

1 What Would Java Print? (Spring 2015 Q1)

In the four blanks beside the print statements, write the result of the print statement. For your reference, the definition of the `IntList` class is given below the code block.

```
public class Problem1 {
    public static void main(String[] args) {
        IntList a = new IntList(5, null);
        System.out.println(a.head);
        IntList b = new IntList(9, null);
        IntList c = new IntList(1, new IntList(7, b));
        a.tail = c.tail;
        a.tail.tail = b;
        b.tail = c.tail;
        IntList d = new IntList(9002, b.tail.tail);

        System.out.println(d.tail.tail.tail.head);
        System.out.println(a.tail.head);

        c.tail.tail = c.tail;

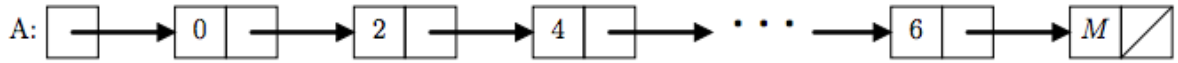
        System.out.println(a.tail.tail.tail.tail.head);
    }
}
```

```
public class IntList {
    private int head;
    private IntList tail;

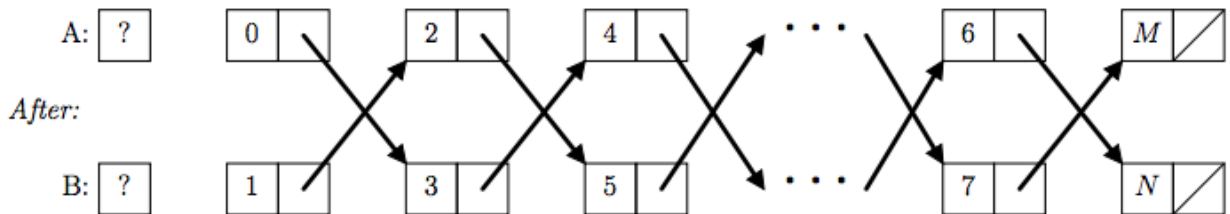
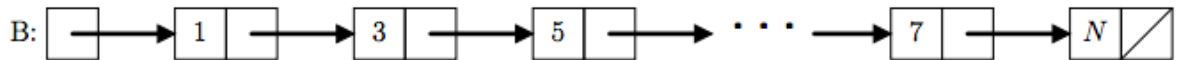
    public IntList(int i, IntList n) {
        head = i;
        tail = n;
    }
}
```

2 Intersecting IntLists (Fall 2014 Q2b)

Here, A and B are declared to be IntLists, and the two boxes in each object are respectively the head and tail of an IntList. Do not change any of the values in the head fields. Do not create new objects. Assume that all four rows have the same number of objects (so that $N = M + 1$). Fill in the blanks to convert the “Before” diagram into the “After” diagram. **Do not introduce any new variables other than those shown in the diagrams.** Put at most one statement or expression in each blank. You need not use all the blanks.



Before:



```

while (A != null) {
    IntList t1 = _____
    _____
    _____
    _____
    _____
    _____
}

```

3 Inheritance (Fall 2015 Q4)

Consider three distinct Java classes, A, B, and C.

- (a) Suppose that the following code compiles and runs without any exceptions. What can you say about the relationship between the classes A, B, and C?

```
A x1 = new C();  
B x2 = x1;  
B x3 = (B) x1;  
B x4 = (C) x1;
```

- (b) Now suppose the code in part (a) fails to compile, but if we remove the second line it compiles and runs without any exceptions. What can you say about the relationship between the classes A, B, and C?
- (c) Now suppose that the code in (a) fails to compile, and when we remove the second and fourth lines it compiles, but causes a `ClassCastException` at runtime. What can you say about the relationship between the A, B, and C?