61A Lecture 24

Announcements

Pairs Review

Pairs and Lists

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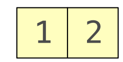

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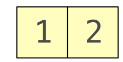

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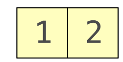

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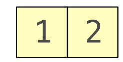

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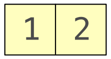

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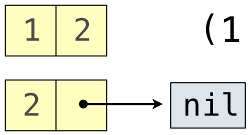

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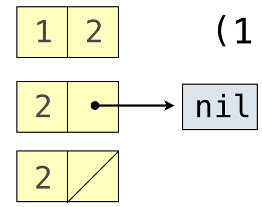
```



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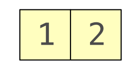

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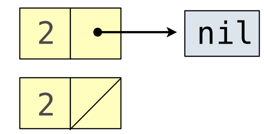

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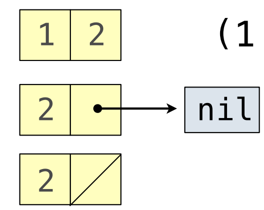

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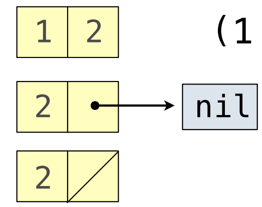

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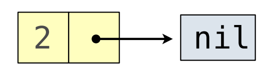

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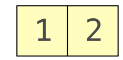

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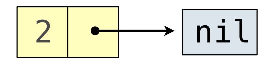
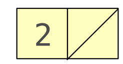
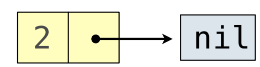




(cons 1 (cons 2 nil))



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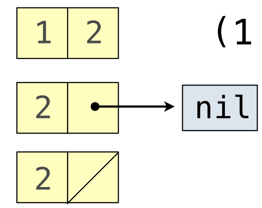


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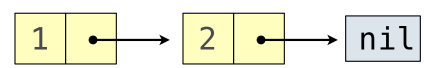

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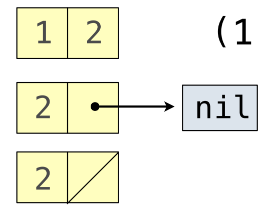

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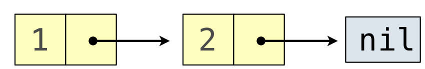

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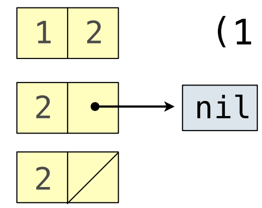

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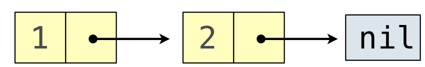

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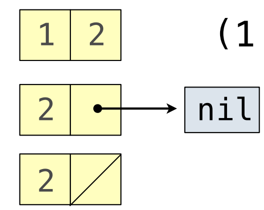

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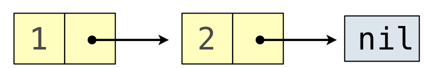

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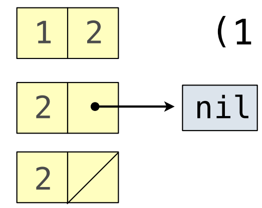

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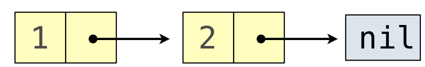

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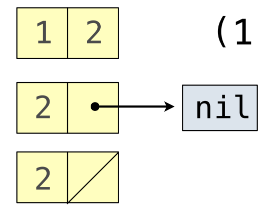

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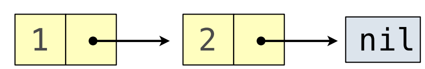

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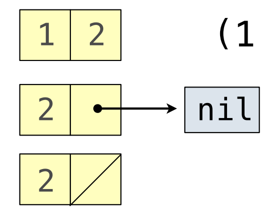

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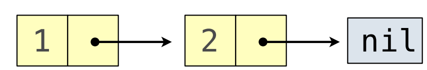

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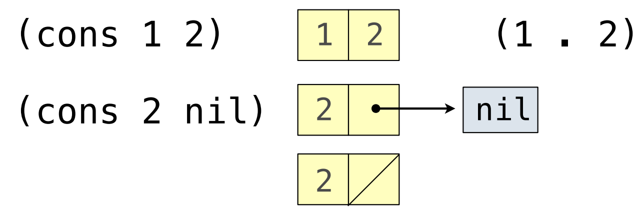

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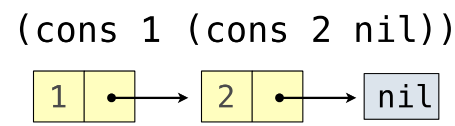
> x
(1 . 2)
> (car x)
1
```



