CSE 3302   Name _____
Test 1
Summer 2014
Multiple Choice. Write your answer to the LEFT of each problem. 5 points each
1. Preprocessor macros are associated with:
        A. C   B. Java   C. JavaScript   D. Pascal
2. `(define x (lambda (y z) (+ y z)))` is an example of:
    A. Applying an anonymous function
    B. Defining a function named `x` in Scheme
    C. Defining a function name `lambda` in JavaScript
    D. Renaming the library function `+` as `x`
3. Which language does not evaluate boolean expressions with "short circuiting"?
        A. Scheme   B. JavaScript   C. Pascal   D. C
4. Having a pointer to a non-existent element one past the end of a table is part of which language's
    dynamic semantics?
        A. Java   B. JavaScript   C. Pascal   D. C
5. Which of the following is not a JavaScript feature?
        A. first-class functions   B. strong type checking
        C. event-driven execution   D. integration with HTML
6. A call to this Scheme function will return:
    ```
    (define (func x)
      (cond
        ((pair? x) (cons (car x) (cdr x)))
        (else x)))
    ```
        A. a function named `x`   B. the value of `x`
        C. the list `x` appended to itself   D. `#t` if and only if `x` is a `pair`
7. Attribute grammars were invented by:
        A. Dijkstra   B. Knuth   C. McCarthy   D. Slonneger
8. The Scheme `cond` is like what idiom in an imperative language?
    A. a chain of ifs   B. a `for` loop   C. `switch`   D. a `while` loop
9. Which of the following is not true regarding attribute grammars?
    A. Synthesized attributes carry information up the parse tree
    B. Inherited attributes carry information down the parse tree
    C. They cannot represent context-sensitive information
    D. They can capture the information that usually goes in symbol tables
10. If a value is second class, then it can be
    A. Passed as an argument   B. Returned from a function
    C. Assigned to a variable   D. All of the above
Long Answer.
1. Give Scheme code for a function `(help i j)` to construct a list with all integer values between `i`
    and `j`, inclusive. If `i` is larger than `j`, then the list will be empty. Error checking is not expected (15
    points)
    ```
    > (help 0 5)
    '(0 1 2 3 4 5)
    > (help 11 14)
    '(11 12 13 14)
    > (help 100 100)
    '(100)
    > (help 200 100)
    '()
    ```

2. Give a Pascal procedure to place all integer values between `i` and `j`, inclusive, into a global array `arr` begining at subscript 0, so `i` will be stored at `arr[0]`. Error checking is not expected. 10 points

```
arr: array[0..1000] of integer;
procedure help(i,j: integer);
```

3. Give a JavaScript function to place all integer values between `i` and `j`, inclusive, into a global array `arr` begining at subscript 0, so `i` will be stored at `arr[0]`. Error checking is not expected. 10 points

```
var arr=[];
function help(i,j) {
```

4. Draw the Scheme node structure for: (5 points)

```
'(a (b (c d) (1 2 3) 4) (5 (6 (7 (8)))))
```

5. Compute the result of: (5 points)

```
(car (cdr (cdr '(a (b (c d) (1 2 3) 4) (5 (6 (7 (8))))))))
```

6. Compute the result of: (5 points)

```
(cdr (car (cdr '(a (b (c d) (1 2 3) 4) (5 (6 (7 (8))))))))
```

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Test 2

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Multiple Choice. Write your answer to the LEFT of each problem. 5 points each

1. In JavaScript, the result of `[0,[1,2],"123",3].length` will be:

    A. `undefined`   B. `3`   C. `4`   D. `5`

2. Which technique is applicable to garbage collection?

   A. binary search B. depth-first search C. dynamic programming   D. shallow copying

3. The notion of l-value and r-value is associated with which PL construct?

    A. assignment   B. iteration   C. recursion   D. selection

4. Many development organizations require the use of `{` and `}` when coding control structures in a C derivative language. This avoids which issue?

    A. dangling else   B. subscripts out of range
    C. unmatched delimiters   D. exceptions

5. Which type cannot be involved when ML attempts an equality comparison?

    A. list   B. tuple   C. int   D. real

6. Suppose a variable is referenced in a subroutine closure. Where is it stored?

    A. static   B. heap   C. stack   D. registers

7. Which language does not allow nesting functions?

    A. C   B. Scheme   C. JavaScript   D. Pascal

8. For JavaScript, which expression always gives the same value as `a && b`?

    A. `!(!a || !b)` B. `a ? b : a`   C. `a ? a : b`   D. `b && a`

9. Generational garbage collection is a generalization of:

    A. mark-and-sweep   B. reference counts   C. Schorr-Waite   D. stop-and-copy

10. Which technique is not used in the PL/0 and Pascal-S environments?

    A. hand-coded scanner   B. recursive-descent parsing
    C. shunting-yard processing   D. stack-based interpreter

Long Answer.

