6.001 Jeopardy

scheme expressions	data	evaluation	environment model	computing theory	terminology	not on the final
100	100	100	100	100	100	100
200	200	200	200	200	200	200
300	300	300	300	300	300	300
400	400	400	400	400	400	400
500	500	500	500	500	500	500

Final Jeopardy

Scheme Expressions: 100

These are the two methods which may be called on any object in the object-oriented programming system from Project 4.

Scheme Expressions: 100

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*** What are IS-A and TYPE ?**

back to contents

Scheme Expressions: 200

This is printed in response to the second expression:

```
(define f
  (lambda (/)
    (lambda (a b)
      (b / a))))
((f 6) 2 -)
```

Scheme Expressions: 200

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*** What is 4?**

back to contents

Scheme Expressions: 300

The usual name for the built-in Scheme function computed by this procedure:

```
(define (what? p x)
  (fold-right
    (lambda (a b)
      (cons (p a) b))
    nil x))
```

Scheme Expressions: 300

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```
(define (what? p x)
  (fold-right
    (lambda (a b)
      (cons (p a) b))
    nil x))
```

*** What is map?**

back to contents

Scheme Expressions: 400

If `double` is a procedure that takes a procedure of one argument and returns a procedure that applies the original procedure twice, this is the value returned by:

```
(((double (double double)) inc) 5)
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Scheme Expressions: 400

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```

*** What is 21?**

back to contents

Scheme Expressions: 500

This function of one argument, an infinite stream, produces as output an infinite stream whose values are the pair-wise averages of the input stream. e.g.

```
(smooth <stream 1 3 6 2 ... >)
    ->  <stream 2 4.5 4 ... >
```

Scheme Expressions: 500

*** What is**

```
(define (smooth s)
   (cons-stream
      (/ (+ (stream-car s)
            (stream-car (stream-cdr s)))
         2)
      (smooth (stream-cdr s))))  ?
```

back to contents

Data: 100

The number of cons cells in the following data structure:

```
(list (cons (list 1 2) (list)) 3)
```

Data: 100

The number of cons cells in the following data structure:

```
(list (cons (list 1 2) (list)) 3)
```

* What is 5?

back to contents

Data: 200

A mathematical description for the stream:

```
(define foo
  (cons-stream 1
     (add-streams
         foo foo)))
```

Data: 200

A mathematical description for the stream:

```
(define foo
  (cons-stream 1
     (add-streams
         foo foo)))
```

* What are the powers of two?

back to contents

Data: 300

It is the printed value of the last expression:

```
(define x '(a b x))
(define y (list x x (list 'x x)))
(set-cdr! (cdr y) (list (quote x)))
y
```

Data: 300

It is the printed value of the last expression:

```
(define x '(a b x))
(define y (list x x (list 'x x)))
(set-cdr! (cdr y) (list (quote x)))
y
```

* What is ((a b x) (a b x) x) ?

back to contents

Daily Double!

Data: 400

This scheme code (which doesn't use quotation) would print out as:

```
((1 . 2) 3 . 4)
```

Data: 400

This scheme code (which doesn't use quotation) would print out as:

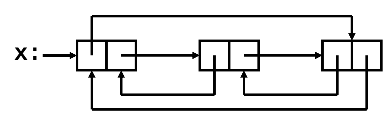
```
((1 . 2) 3 . 4)
```

* What is
  (cons (cons 1 2) (cons 3 4)) ?

back to contents

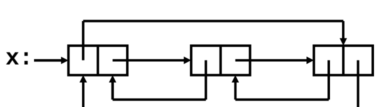
Data: 500

The scheme expression(s) needed to create this data structure:



Data: 500

The scheme expression(s) needed to create this data structure:



* What is

```
(define x (list 1 2 3))
(set-car! x (cddr x))
(set-car! (cdr x) x)
(set-car! (cddr x) (cdr x))
(set-cdr! (cddr x) x) ?
```

back to contents

Evaluation: 100

The value of the following expression:

```
(let ((a 3))
     (let ((a 4)
           (b a))
       (list a b)))
```