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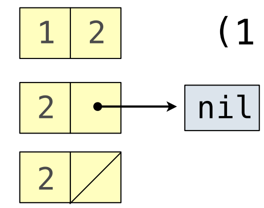

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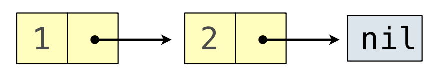

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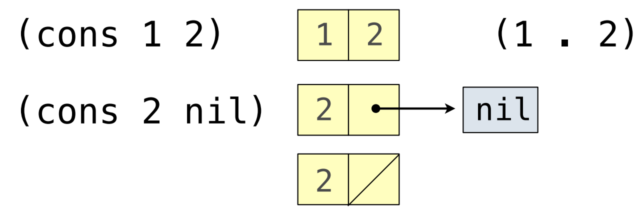
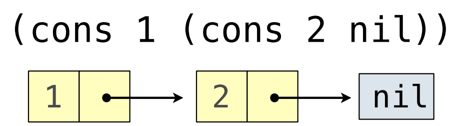



```
> (define x (cons 1 2))
> x
(1 . 2)
> (car x)
1
> (cdr x)
2
```



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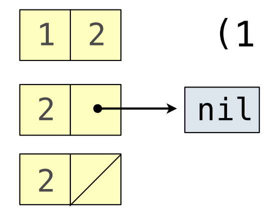

(1 . 2)

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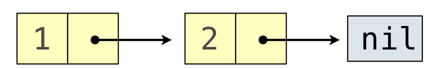

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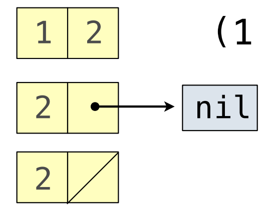

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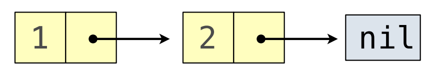

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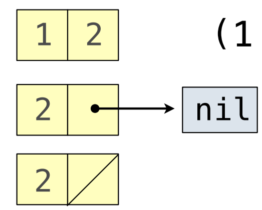

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Not a well-formed list!

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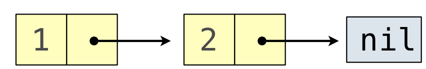

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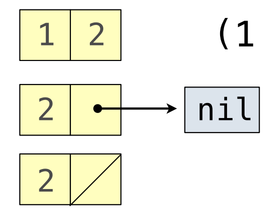
- **Important!** Scheme lists are written in parentheses separated by spaces
- A dotted list has some value for the second element of the last pair that is not a list

(cons 1 2)

(cons 2 nil)



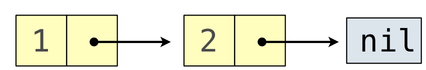
(1 . 2)

```
> (define x (cons 1 2))
> x
(1 . 2)
> (car x)
1
> (cdr x)
2
> (cons 1 (cons 2 (cons 3 (cons 4 nil))))
(1 2 3 4)
```

Not a well-formed list!

