The 6.001 Cookie Recipe

Recipe

<table>
<thead>
<tr>
<th>20 eggs, 2lb flour, 1lb sugar...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mix flour, sugar, ....</td>
</tr>
<tr>
<td>Add eggs, ...</td>
</tr>
<tr>
<td>Bake for 1 semester</td>
</tr>
</tbody>
</table>

Procedure

Naming

Process

Value

6.001 Cookie

Cooking

(Apply recipe to actual ingredients)

Cookies!
6.002 in a Nutshell

**Primitives**

**Means of Combination**

**Means of Abstraction**

KVL, KCL

Thevenin equivalent
A Recipe for Square Root

To find square root of x:
1. Guess a root g
2. Improve the guess by averaging g and x/g
3. Keep improving until guess is good enough

```
(define try
  (lambda (guess x)
    (if (good-enuf? guess x)
        guess
        (try (improve guess x) x))))

(define improve
  (lambda (guess x)
    (average guess (/ x guess)))))

(define average
  (lambda (a b)
    (/ (+ a b) 2)))

(define good-enuf?
  (lambda (guess x)
    (< (abs (- (square guess) x)) 0.001)))

(define sqrt
  (lambda (x) (try 1 x)))
```

Dependency Graph
Lexical Scoping

(define sqrt
  (lambda (x)
    (define good-enuf?
      (lambda (guess)
        (< (abs (- (square guess) x)) 0.001)))
    (define improve
      (lambda (guess)
        (average guess (/ x guess))))
    (define sqrt-iter
      (lambda (guess)
        (if (good-enuf? guess)
            guess
            (sqrt-iter (improve guess)))))))
(sqrt-iter 1.0))
Language Components

• Primitives

• Means of combination
  - procedure application
  - compound data structures

• Means of abstraction
  - naming
  - procedures
  - data abstraction
**Scheme Basics**

**RULES for SCHEME**
1. (Almost) Every expression has a value (which is "returned" when an expression is "evaluated").
2. Every value has a type.

**RULES FOR EVALUATION**
1. If self-evaluating, return value
2. If a name, return value associated with name in environment
3. If a special form, do something special
4. If a combination, then
   a. evaluate all of the subexpressions in combination (any order)
   b. apply the operator to the values of the operands (arguments)
      and return the result

**RULES FOR APPLICATION**
1. If procedure is primitive procedure, just do it
2. If procedure is a compound procedure, then
   evaluate the body of the procedure with the formal parameters replaced by the actual argument values.