CS 125 - Lecture 18

Objectives: Color representation; images; 2-D arrays; class methods;

3. **Representing colors?**

What color is (red=100%, green = 0%, blue = 0%)?

Design a solution to work in base 10. How would you represent this color as a single integer? e.g. This color is represented by the integer 900.

Now think in base2, What color is $111111111111111111111111_2$

Base-16 colors:

4. **What is this doing? What are the mystery variables representing?**

```
int mystery1 = (rgb) & 0xff;       // mystery1 is:
int mystery2 = (rgb >> 8) & 0xff;  // mystery2 is:
int mystery3 = (rgb >> 16) & 0xff; // mystery3 is:
```

Can you go in reverse?

```
int rgb = (__________<< 16) | (___________ << 8) | (___________);
```

1. Fix / Complete the following code to initialize and return a square array of size h x h to a checker patter of "O" and "E" (O for 'odd' squares, E for even including [0][0]).

```
public static ____________ makeChecker(int h) {
   _______________ result = new _________________
   int i=0, j =0;
   for( ; i < result.length; i++ ) {
      for( ; j < result.length; j++) {
         if((i+j) _______________ )
            result_________________
         else
            result _________________
      }
   }

}
```

1b. How should we test makeChecker?

2. **Bit-wise operators: (& , | , ~ , ^)**

a = 60_{10} = _____$_2$

b = 13_{10} = _____$_2$

a & b = _____$_2$ = _____$_{10}$

a | b = _____$_2$ = _____$_{10}$

a ^ b = _____$_2$ = _____$_{10}$

~b = _____$_2$ = _____$_{10}$

Bit-wise shifts:

Evaluate a << 2 ? _____$_2$ = _____$_{10}$

Evaluate a >> 2 ? _____$_2$ = _____$_{10}$

Evaluate 0x33ff33 >> 8 ?

5a. **Introducing class methods. Think about Math.random()…**

5b. **Demo … write a class method (subroutine) that solves the quadratic equation:**

Given: $ax^2 + bx + c = 0$ **then solution is:** $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

6. **Merge…**

Complete the following code to merge two sorted integer arrays together into a single output array

```
public static int[] merge(int[] A, int[] B) {
   int done = 0;
   int countA = 0;
   int countB = 0;
   int[] result = new int[_____________________________];
   while ((countA < A.length) ____ _____________________) {
      if (_____________________]) result[done++] = A[ countA++];
      else
         result[_______] = B[ __________];
   }
while (countA < A.length)
   result[done++] = A[countA++];
```

7. **Using 2D arrays to represent an image.**

Create a picture of the JVMs memory and use memory pointers to explain why the following code swaps two rows.

```
int[][] pixels;
pixels = new int[480 /*row or 'y' coordinate*/][640 /* column or 'x'];
//  initialize pixel array : Odd rows are black.
//  Even rows are white
for(int y=0;y< 480; y++)
   for(int x = 0; x< 640; x++)
      if(y % 2 ==0) pixels[___][____] = 0xffffff;

//0xffffff = all white (red=255,green=255,blue=255)
int[] temp = pixels[10];
pixels[10] = pixels[11];
pixels[11] = temp;
```

5. **First, implement the Add method with three integer parameters return the sum of the parameters unless if any of the values are less than zero return zero if the sum is greater than 1000 return 1000.**

Second, implement an Add method with two integer parameters with the same rules except that if the first value is -1 return -1. ***Hint: Call your first Add method.***

```
public class Program {
   public static void main(String[] args) {

     int a, b, c, sum;
     a = TextIO.getlnInt();
     b = TextIO.getlnInt();
     c = TextIO.getlnInt();
     sum = Add(a, b, c);
     System.out.println("Total is " + sum);
   }
}
```

Third … Why can you not make a third method Add in the same class that takes two ints and returns a double? `double Add(int x, int y)`

6. **Complete the following bucket sort code to sort the data array.**

```
int[] data = {5,22,5,18,4,…. 74623 more values between 0 & 999

int max = 1000;
int[] histogram = new int[max];

// Phase 1, count the number of occurrences of 0,1,2,3... max-1

for(int i =0; i < data.length; i ++)

   ? _____________________________________


// Phase 2, Use histogram to create the sorted output data

int ptr=0; // we will write values into data[ptr]

for(int value=0; value<max; value ++)

?

// This sort is fast but what limitations can you see with this
algorithm?
```

7. **Where are the scoping errors in the following code? Can you fix them by adding parameters and return types?**

```
public class Scope {
   private static final String BONJOUR = "hi"; // Class variable
   private static int count = 0; // Class variable
   public static void main(String [] args) {
     int i = 6; // Local (temporary) variable only accessible inside main
     friendlyMethod();
     Scope.friendlyMethod();
     TextIO.putln(hello);
  }
  public static void friendlyMethod() {
     Scope.printer("Welcome");
     printer(“Huh?");
     String hello = "hello!";
     printer(hello + Scope.BONJOUR);
     printer(hello + BONJOUR);
     TextIO.putln("i = "+ i);
     count++;
     TextIO.putln(count);
   }
   public static void printer(String h) {
      TextIO.putln(h+”...");
   }
}
```