(Demo)

(cons 1 (cons 2 nil))



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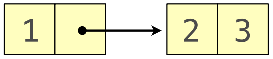

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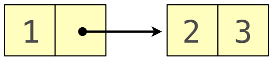

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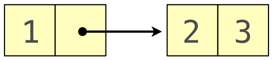

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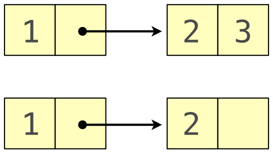

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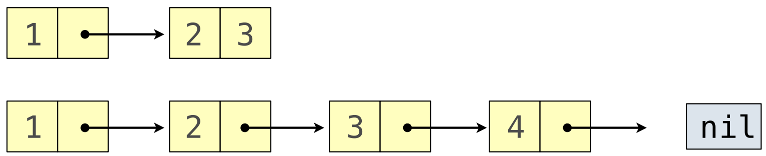

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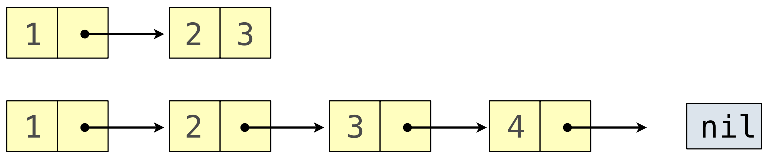

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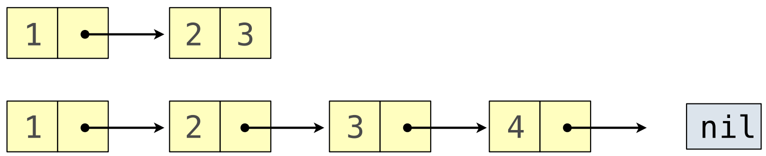

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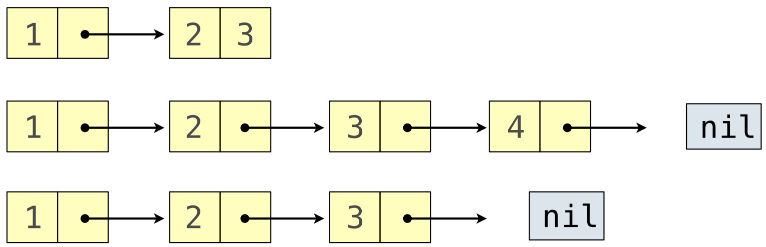

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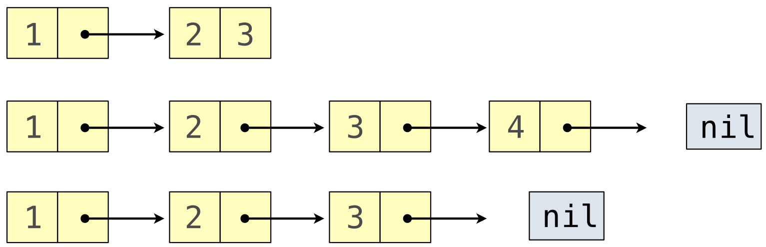

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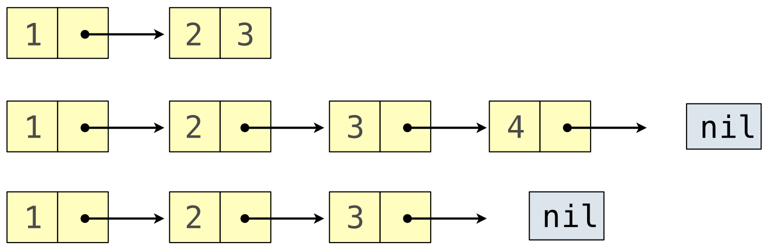

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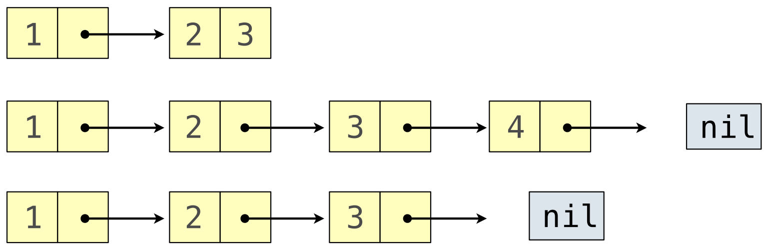