Evaluation: 100

The value of the following expression:

```
(let ((a 3))
     (let ((a 4)
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       (list a b)))
```

* What is (4 3) ?

back to contents

Evaluation: 200

The number of times m-eval is invoked when the following expression is entered into the evaluator:

```
((lambda (x) (* x 2)) 3)
```

Evaluation: 200

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((lambda (x) (* x 2)) 3)
```


* What is 7: combination, lambda, 3, (* x 2), *, x, 2 ?

back to contents

Evaluation: 300

Using this type of evaluation some constructs (such as *if*, *and*, & *or*) would not need to be special forms.

Evaluation: 300

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* What is normal order/lazy application?

back to contents

Evaluation: 400

The result of evaluating this expression:

```
(letrec
   ((fact (lambda (n)
             (* n (fact (decr n)))))
    (decr (lambda (x) (- x 1))))
 (fact 4))
```

Evaluation: 400

The result of evaluating this expression:

```
(letrec
   ((fact (lambda (n)
            (* n (fact (decr n)))))
    (decr (lambda (x) (- x 1))))
 (fact 4))
```

* What is an infinite loop?

back to contents

Evaluation: 500

The correct matching of the following three expressions:

A: In applicative order...
B: In normal order without memoization...
C: In normal order with memoization...

...the arguments passed in to a combination...

1: ... are evaluated at most once.
2: ... are evaluated exactly once.
3: ... may be evaluated many times or not at all.

Evaluation: 500

The correct matching of the following three expressions:

* What is A-2, B-3, C-1?

back to contents

Environment Model: 100

If you program without these, the order of evaluation is not important and the substitution model is sufficient. Repeated evaluation of sub-expressions may affect performance, but not the resulting value.

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* What is a side effect?

back to contents

Environment Model: 200

The opposite of syntax, changing this may affect how the environment model is drawn.

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The opposite of syntax, changing this may affect how the environment model is drawn.

* What are the semantics of a language?

back to contents

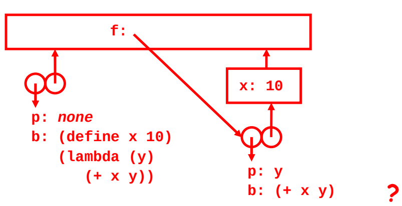
Environment Model: 300

The environment diagram resulting from the evaluation of this expression:

```
(define f ((lambda ()
             (define x 10)
             (lambda (y)
               (+ x y)))))
```

Environment Model: 300

What is:



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Environment Model: 400

Under dynamic scoping, the value of the last expression below:

```
(define op square)
(define (foo op) (op a))
(define a 4)
(let ((a 9)
      (op (lambda (x) x)))
  (foo sqrt))
```

Environment Model: 400

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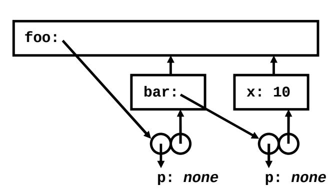
```
(define op square)
(define (foo op) (op a))
(define a 4)
(let ((a 9)
      (op (lambda (x) x)))
  (foo sqrt))
```

* What is 3?

back to contents

Environment Model: 500

This scheme expression results in the following environment diagram:



Environment Model: 500

* What is

```
(define foo
  (let ((bar (let ((x 10))
               (lambda () x))))
    (lambda () (bar)))) ?
```

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Computing Theory: 100

The classic example of a non-computable problem.

Computing Theory: 100

The classic example of a non-computable problem.

* What is the halting problem?

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Daily Double!

Computing Theory: 200

This data structure allows constant time expected query operations on large databases of information.

Computing Theory: 200

This data structure allows constant time expected query operations on large databases of information.

* What is a hash table?

back to contents

Computing Theory: 300

The order of growth in space and the order of growth in time of this function:

