Solutions to Sample Quiz 1

Problem 1
11
error (arguments passed in wrong order)
36

Problem 2
Applicative order: Evaluate all subexpressions first, then apply the first to the rest. (Scheme uses this.)

Normal order: No arguments are evaluated until they are needed. Fully expand, then reduce.

In Scheme (applicative order), the following two items could be printed:

one two plus
two one plus

In normal-order Scheme, the following two items could be printed:

plus one two
plus two one

Problem 3
#f  #f  #t
#f  #f  #t
#f  #f  #t
#t  #t  #t

Problem 4
(caddr first-list)
(caadr second-list)

Problem 5
(define (merge list1 list2)
  (cond ((null? list1) list2)
        ((null? list2) list1)
        ((= (car list1) (car list2))
         (cons (car list1)
               (merge (cdr list1) (cdr list2))))
        ((< (car list1) (car list2))
         (cons (car list1)
               (merge (cdr list1) list2)))
        (else (cons (car list2) (merge list1 (cdr list2))))))

Time: Θ(n)
Space: Θ(n)
n is dependent upon the size of the longer list
Recursive process
**Problem 6**

\[
(\text{define (apply-twice f)} \\
(\lambda (x) (f (f x))))
\]

**Problem 7**

\[
(\text{tree-manip test-tree} \\
0 \\
(\lambda (x) x) \\
\text{car} \\
\text{cdr} \\
+) \\

(\text{tree-manip test-tree} \\
nil \\
(\lambda (x) (\text{list } x)) \\
\text{car} \\
\text{cdr} \\
\text{append})
\]

**Problem 8**

\[
(\text{define (item-name item)} \\
(\text{caar item})) \\

(\text{define (item-value item)} \\
(\text{cdar item})) \\

(\text{define (item-condition item)} \\
(\text{cadr item})) \\

(\text{define first-item car}) \\

(\text{define rest-items cdr}) \\

(\text{define (total-value item-list)} \\
(\text{if (null? item-list)} \\
\text{0} \\
(+ (\text{item-value (first-item item-list)}) \\
(\text{total-value (rest-items item-list)}))))
\]

Time: $\Theta(n)$
Space: $\Theta(n)$
$n$ is dependent upon the length of the list of items
Recursive process

**Problem 9**

\[
(\text{define (car z)} \\
(z \ '\text{car})) \\

(\text{define (cdr z)} \\
(z \ '\text{cdr}))
\]