

## 1 Give em the 'Ol Switcheroo

For each function call in the `main` method, write out the `x` and `y` values of both `foobar` and `baz` after executing that line. (Spring '15, MT1)

```
1 public class Foo {
2     public int x, y;
3
4     public Foo (int x, int y) {
5         this.x = x;
6         this.y = y;
7     }
8     public static void switcheroo (Foo a, Foo b) {
9         Foo temp = a;
10        a = b;
11        b = temp;
12    }
13    public static void fliperoo (Foo a, Foo b) {
14        Foo temp = new Foo(a.x, a.y);
15        a.x = b.x;
16        a.y = b.y;
17        b.x = temp.x;
18        b.y = temp.y;
19    }
20    public static void swaperoo (Foo a, Foo b) {
21        Foo temp = a;
22        a.x = b.x;
23        a.y = b.y;
24        b.x = temp.x;
25        b.y = temp.y;
26    }
27
28    public static void main (String[] args) {
29        Foo foobar = new Foo(10, 20);    foobar.x = 10, y = 20
30        Foo baz = new Foo(30, 40);       baz.x = 30, y = 40
31        switcheroo(foobar, baz);          foobar.x: 10_ foobar.y: 20_ baz.x: 30_ baz.y: 40_
32        fliperoo(foobar, baz);            foobar.x: 30_ foobar.y: 40_ baz.x: 10_ baz.y: 20_
33        swaperoo(foobar, baz);            foobar.x: 10_ foobar.y: 20_ baz.x: 10_ baz.y: 20_
34    }
35 }
```

## 2 Quik Maths

What would the contents of the array be after being run through these functions in the main method? (Fall '16, MT1)

```

1  public class QuikMaths {
2      public static void mulitplyBy3(int[] A) {
3          for (int x: A) {
4              x = x * 3;
5          }
6      }
7
8      public static void multiplyBy2(int[] A) {
9          int[] B = A;
10         for (int i = 0; i < B.length; i+= 1) {
11             B[i] *= 2;
12         }
13     }
14
15     public static void swap(int A, int B ) {
16         int temp = B;
17         B = A;
18         A = temp;
19     }
20     public static void main(String[] args) {
21         int[] arr;
22         arr = new int[]{2, 3, 3, 4};
23         multiplyBy3(arr);
24
25         /* Value of arr: {__2,3,3,4_____} */ // Enhanced for loop variables do not change. Only when indexing
26
27         arr = new int[]{2, 3, 3, 4};
28         multiplyBy2(arr);
29
30         /* Value of arr: {_____4,6,6,8_____} */
31
32         int a = 6;
33         int b = 7;
34         swap(a, b);
35
36         /* Value of a: 6_____ Value of b: _____7_____ */ // Variables aren't being returned. They are passed in by value
37     }
38 }

```

### 3 Static Books

Suppose we have the following `Book` and `Library` classes.

```
class Book {
    public String title;
    public Library library;
    public static Book last = null;

    public Book(String name) {
        title = name;
        last = this;
        library = null;
    }

    public static String lastBookTitle() {
        return last.title;
    }
    public String getTitle() {
        return title;
    }
}

class Library {
    public Book[] books;
    public int index;
    public static int totalBooks = 0;

    public Library(int size) {
        books = new Book[size];
        index = 0;
    }

    public void addBook(Book book) {
        books[index] = book;
        index++;
        totalBooks++;
        book.library = this;
    }
}
```

- (a) For each modification below, determine whether the code of the `Library` and `Book` classes will compile or error if we **only** made that modification, i.e. treat each modification independently.

- |  |  |
|--|--|
| 1. Change the <code>totalBooks</code> variable to <b>non static</b>  | compiles   |
| 2. Change the <code>lastBookTitle</code> method to <b>non static</b> | compiles. nonstatic methods can reference static variables                 |
| 3. Change the <code>addBook</code> method to <b>static</b>           | error - static method will be calling instance variables which is an error |
| 4. Change the <code>last</code> variable to <b>non static</b>        | Error - variable is being called by static method                          |
| 5. Change the <code>library</code> variable to <b>static</b>         | Compiles   |

- (b) Using the `Book` and `Library` classes from before, write the output of the `main` method below. If a line errors, put the precise reason it errors and continue execution.

1	<b>public class</b> Main {	
2	<b>public static void</b> main(String[] args) {	
3	System.out.println(Library.totalBooks);	0
4	System.out.println(Book.lastBookTitle());	error, null pointer exception
5	System.out.println(Book.getTitle());	error
6		
7	Book goneGirl = <b>new</b> Book("Gone Girl");	
8	Book fightClub = <b>new</b> Book("Fight Club");	
9		
10	System.out.println(goneGirl.title);	Gone Girl
11	System.out.println(Book.lastBookTitle());	Fight Club
12	System.out.println(fightClub.lastBookTitle());	Fight Club
13	System.out.println(goneGirl.last.title);	Fight Club
14		
15	Library libraryA = <b>new</b> Library(1);	
16	Library libraryB = <b>new</b> Library(2);	
17	libraryA.addBook(goneGirl);	
18		1
19	System.out.println(libraryA.index);	1
20	System.out.println(libraryA.totalBooks);	1
21		
22	libraryA.totalBooks = 0;	
23	libraryB.addBook(fightClub);	
24	libraryB.addBook(goneGirl);	
25		2
26	System.out.println(libraryB.index);	2
27	System.out.println(Library.totalBooks);	2
28	System.out.println(goneGirl.library.books[0].title);	fight club
29	}	
30	}	