```
(define (sort lst)
  (define (insert elt lst)
    (if (or (null? lst)(< elt (car lst)))
        (cons elt lst)
        (cons (car lst) (insert elt (cdr lst)))))
  (define (sort-iter answer rest)
    (if (null? rest)
        answer
        (sort-iter (insert (car rest) answer)
                   (cdr rest))))
  (sort-iter '() lst))
```

Computing Theory: 300

The order of growth in space and the order of growth in time of this function:

*** What is O(n) space and $O(n^2)$ time?**

back to contents

Computing Theory: 400

The type of this Scheme expression:

```
(define (swap-args f)
  (lambda (x y) (f y x)))
```

Computing Theory: 400

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```
(define (swap-args f)
  (lambda (x y) (f y x)))
```

*** What is**
`swap-args: (a,b->c) -> (b,a->c)?`

back to contents

Computing Theory: 500

The order of growth in time and the order of growth in space of this function:

```
(define (h n)
  (if (= n 0)
      1
      (+ (h (quotient n 2))
         (h (quotient n 2)))))
```

Computing Theory: 500

The order of growth in time and the order of growth in space of this function:

```
(define (h n)
  (if (= n 0)
      1
      (+ (h (quotient n 2))
         (h (quotient n 2)))))
```

*** What is O(n) time and O(log n) space?**

back to contents

Terminology: 100

Any procedure that takes a procedure as an argument or returns a procedure as a value.

Terminology: 100

Any procedure that takes a procedure as an argument or returns a procedure as a value.

*** What is a higher-order procedure?**

back to contents

Terminology: 200

This type of recursion does not require use of the stack.

Terminology: 200

This type of recursion does not require use of the stack.

*** What is tail recursion?**

back to contents

Terminology: 300

Shorthand for "the contents of the address portion of the register".

Terminology: 300

Shorthand for "the contents of the address portion of the register".

*** What is car?**

back to contents

Terminology: 400

This object-oriented programming technique is often the most concise way to extend the interfaces of several types, although it can be challenging to correctly specify the behavior when names overlap.

Terminology: 400

This object-oriented programming technique is often the most concise way to extend the interfaces of several types, although it can be challenging to correctly specify the behavior when names overlap.

*** What is multiple inheritance?**

back to contents

Terminology: 500

The problem with the following fragment of code:

```
(define make-vector cons)
(define vector-x car)
(define vector-y cdr)
(define v1 (make-vector 2 3))
(define (magnitude v)
  (let ((cars (* (car vec) (car vec)))
        (cdrs (* (cdr vec) (cdr vec))))
    (sqrt (+ cars cdrs))))
```

Terminology: 500

The problem with the following fragment of code:

*** What is an abstraction violation?**

back to contents

Not on the 6.001 Final: 100

The inner door combo to get into the 6.001 lab.

Not on the 6.001 Final: 100

The inner door combo to get into the 6.001 lab.

*** What is 21634*?**

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Not on the 6.001 Final: 200

The hero of project 4 and his institution.

Not on the 6.001 Final: 200

The hero of project 4 and his institution.

* **Who is Hairy Cdr from the Wizard's Institute of Technocracy?**

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Not on the 6.001 Final: 300

These guys make origami and download music from Napster and claim it's research.

Not on the 6.001 Final: 300

These guys make origami and download music from Napster and claim it's research.

* **Who are Professors Erik Demaine and Frans Kaashoek?**

back to contents

Not on the 6.001 Final: 400

The architect for our crazy new computer science building.

Not on the 6.001 Final: 400

The architect for our crazy new computer science building.

* **Who is Frank O. Gehry?**

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Not on the 6.001 Final: 500

Not on the 6.001 Final: 500

- Who is Professor Eric Grimson, the 6.001 online lecturer?

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Final Jeopardy

Category:

Capturing local state

Final Jeopardy

This function takes in one argument and returns #t if the argument has the same value as on the previous call to the function and #f otherwise. The first call to the function returns #f.

Final Jeopardy

- **What is**

```
(define previous
   (let ((last #f)
         (initialized #f))
      (lambda (x)
        (if (and initialized (equal? x last))
            #t
            (begin (set! last x)
                   (set! initialized #t)
                    #f))))) ?
```

back to contents