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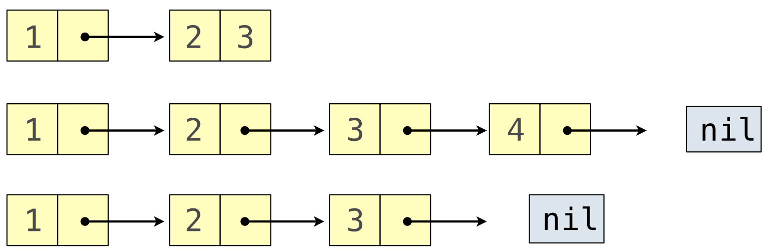

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Exceptions

Today's Topic: Handling Errors

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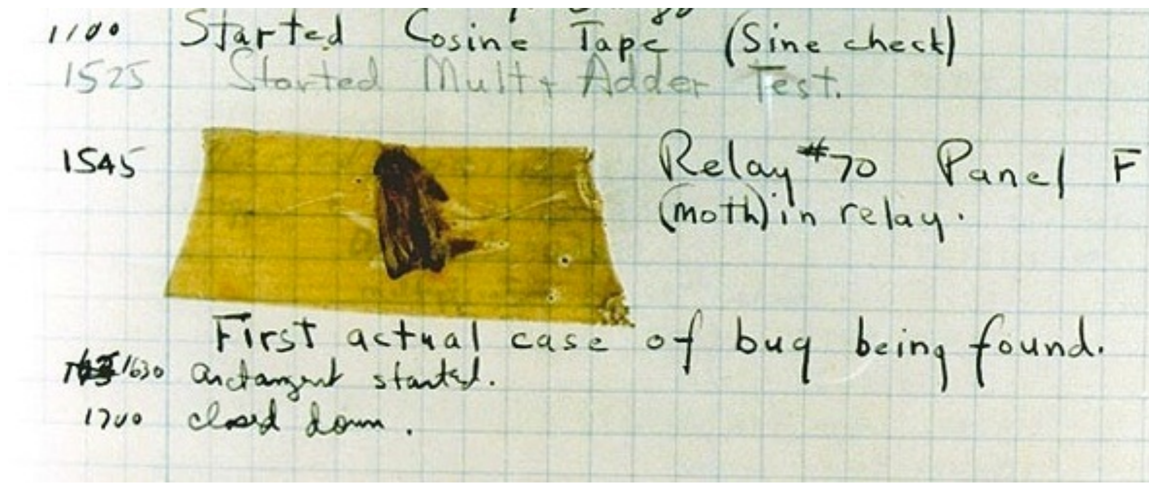

Grace Hopper's Notebook, 1947, Moth found in a Mark II Computer

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(Exception handling tends to be slow.)

Raising Exceptions

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(Demo)

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Example: Reduce

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    E.g., reduce(mul, [2, 4, 8], 1) is equivalent to mul(mul(mul(1, 2), 4), 8).

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f is ...
  a two-argument function
```

Reducing a Sequence to a Value

```
def reduce(f, s, initial):
    """Combine elements of s pairwise using f, starting with initial.

    E.g., reduce(mul, [2, 4, 8], 1) is equivalent to mul(mul(mul(1, 2), 4), 8).

    >>> reduce(mul, [2, 4, 8], 1)
    64
    """
```

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f is ...
  a two-argument function
s is ...
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```
reduce(pow, [1, 2, 3, 4], 2)
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pow

`reduce(pow, [1, 2, 3, 4], 2)`

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pow   2

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pow 2 1

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reduce(pow, [1, 2, 3, 4], 2)
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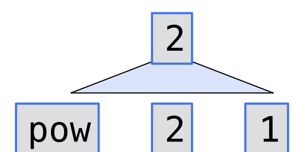


```
reduce(pow, [1, 2, 3, 4], 2)
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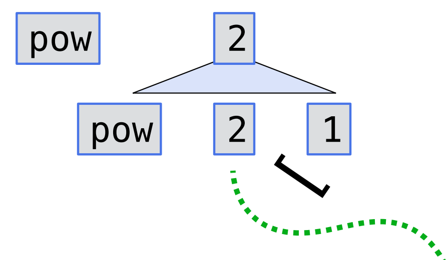


