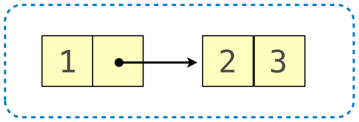

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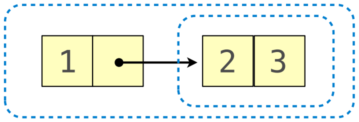

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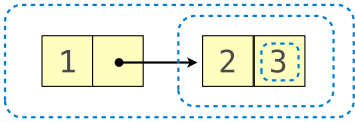

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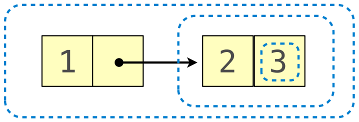
```



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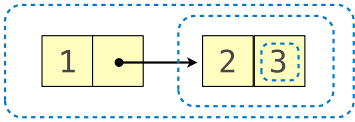

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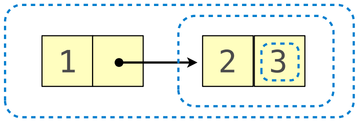

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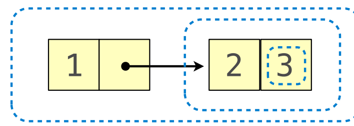

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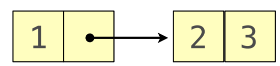

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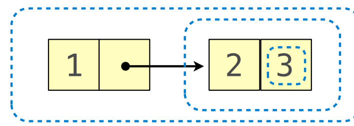

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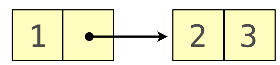

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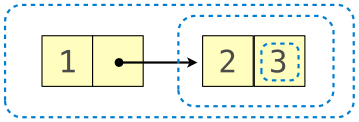

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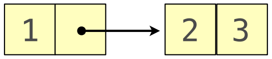

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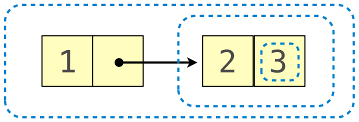

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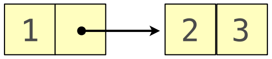

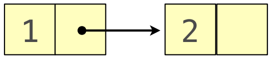

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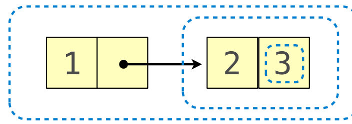

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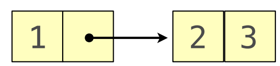

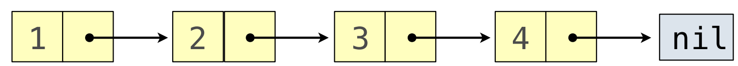

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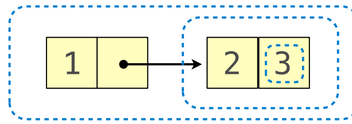

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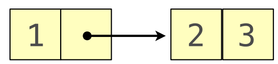

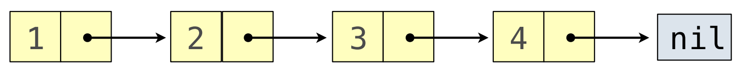

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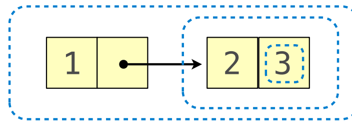

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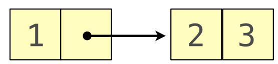

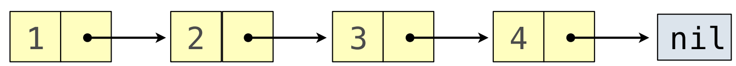

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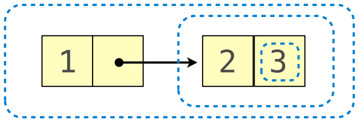

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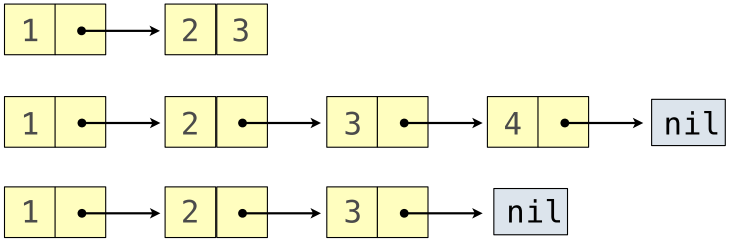

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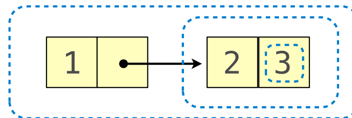

