

Exam Review

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What Is Emphasized?

Design recipe (with minimal testing)

Programming with functions. Using map. Using foldr. Practice writing functions using map and foldr.

Example: cons-all

Functional abstraction. Inclusion of map, foldr in Scheme library. What is motivation for including map. How do we get foldr from the structural recursion template for lists?

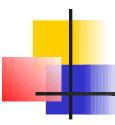


An Example from HW3

Write

```
cross: (list-of symbol) (list-of number) ->
  (list-of (pair-of symbol number))
```

Template instantiation:



What Is Mentioned

- Hand evaluation
- What expressions are values?
 - Atomic constants
 - Symbols
 - Numbers
 - Strings
 - true false empty
 - Constructors applied to values
 - Lambda-expressions



Glitch in HTDP

- In absence of lambda-expressions, defined function names must be classified as values.
- Example:

```
(define (double x) (+ x x))
(define freezing 32)
```

- What is double in (map double '(1 2 3))
- What is freezing in (map double (list freezing))

But no gotcha questions on this issue on exam.



Glitch in HTDP cont.

With lambda-expressions, this glitch can be eliminated by interpreting
 (define (f x1 ... xn) M)
 as an abbreviation for
 (define f (lambda (x1 ... xn) M)

- Over a decade ago, we taught lambda notation in define statements from the beginning of Comp 210 for this reason!
- On the exam, we will accept either convention regarding treating function names as values on the exam, but be consistent!



Glitch in HTDP cont.

In the absence of data structures containing functions, where does this issue arise? When evaluating function applications. Given the definition of double, what is the next step in evaluating (reducing)

```
(double 4)
```

- According to the book (prior to Ch. 38),
 (double 4) => (+ 4 4)
- But what if double is not a value?(double 4)

$$=> ((lambda (x) (+ x x)) 4)$$

$$=> (+ 4 4)$$



What Is Peripheral But Useful

Demand-driven evaluation by wrapping an expression in (lambda () ...) called a "thunk" or "suspension". This material only appears in the Extra Credit problem. This language construction is not supported in DrScheme until the Advanced Student level, which is a superset of the Intermediate Student with lambda level.

Example: simulating Scheme or



Prior to Taking Exam

- Prepare for exam
- Work on Optional HW 6?
- Reading:
 - Review all assigned reading with an emphasis on functions as data.