

CSCI 3155: Principles of Programming Languages
Exercise sheet #4
7th June 2007

Group name: _____

PL Detective, Bindings, and Lifetime

Exercise 1. (Book, p241, Problem Set 5) Dynamic type binding is closely related to implicit heap-dynamic variables. Explain this relationship.

Exercise 2. To become acquainted with MYSTERY, the language underlying the PL Detective, we will go through a couple of programming exercises. Use the MYSTERY syntax to guide your exploration. Note that the PL Detective provides no default bindings, meaning that you have no “standard library” to rely on.

The system will automatically record your program submissions, so you don’t need to reproduce them here. Each submission will be assigned a number; please record that number on this sheet.

- (a) Write a program that prints out the number 1.
- (b) Write a program that uses variables and the IF construct.
- (c) Write a program that uses procedures.
- (d) Write a program that prints out the numbers from 0 to 99. Use only one PRINT statement.

Exercise 3. On the previous worksheet, we discussed how some languages handle integer overflow by wrap-around and some by triggering an *overflow* error condition.

Determine whether the PL Detective has a limit on the size of integers. If so, specify how the system behaves when you provide too large an integer. (Hint: the PL Detective is implemented in Java.) Explain, and provide the submission numbers of PL Detective programs that support your claim.

Exercise 4. The handbook discusses two different type bindings: static and dynamic.

(**Skills 4.1, 4.2**) Using the BNF syntax of MYSTERY as well as the compiler and run-time system, determine which of the two type bindings MYSTERY uses. Explain your result. If you used a program or multiple programs, provide the submission numbers recorded by the PL Detective.

Exercise 5. The handbook discusses four different storage bindings: static, stack-dynamic, explicit heap-dynamic, and implicit heap-dynamic.

(**Skills 4.3, 4.4**) Using the BNF syntax of MYSTERY as well as the compiler and run-time system, determine which of the four storage bindings MYSTERY supports. Substantiate your answers by referencing appropriate parts of the grammar or giving a sample program (or a reference number as provided by the PL Detective).

Exercise 6. MYSTERY provides two “logical” operators, AND and >. However, Mystery provides no type for booleans: instead, it uses integers.

(**Skill 3.4**) For both operators, write a series of experiments to determine their semantics. Write down your estimation of their denotational semantics, and justify by giving the program submission numbers provided by the PL Detective and a short explanation.

Exercise 7. Are variable names in the PL Detective case-sensitive? Justify.

Exercise 8. (Skills 1.1, 1.3) Given what you have learned about MYSTERY today, write a brief critique about its readability and writability.