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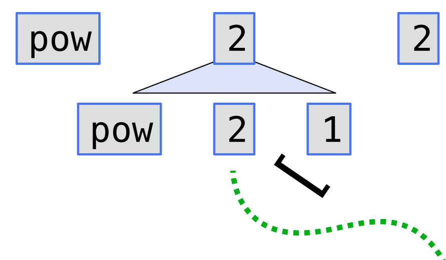


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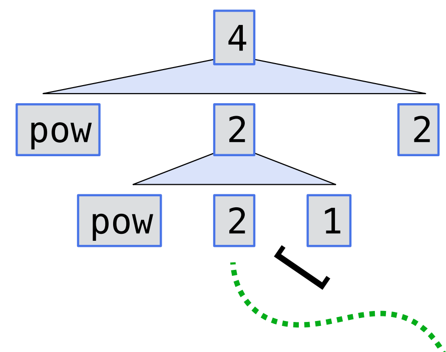


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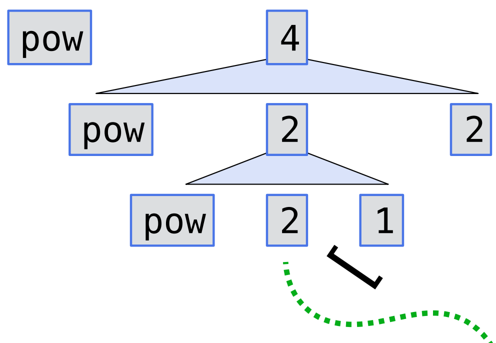


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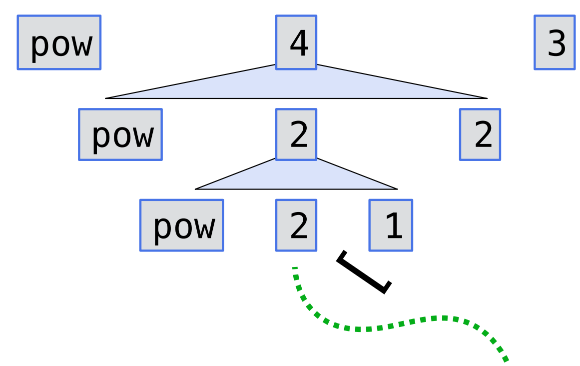


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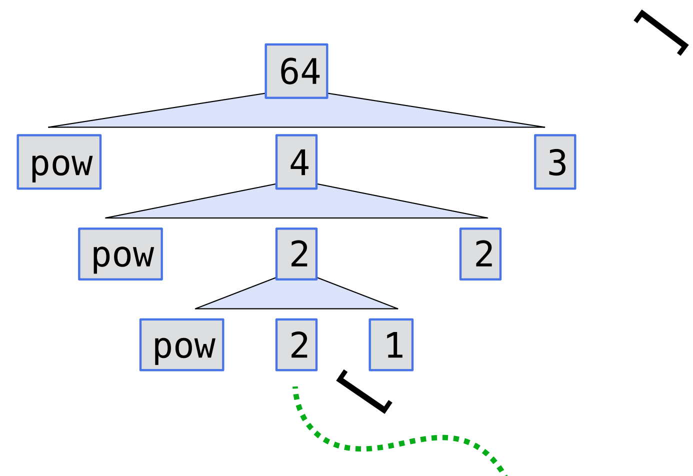

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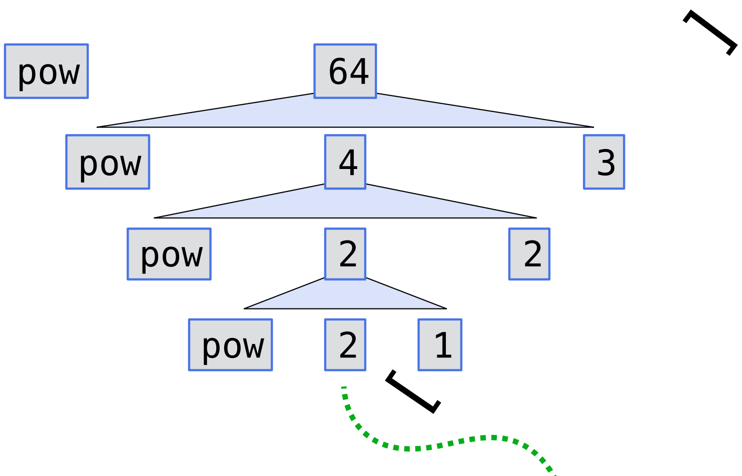


