

CS 3 Midterm #1 — February 23, 1994

Your name _____

login cs3-_____

Discussion section number _____

TA's name _____

This exam is worth 15 points, or about 14% of your total course grade. The exam contains five questions.

This booklet contains four numbered pages including the cover page. Put all answers on these pages, please; don't hand in stray pieces of paper. This is an open book exam.

When writing procedures, don't put in error checks. Assume that you will be given arguments of the correct type.

Our expectation is that many of you will not complete one or two of these questions. If you find one question especially difficult, leave it for later; start with the ones you find easier.

1	/3
2	/2
3	/2
4	/4
5	/4
total	/15

Question 1 (3 points):

What will Scheme print in response to the following expressions? If an expression produces an error message, you may just say “error”; you don’t have to provide the exact text of the message. If the value of an expression is a procedure, just say “procedure”; you don’t have to show the form in which Scheme prints procedures.

```
(item (- 5 3) (* 8 9))
```

```
(keep (lambda (x) (member? 'a x)) '(eight days a week))
```

```
(first (first (butfirst (butfirst '(fool on the hill)))))
```

```
(member? 'b (or 'red 'blue))
```

```
(every 'square '(4 5 6))
```

```
(lambda (rin go) (word rin go))
```

Question 2 (2 points):

Describe, as precisely as possible, the domain and range of the `every` procedure. (“As precisely as possible” doesn’t mean that you have to use a lot of ink. It means, for example, that “it takes a positive integer as argument” is better than “it takes a number as argument.”)

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Question 3 (2 points):

Consider the following procedure definition:

```
(define (strange a b)
  (if (> a 3) (+ a 1) (* 2 b)))
```

Two CS 3 students are arguing about what would happen if we tried to invoke the procedure with this expression:

```
(strange (+ 5 6) (/ 7 0))
```

Wacko says, “This will give an error message, because you can’t divide seven by zero.” Yakko says, “No it won’t, because the first argument `a` has the value 11, which is greater than 3, so the `strange` procedure never uses the value of the second argument `b`, so it doesn’t matter that computing `b` would be an error.”

Who’s right, Wacko or Yakko? Why?

Question 4 (4 points):

Write a procedure `long-word` that takes a sentence as its argument, returning the number of letters in the longest word of the sentence. For example:

```
> (long-word '(while my guitar gently weeps))
6
```

```
> (long-word '(strawberry fields forever))
10
```

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Question 5 (4 points):

Write a procedure `keeper` that takes a word as its argument. `Keeper` should return another procedure that takes a word as its argument. This second procedure returns those letters from `keeper`'s argument that appear in the new procedure's argument. For example:

```
> (define vowels (keeper 'aeiou))
```

```
> (vowels 'elephant)
```

```
AE
```

```
> (vowels 'mississippi)
```

```
I
```

```
> (vowels 'computer)
```

```
EOU
```

```
> ((keeper 'ijk) 'joint)
```

```
IJ
```

Notice that in the returned word the letters appear in the order in which they appear in the argument to `keeper`, not in the order in which they appear in the argument to the new procedure; also, each letter of `keeper`'s argument appears at most once in the returned word, even if it appears more than once in the argument to the new procedure.