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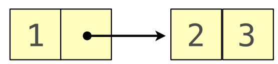

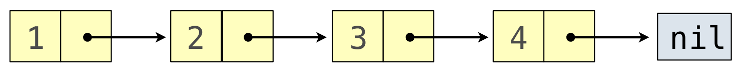

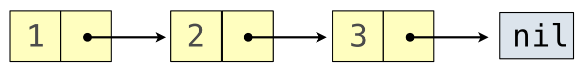

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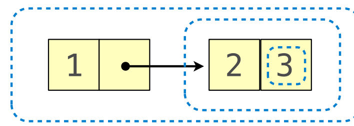

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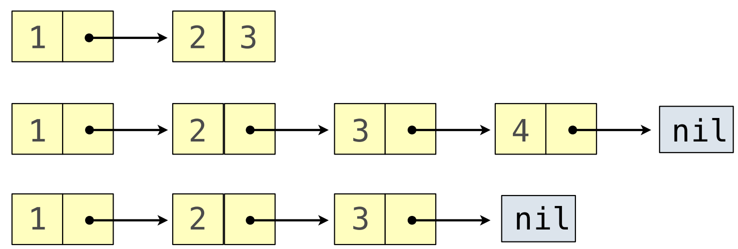

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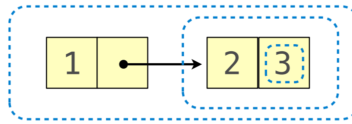

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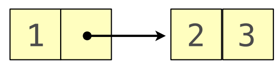

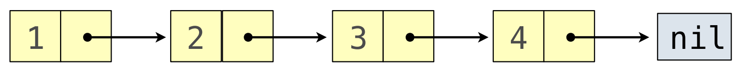

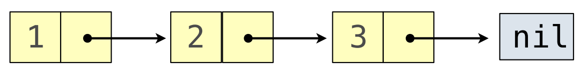

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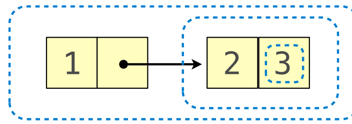

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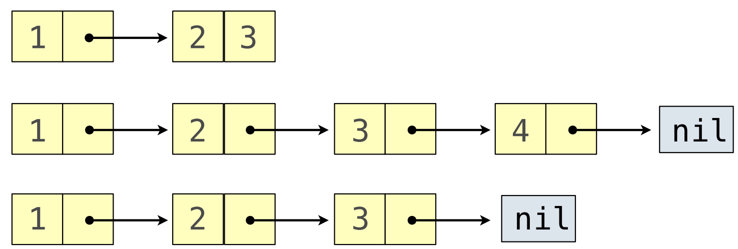

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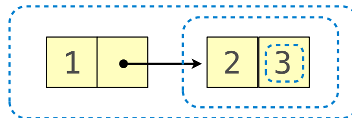

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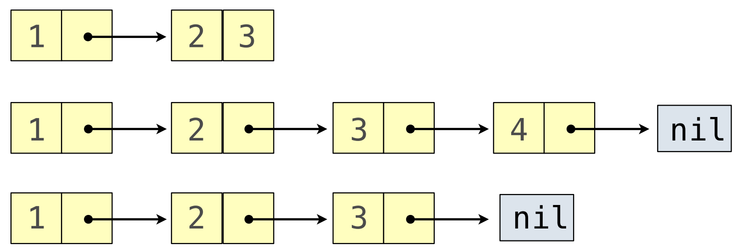

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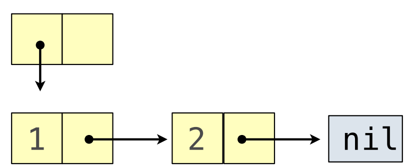

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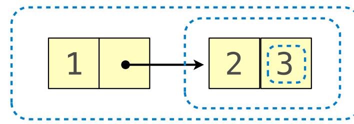

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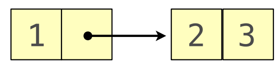

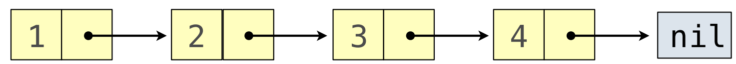

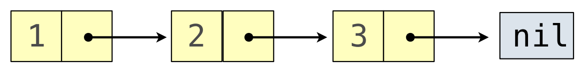

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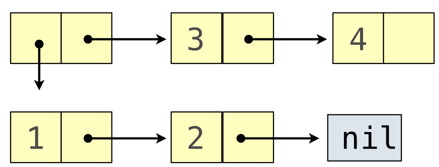

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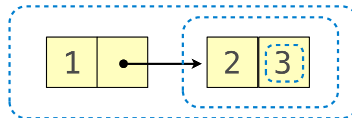

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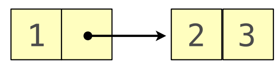

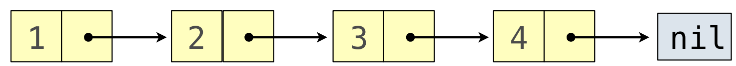

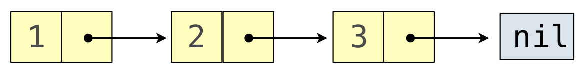

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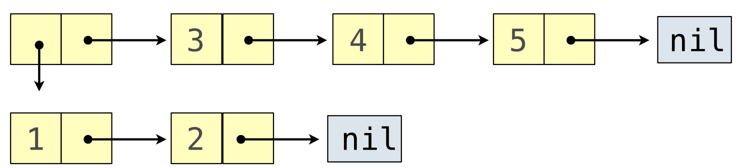

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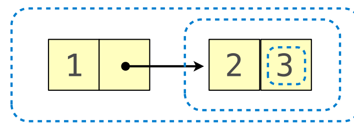
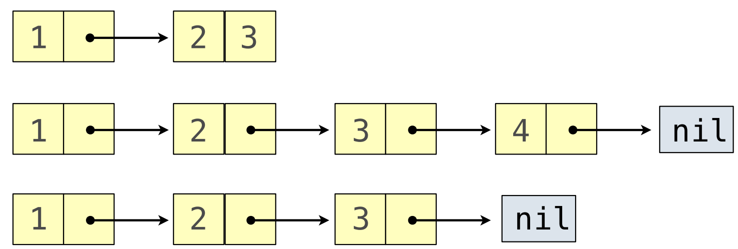
Dots can be used in a quoted list to specify the second element of the final pair.

```
> (cdr (cdr '(1 2 . 3)))
3
```



However, dots appear in the output only of ill-formed lists.

```
> '(1 2 . 3)
(1 2 . 3)
> '(1 2 . (3 4))
(1 2 3 4)
> '(1 2 3 . nil)
(1 2 3)
```



What is the printed result of evaluating this expression?

```
> (cdr '((1 2) . (3 4 . (5))))
(3 4 5)
```