

SEVENTH QUIZ

You have 15 minutes from the start of class to complete this quiz. Read the questions with care; work with deliberate speed. Don't give us more than we ask for. The usual instructions apply. Good luck!

Problem 1 (3 points)

What is the value of each of the following expressions? (Remember that `even?` returns true if its input is an even number, `second` returns the second item on a list, and `add1` adds 1 to its argument.)

```
(define LO `(("Barack" 1961) ("Michelle" 1964) ("Malia" 1998) ("Sasha" 2001)))
```

(a) `(filter even? (list 1 3 2 4 7 8))`

(b) `(map add1 (list 4 6 8 10 12))`

(c) `(map (lambda (N) (/ N 10)) (list 9000 700 50))`

(d) `(foldr (lambda (P L) (cons (second P) L))
empty
LO)`

Problem 2 (13 points)

Suppose we have a list called `BL` of books defined as follows:

```
(define-struct book (title author genre price sold instock))
```

where `title` and `author` are strings, `genre` is a string (e.g., "cookbook" or "humor") representing the category of the book, `price` is a number representing the price of one copy, `sold` is the number of copies sold, and `instock` is the number of copies in stock.

(a) (4 points) For each of the following expressions, describe in one clear and precise English phrase what value it returns. Don't just say, "It does a foldr of plus and zero and ..."; give a description of what the expression *means*, something you could put in a software catalog so that a prospective buyer could find what he or she wanted. Use real-world terms, not program syntax terms: Say something like, "a list of the authors whose books earned over \$1,000,000," not "books whose `book-sold` field is greater than 1000."

(a.1) `(map book-title (filter (lambda (B) (= 0 (book-instock B))) BL))`

(a.2) `(first (quicksort BL (lambda (B1 B2) (> (book-price B1) (book-price B2)))))`

(b) (4 points) Using `map`, `filter`, and/or `foldr`, define the following function without using explicit recursion.

```
;; books-by-author: list-of-book string -> list-of-book
;; Return a list of books in the input list written by the specified author.
```

(c) (5 points) Using `map`, `filter`, and/or `foldr`, define the following function without using explicit recursion.

```
;; genre-average-price: list-of-books string -> number
;; Return the average price of books of the specified genre
```

Problem 3 (4 points)

We have distributed a Deus X reference sheet; you don't have to turn it back in, but we'll recycle it if you do. We'll have a better chance of assigning you partial credit if you show your work (e.g., draw a picture of the register(s) and/or memory locations).

Suppose that location 333 of the Deus X machine's memory holds the word `LION`, that location 444 holds the word `BEAR`, and that location 555 holds the word `SEAL`. What does the Deus X machine print after executing these instructions?

0.	10	333	(lda 333)
1.	50	555	(cmpa 555)
2.	62	5	(jg 5)
3.	6	555	(out 555)
4.	7	6	(jmp 6)
5.	6	444	(out 444)
6.	...		