1. What appears on the console for the code below? (10 points)

```
a={b: 5, c: 6};
b=Object.create(a);
a.c=7;
c=Object.create(b);
b.c=8;
c.d=9;
delete c.c;
```

```
delete b.c;
console.log(c.b);
console.log(c.c);
console.log(c.d);
```

2. Suppose a Pascal array is to be stored starting at location `50000` and is declared:

   `c: array[25..70,20..33] of integer;`

   If one `integer` takes four bytes, what is the location of `c[35,30]`? (10 points)

3. Give equivalent C code (e.g. using `if ... else ...`) to demonstrate the short-circuit nature of C boolean operators. Do not use `&&`, `||`, or `!` in your solution! Do not use work variables! Do not use `return`! (15 points)

   a. `result = a < 10 || b > 13;`

   b. `result = c < 20 && d > 17;`

   c. `result = d < 66 && !(e < 25 || f > 55);`

4. What appears on the console for the code below? (15 points)

```
var makeCounterGroup = function() {
  var counter=0;
  return {
    newSub: function (initVal) {
      var subCounter=0;
      var funcs = {
        reset: function() {
          counter=counter-subCounter+initVal;
          subCounter=initVal;
        },
        up: function(val) {
          subCounter+=val;
          counter+=val;
        },
        down: function(val) {
          subCounter-=val;
          counter-=val;
        },
        value: function() { return subCounter; }
      };
      funcs.reset();
      return funcs;
    },
    value: function() { return counter; }
  };
};
var a=makeCounterGroup();
var b=makeCounterGroup();
var c=a.newSub(100);
var d=a.newSub(200);
var e=b.newSub(300);
var f=b.newSub(400);
c.up(50);
f.down(50);
e.reset();
console.log(a.value());    _____
console.log(b.value());    _____
console.log(c.value());    _____
console.log(d.value());    _____
console.log(e.value());    _____
console.log(f.value());    _____
```

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Test 3

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Multiple Choice. Write your answer to the LEFT of each problem. 5 points each

1. For which of these languages is there a significant difference between `for` and `while` loops?
    A. C   B. Java   C. JavaScript   D. Pascal

2. Keyword parameters give flexibility in:
    A. achieving overloading
    B. making call-by-name work effectively
    C. overriding the reserved words of a language
    D. the order in which parameters are passed

3. Beside a `switch` statement, Duff's device also involves which C construct?
    A. `break`   B. `continue`   C. `goto`   D. loop

4. The cost of addressing a variable in PL/0 is linear in:
    A. level difference   B. number of entries in the display
    C. scope level of the instruction   D. scope level of the variable

5. `(cons (cdr '(e (g f) (a b c))) (car (cdr '(h (i j k) l m))))` will result in:
    A. `'((e (g f) (a b c)) i j k)`
    B. `'((i j k) e (g f) (a b c))`
    C. `'(((g f) (a b c)) i j k)`
    D. `'((i j) e (g f) (a b c))`

6. `(cdr (cdr (cdr (cdr '(a b (c d e) f (g h i))))))` will result in:
    A. `'((g h i))`   B. `'b`   C. `'(c d e)`   D. `'(g h i)`

7. The `for .. in` construct is used to:
    A. enumerate array elements that are not `undefined`   B. enumerate properties
    C. test a subclass/superclass relationship   D. iterate over an integer subrange

8. Call-by-name is most similar to application of:
    A. `#include`   B. macro   C. r-value   D. recursion

9. The state of a Scheme computation may be saved as:
    A. an anonymous function   B. a continuation   C. a fixed point   D. a thread

10. PL/0 uses dynamic links to:
    A. Place an integer on the stack   B. Reference data
    C. Update the display table   D. Return from a called procedure

Long Answer.

1. What is the result of executing this Scheme code? 10 points

```
(define y 10)

((lambda (x y)
   (x (x (x y y) y) y))
 (lambda (x y)
   (+ x y))
 7)
```

2. A list has only integers as elements (i.e. no nested sub-lists, a "lat"). Give Scheme code that returns the sum of these integers. (Line breaks, indenting, and comments are useful.) 20 points

```
> (sum '())
0
> (sum '(1 2 3 4))
10
> (sum '(100))
100
> (sum '(1000 200))
1200
```

3. Two unordered lists have only atoms as elements (i.e. no nested sub-lists, a "lat"). Give Scheme code to test whether the sets of atoms appearing in the two lists are the same. (Line breaks, indenting, and comments are useful.) 20 points

```
> (lists=? '(1 a 4 5 2 3 "XXXX") '(5 1 "XXXX" a 4 2 3))
#t
> (lists=? '() '())
#t
> (lists=? '(a c e) '(a b c d e))
#f
> (lists=? '(1 4 3 2 1 3 2) '(2 3 4 1 2))
#t
> (lists=? '(1 3 2 1 3 2) '(2 3 4 2))
#f
```