Exam 1 Information

The exam will be in class on Wednesday, 30 September. It will cover all material up through Friday, 25 September. The main topics we have covered so far are:

- Compilation and interpretation (chapter 1)
- Binding, names, and scope (chapter 3)
- Control structures (through loops and conditionals, chapter 6)

Questions will be aimed at basic understanding of concepts and the ability to apply them in concrete examples.

Question types will include:

- Short answer (may occasionally require writing simple code)
- True/false
- Multiple choice

You will not be asked to write whole programs; however, you have been exposed to a number of concepts through languages other than Java (in labs, in class) and you will be expected to recognize features of such languages when they were highlighted in class (e.g., used of postfix notation in PostScript, or syntax for different scoping rules in JavaScript)

Here are examples of the kinds of questions that might be asked. This is not intended to be a sample exam; the topics covered below are not intended to be an exhaustive review. In particular, knowing the answers to all the questions below will not guarantee a good grade on the exam!

1. List, in order, the steps involved in compiling a program

2. What is the difference between “block level scoping” and “function level scoping”? Give an example of a language that uses function level scoping.

3. Explain the difference between prefix, infix, and postfix notation, and give examples of each in languages that we have studied (identify the language and which notation is being used).

4. Give an example of a “ternary operator” (show the operator and explain its use with an example).
5. Given the following grammar (start symbol $S$, terminal symbols $a$, $+$, and $b$):

$$
S \rightarrow S + V \mid V \\
V \rightarrow a \mid b \mid + S
$$

(a) [True/False] The following is a valid parse tree for the string “+a++b”:

(b) Is it possible to draw a parse tree for the string “a+b+”? If so, draw one, if not, illustrate the problem.

(c) Is it possible to draw a parse tree for the string “+++a”? If so, draw one, if not, illustrate the problem.

6. Here is an excerpt from a valid Java program (line numbers are included as references). Assume “Something” is the name of another class.

```
10 // INSTANCE VARIABLES:
11 private int i, j;
12
13 // METHODS:
14 public void a(int i, int j) {
15   double x, y;
16   Something z = new Something();
17       ...
18 }
19 public void b(int p, int q) {
20   int x, y;
21       ...
22 }
23```

(a) Using line numbers to refer to portions of the program and naming the affected variables in the program, illustrate an example of “hole in scope”
(b) In line 14, what kind of memory allocation is used for parameters i and j?
(c) In line 15, what kind of memory allocation is used for local variables x and y?
(d) In line 16, what kind of memory allocation is used for the new object created for variable z?
(e) If method a calls method b and method b makes a reference to a variable named i, which “i” does it refer to—the one declared in line 11 or the one declared in line 14?

7. What kinds of data might be stored in static memory?

8. Suppose an imaginary language contains the following function and variable definitions:

    int i = 10; // global
    function f() {
        int i = 20; // local
        g(); // call function g
    }
    function g() {
        print(i);
    }

    What will g print if this language uses lexical scoping? What will it print if dynamic scoping is used?

9. [Multiple choice.] During which phase of computation does a compiler detect errors such as missing semicolons or unmatched parentheses?
   (a) lexical analysis
   (b) semantic analysis
   (c) syntactic analysis
   (d) none of the above

10. Is Java a compiled language, an interpreted language, or something in between? Justify your answer!

11. What is “garbage”? Give a short code example that illustrates how garbage can be created.

12. What kinds of information go into a frame (activation record)? Try to be as specific as possible.

13. Explain short-circuit evaluation with a simple example involving the logical “or” operator “||”.

   The above is not a full review! Please come to Monday’s class prepared to ask questions about material on the exam.