CS 61B Discussion 6: Exam Prep Spring 2020

1 Packages have arrived

In the following classes, cross out the lines that will result in an error (either during compilation or execution). Next to each crossed-out line write a replacement for the line that correctly carries out the evident intent of the erroneous line.

Each replacement must be a single statement. Change as few lines as possible.

After your corrections, what is printed from running **java P2.C5**?

```
package P1;

public class C1 {

    private int a = 1;
    protected int b = 2;
    int c = 3;

    public static int d() {
        return 13;
    }
    public void setA(int v) { a = v; }
    public void setB(int v) { b = v; }
    public void setC(int v) { c = v; }
    public int getA() { return a; }
    public int getB() { return b; }
    public int getC() { return c; }

    public String toString() {
        return a + " " + getB() + " " + getC() + " " + d();
    }
}
```

```
Write output here:

____ 1 2 3 13 __________

____ 20 60 40 13 _______

____ 15 2 3 14 _________
```

```
package P1;

public class C2 extends C1 {

    public C2() {}
    public C2(int a, int b, int c) {

        setA(a);

        this.b = b;
        this.c = c;
    }
    public static int d() {
        return 14;
    }
    public C1 gen() {
        return new C3();
    }
}
```

```
package P1;
public class C3 extends C2 {
    private int a = 15;
    public String toString() {
        return a + " " + getB() + " " + getC() + " " + d();
    }
}
```

```
package P2;
class C4 extends P1.C2 {
    public int getB() {
        return 2 * b;
    }
    public C4(int a, int b, int c) {
        setA(a);
        this.b = b;
        setC(c);
    }
    public C4(int v) {
        super(v,v,v);
    }
}
```

```
package P2;
class C5 {
    public static void main(String... args) {
        P1.C1 x = new P1.C1();
        P1.C2 y = new C4(20, 30, 40);
        P1.C3 z = (P1.C3) y.gen();

        System.out.println(x);
        System.out.println(y);
        System.out.println(z);
    }
}
```

2 Max Pooling

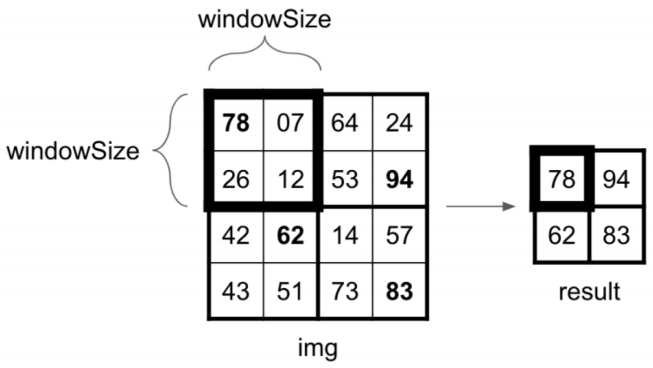
In this question, you will implement a function for performing max pooling, which is a technique used in deep learning for reducing the resolution of an image being fed through the layers of a neural network. (Summer 2019, MT1)

Images can be represented by two-dimensional arrays; the first dimension represents the rows of the image, and the second dimension is to represent the value of the pixel at a particular column index within a row.

For example, given a 2-dimensional image int[][] array called img, the pixel in the 5th row, and the 7th column can be accessed via img[5][7].

One way we can implement max pooling is by cutting up our image (img) into small equal sized squares, and taking only the largest pixel value in each piece as the representative for that piece in our final downsampled image.

For example, this 4 by 4 img can be broken down into 4 equal-sized pieces of shape windowSize by windowSize (where windowSize is 2). The largest value in each of these pieces is recorded in result in their corresponding locations.



Fill in the blanks so that the function behaves as intended. (Hint: In Java, an int divided by an int will always result in a ...?)

```
static int[][] maxPool(int[][] img, int windowSize) {
    // resRows are the number of rows in result.
    // resCols are the number of columns in result.

    int resRows = img.length / windowSize;
    int resCols = img[0].length / windowSize;
    int[][] result = new int[resRows][resCols];

    for (int r = 0; r < img.length ; r++ ) {
        for (int c = 0; c < img[0].length ; c++ ) {
            // Java's Math.max() function only accepts two arguments at a
               time.
            // (Put one on the first line, and the second on the line below
               it).

            int largestSoFar = Math.max(img[r][c],
                                        result[r/windowSize][c/windowSize]);
            result[r/windowSize][c/windowSize] = largestSoFar;
        }
    }

    return result;
}
```

3 Iterator of Iterators

Implement an `IteratorOfIterators` which will accept as an argument a `List` of `Iterator` objects containing `Integers`. The first call to `next()` should return the first item from the first iterator in the list. The second call to `next()` should return the first item from the second iterator in the list. If the list contained `n` iterators, the `n+1`th time that we call `next()`, we would return the second item of the first iterator in the list.

For example, if we had 3 `Iterators` A, B, and C such that A contained the values [1, 2, 3], B contained the values [4, 5, 6], and C contained the values [7, 8, 9], calls to `next()` for our `IteratorOfIterators` would return [1, 4, 7, 2, 5, 8, 3, 6, 9].

Feel free to modify the input `a` as needed.

Note - this is only one possible solution, as there are many others.

```java
import java.util.*;
public class IteratorOfIterators implements Iterator<Integer> {
    LinkedList<Integer> l;
    public IteratorOfIterators (ArrayList<Iterator<Integer>> a) {
        l = new LinkedList<>();
        int i = 0;
        while (!a.isEmpty()) {
            Iterator<Integer> curr = a.get(i);
            if (!curr.hasNext()) {
                a.remove(curr);
                i -= 1; //or else we'll skip an element
            } else {
                l.add(curr.next());
            }
            if (a.isEmpty()) { //could've removed the last Iterator
                break;
            }
            i = (i + 1) % a.size();
        }
    }

    @Override
    public boolean hasNext() {
        return !l.isEmpty();
    }

    @Override
    public Integer next() {
        return l.removeFirst();
    }
}
```