

CSE 3302/5307 Programming Language Concepts

Homework 6 - Fall 2025

Due Date: Sep. 29, 2025, 9:00PM Central Time

Name: _____ UTA ID: _____

Problem1 - 30%

Consider the following program which is written in Java syntax.

```
public class test {  
    int x = 3;  
  
    public void f1() {  
        int x = 10;  
        f2();  
        System.out.println(x);  
    }  
  
    public void f2() {  
        System.out.println(x);  
    }  
  
    public static void main(String[] args) {  
        test a = new test();  
        a.f1();  
    }  
}
```

What will be printed after running `main()` when it uses static scoping and dynamic scoping, respectively? Justify the operation in each case.

Problem2 - 40%

Extend tuples to records, and write the (a) syntax for expression and value form(s) in BNF and (b) operational semantic rules for records. Example usage for records:

- Elements are indexed by labels:
 - $\{y = 10\}$
 - $\{id = 1, salary = 50000, active = \mathbf{true}\}$
- The order of the record fields is insignificant:
 - $\{y = 10, x = 5\}$ is the same as $\{x = 5, y = 10\}$
- To access fields of a record:
 - $a.id$
 - $b.salary$

Including typing semantics and their syntax correctly would correspond to a 5% bonus for the previous assignment.

Problem3 - 30%

For the syntax of pairs and tuples, let's change(or add) $e.1$ $e.2$ or $e.i$ to $e_1.e_2$ so that the previous static projection is replaced by the dynamic projection, meaning that e_2 can be any Lambda expression that evaluates to an index value. The base types are $bool \mid int \mid t1 \rightarrow t2$. Update the typing rules and semantic rules (still left-to-right call-by-value operational semantics) for pairs and tuples accordingly, checking the type of e_2 in $e_1.e_2$ and the value of e_2 for not going out of bounds.