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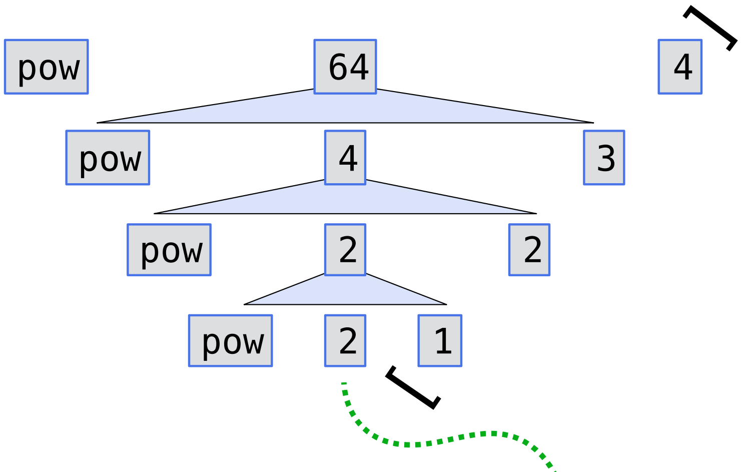


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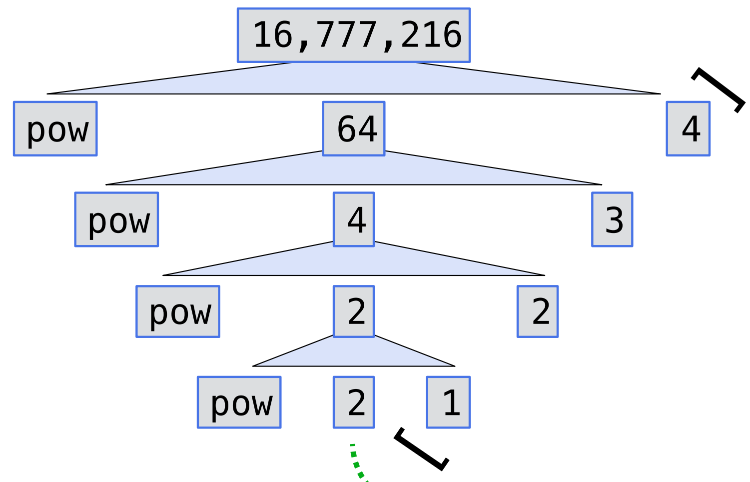


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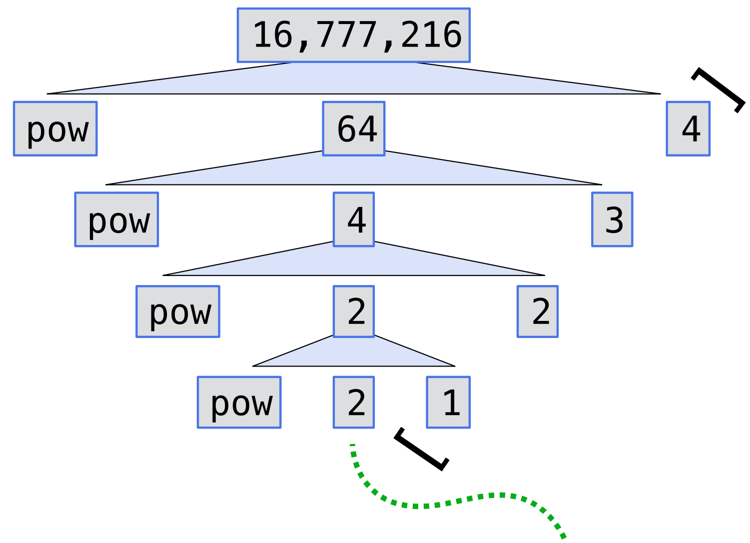


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(Demo)

Sierpinski's Triangle

(Demo)