CS125 Section 8 "I Object!"

For each entry under “Array” and “Object” place a “Y” if the statement holds for that type and “N” if not.

Conjecture	True for Arrays?	True for Object?
1 Holds multiple pieces of data.		
2 Data must be of the same type.		
3 Can compare contents to another of same type using ==		
4 Contents can be copied by using =		
5 Makes a new object when passed as a parameter to a function.		
6 Allows programmers to build new types.		
7 Internal elements are accessed using the [] or "square bracket" operator.		
8 Internal elements are accessed using the . or "dot" operator.		

When we define a class, we put two kinds of things in a class file: methods and data. **Methods** are code *e.g.,* Math.random() which returns a new random number for us, and **values** are variables that hold state *e.g.,* Math.PI which holds an approximation of π. Calling a method uses parentheses. Accessing a value does not.

A method is a class method (aka static method) or an instance method. The following code defines a new object type to represent holidays.

```
public class Holiday {
 public static String[] months = {"Jan", "Feb", "Mar",..., "Aug", "Sep", "Oct", "Nov", "Dec"};
 static int numHolidays;   // keeps track of how many holidays have been created
 String name;
 int month;
 int day;

 public static Holiday createNewHoliday(String theName, int theMonth, int theDay) {
  numHolidays ++;   // we're creating a new  Holiday!
  Holiday result = new Holiday();
  result.name = theName;
  result.month = theMonth;
  result.day = theDay;
  return result;
 }

 public static int getNumHolidays() {
                        return numHolidays;}
 public String getName() {return this.name;}
 public int getMonth() {return this.month;}
 public int getDay() { return this.day;}

 public Holiday mystery1() {
  Holiday h = new Holiday();
  h.name = this.name;
  h.month = this.month;
  h.day = this.day;
  return h;
 }


 public boolean mystery2(Holiday other) {
  return this.name.equals(other.name) &&
         (this.month == other.month) &&
         (day == other.day);
 }
}
```

	Class(static)	Instance	Local (temporary)
Value			
Method			Not Applicable

1. Use the above grid to classify all of the methods and values which are local variables.
2. Explain why the class would *still* compile if the programmer forgot the 'static' for `getNumHolidays`.
3. Explain why the class would *not* compile if the programmer added static to `getName`?
4. Choose better names for *mystery1* and *mystery2* methods.
5. Why did the programmer use `name.equals` but '==' to compare `month` and `day`?

Calling Class(Static) vs. Instance methods

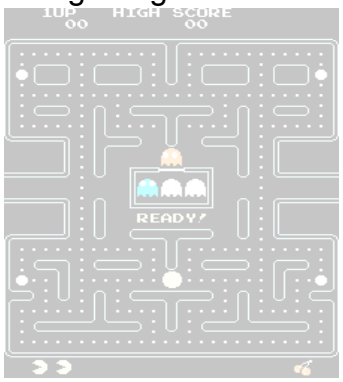
1. For each line of code below, identify whether the method call is invoking instance methods or class methods of the Holiday object or class, respectively.
2. If the main method had been written inside the Holiday class, how could this code be written shorter?

```
public class HolidayRunner {  // Notice we're inside a different class
 public static void main(String[] args) {
   Holiday hween = Holiday.createNewHoliday("Halloween", 10, 31);
   TextIO.put("My favorite holiday is " + hween.getName());
   TextIO.put(" which is on " + Holiday.months[hween.getMonth() - 1]);
   TextIO.putln(" " + hween.getDay());

   Holiday lincoln = Holiday.createNewHoliday("Lincoln's Birthday", 2, 12);
   if (!hween.mystery2(lincoln)) {
     TextIO.putln("Created " + Holiday.getNumHolidays() + " different ones");
   }
   Holiday halloween = hween.mystery1();
   Holiday lincolnsBday = lincoln;
 }
}
```

3. Object References are just pointers (aka "Zombies!") not actual objects. Explain why the following code only creates three ghost objects.
4. What is printed by the last line of the following Java code? true or false?
5. Which objects are no longer referenced (Blinky Pinky Inky) and can be recycled by the garbage collector?

```
Ghost g1, g2, g3, g4;
g1 = new Ghost();  // Blinky
g2 = new Ghost();  // Pinky
g3 = new Ghost();  // Inky
g4 = g2;
g1 = g3;
g2 = g3;
g3 = g2;
boolean result = (g3 == g1);
System.out.println(result);
```



6. IMPROVE THE CODE: SPOT AND FIX THE MISTAKES

```
class DodgyDice {
  public int side = 0; // 0...5

  public int roll() {
     side = (side + 1) % 6;
     return 1 + side;
  }
  public static boolean rolledSix() {
    return (side == 6);
  }
}


// Example use
DodgyDice d6 = new DodgyDice();
int rick = d6.roll();
TextIO.putln("I rolled " + rick);
if (d6.rolledSix()) TextIO.put("Lucky");
```

```
class QuoteList {
  String[] array = new String[1000];
  int used = 0;
  public void add(String quote) {
     this.array[used ++] = quote;
  }
  public int countEmpty() {
    int result = 0;
    for (int i = 0 ; i < array.length() ; i ++)
        if (array.length == 0) result ++;
    return result;
  }
  public boolean equals(QuoteList other) {
    boolean isSame = true;
    for (int i = 0 ; i < array.length() ; i ++)
       isSame = (other[i] == array[i]);
    return isSame;
  }
}
```