

COMP 520: Compilers

Written Assignment 1

Assigned: Tue Jan 11, 2022

Due: Thu Jan 13, 2022 (turn in at 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.

```
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) Suppose we place the statement `Beta b = b;` in the box. What goes wrong and why?
2. (4 points) In the space provided on the next page, write a machine code program (e.g. MIPS or ARM assembly or similar instruction set of your choice) that implements the following program fragment to compute the greatest common divisor $\text{gcd}(x,y)$ for positive integers x and y .

```
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 $\text{gcd}(x,y)$. Strict adherence to assembly syntax is not required.

3. (4 points) Consider the following Java code.

```
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)