

# CPTS 355 Midterm 1 Sample Exam

## Fall 2011

NAME \_\_\_\_\_

**Directions:** Answer all of the questions. You may have **one 8 1/2 X 11 sheet of notes** during the exam.. You may **not** use a computer, PDA, calculator or phone during the test. Remove all caps and visors.

There are 8 major problems on 5 pages totaling 96 points. **Make sure that you have a complete exam before beginning.**

Write your name on your exam **now**.

1) **[15 pts] Directions:** Short answer – each answer is an expression or a couple of sentences at most. (3 points for each subproblem)

a) (3) What is an equivalent infix expression for this postfix (RPN) expression?

5 1 + 2 2 \* + 3 \*

b) (3) In Scheme what is `(list 1 '(2 3))`

c) (3) In Scheme what is `(cons (list 1 2 3) '(car (1 2 3)))`?

d) (3) In Scheme what is `(append '(1 2 3) (cdr (list 4 5 6)))`?

e) (3) True or false: Every partial function is a total function.

True or false: Every computable function is a total function.

True or false: Every total function is a computable function.

2a) **[10 points]** Describe what occurs when each `def`, `dict`, `begin`, `end`, and `mul` operation is executed in the following PostScript program. You must list the operations **in the order they are executed**. For each one say which line number it occurs on and what operands it uses. The first one is done for you as an example. (Of course, the line numbers are not part of the program. There are more blank lines than required answers.)

```

Line
0    /y 3 def
1    /f { dict /z y def
2        begin
3        /z 4 def
4        /y 5 def
5        z y mul
6        } def
7        y f y mul

```

Line	Operation	Operands
0	def	/y 3
—	—	—
—	—	—
—	—	—
—	—	—
—	—	—
—	—	—
—	—	—
—	—	—

2b) **[5 pts]** What values are on the operand stack when the program finishes execution? Circle the value that is at the top of the operand stack.

2c) **[5 pts]** What is on the dictionary stack when the program finishes execution? Circle the dictionary at the top of the stack.

3) **[10 pts]** Define a recursive Scheme function, `pairprods`, that will take two lists as input and produce as output a list whose elements are the products of the corresponding elements of the two lists. For example, `(pairprods '(1 14 7 22) '(4 5 3 6))` should produce `(4 70 21 132)` as its answer. If the two argument lists are of different lengths the length of the answer is the length of the shorter list.

```
(define (pairprods L) (
```

```
))
```

4) **[10 pts]** Define a *tail-recursive* Scheme function, `(prod L v)`, that takes a list numbers, `L`, and a value `v`, and returns `v` if the list is empty and the product of all the numbers in `L` and `v` if `L` is not empty. For example `(prod '() 3)` is 3 and `(prod '(4 3) 2)` is 24.

```
(define (prod L v) (
```

```
))
```

5) **[10 pts]** Using the built-in `map` function, define a function `squares` that takes a list of numbers and returns a list of their squares. `(squares '(1 2 3))` is `(1 4 9)`.

```
(define (squares L) (
```

```
))
```

6) **[15 pts]** Below is a sequence of four Python assignments. Following those assignments are a number of questions. Answer each question assuming that the 4 assignments have been performed immediately prior to executing the code in that question. The answer to some of the questions may be “an error occurs” in which case describe why it is an error.

```
L = [1, 2, 3]
S = (1, 2, 3)
C = "1 2 3"
D = {3:4, 2:5, 1:6}
```

6a) What is `L[-1]` ?

6b) What is `C[1]` (make sure you give an answer of the right type!)?

6c) What is `S[1:-1]` ?

6d) What is the value of `C` after executing `C[1] = "3"` ?

6e) What is the value of `D[3]`?

7) **[10 pts]** Define a Python function `wordCount` that is given a list of words (strings) as an argument and returns a dictionary mapping each word to the number of times it appears in the list.

```
def wordCount(L):
```

8) **[6 pts]** After the following Python code:

```
L = [1, 2, 3, 4]
M = L + [5, 6]
L[2:3] = [5, 6]
L[2] = [7, 8]
```

a) What is the value of `M`?

b) What is the value of `L`?