COMP 520: Compilers

Written Assignment 1

Assigned: Thu, Jan 10, 2019
Due: Tue Jan 15, 2019 (start of class)

The purpose of this short assignment is to get you thinking about Java and to recall some aspects of assembly language programming. This assignment should be completed on your own. Write your solutions on this handout, and be sure to add your name/PID at the top of this page.

1. **(4 points)** Consider the following Java class.
   
   ```java
   class Beta {
       public Beta b;
       public void test(int x) {
           //
           //
           //
       }
   }
   ``
   
   For each of the declarations below individually, show how to write it, assuming it is the only statement placed in the box shown above, or explain why the declaration cannot be made.
   
   (a) Declare a local variable `b` of type `int` with initial value 1
   
   (b) Declare a local variable `x` of type `Beta` with initial value `null`
   
   (c) Declare a local variable `Beta` of type `int` with initial value 1
   
   (d) Declare a local variable `b` of type `Beta` with initial value `b`

2. **(4 points)** In the space provided on the flip side of this page, write a machine code program (e.g. MIPS assembly or similar instruction set of your choice) that implements the following program fragment to compute the greatest common divisor gcd(x,y) for positive integers x and y.
   
   ```java
   while (x != y) {
       if (x > y)
           x = x - y;
       else
           y = y - x;
   }
   ```
   
   Assume initially the values of `x` and `y` are held in two general-purpose registers of your choice. On termination both these registers will hold gcd(x,y). A description of the MIPS instruction set is available on the class web page - strict adherence to MIPS assembly syntax is not required!
3. **(4 points)** Consider the following Java code.

```java
interface I1 {
double x = Math.random();
}
class T1 implements I1 {
double x = Math.random();
}
class T2 extends T1 {
    private double x = Math.random();
}
class T3 extends T1 {
    double x = Math.random();
    void show() { System.out.println(__________); }
}
class Test {
    public static void main(String[] args) {
        new T3().show();
    }
}

For each of the four below, give an expression to be placed in the box in method show() that prints the value of the specified instance of x, or argue it cannot be accessed.

(a) x in I1 :

(b) x in T1 :

(c) x in T2 :

(d) x in T3 :

(space for problem 2 solution)