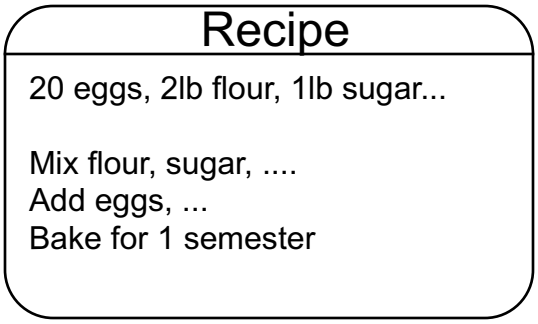
The 6.001 Cookie Recipe



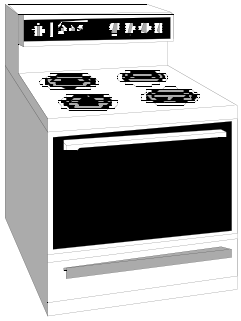
Procedure

6.001
Cookie

Naming

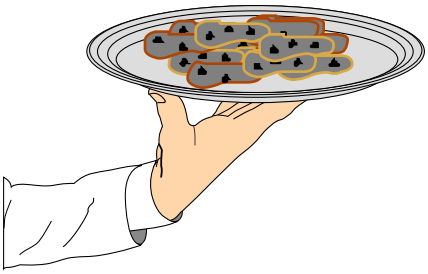
Cooking

(Apply recipe to actual ingredients)



Process

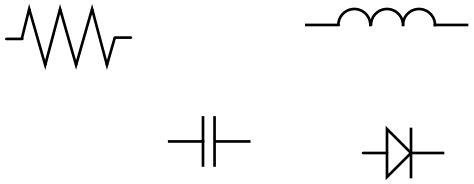
Cookies!



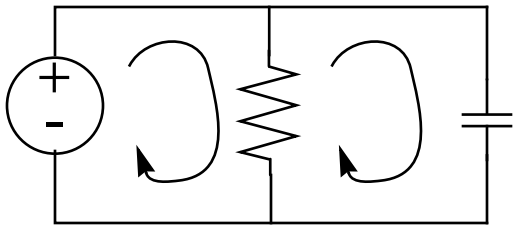
Value

6.002 in a Nutshell

Primitives

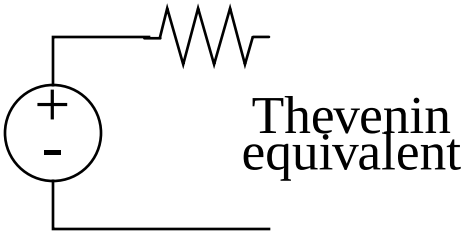


Means of Combination



KVL, KCL

Means of Abstraction



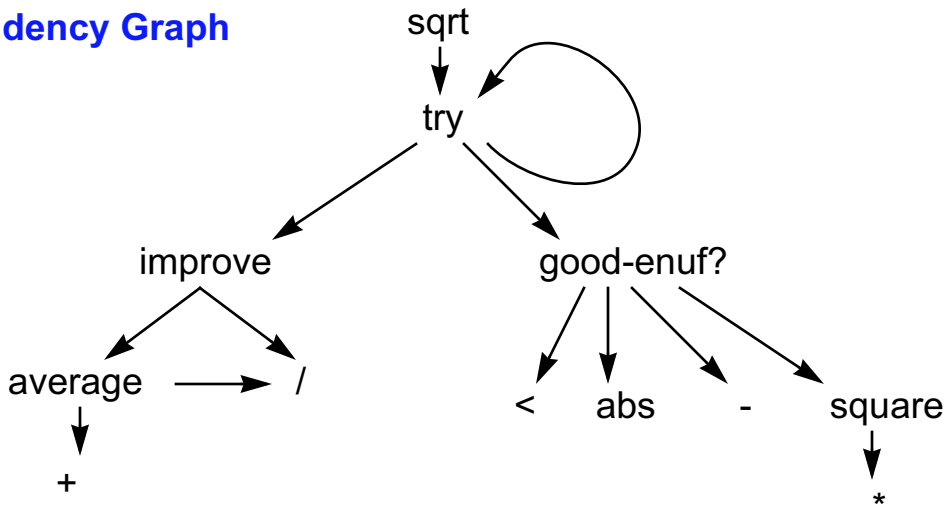
A Recipe for Square Root

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.