

## 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    public static void main (String[] args) {
28        Foo foobar = new Foo(10, 20);
29        Foo baz = new Foo(30, 40);
30        switcheroo(foobar, baz);    foobar.x: ___ foobar.y: ___ baz.x: ___ baz.y: ___
31        fliperoo(foobar, baz);      foobar.x: ___ foobar.y: ___ baz.x: ___ baz.y: ___
32        swaperoo(foobar, baz);      foobar.x: ___ foobar.y: ___ baz.x: ___ baz.y: ___
33    }
34 }
```

**Solution:**

```
line 30: foobar.x: 10 foobar.y: 20 baz.x: 30 baz.y: 40  
line 31: foobar.x: 30 foobar.y: 40 baz.x: 10 baz.y: 20  
line 32: foobar.x: 10 foobar.y: 20 baz.x: 10 baz.y: 20
```

## 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
21     public static void main(String[] args) {
22         int[] arr;
23         arr = new int[]{2, 3, 3, 4};
24         multiplyBy3(arr);
25
26         /* Value of arr: {_____} */
27
28         arr = new int[]{2, 3, 3, 4};
29         multiplyBy2(arr);
30
31         /* Value of arr: {_____} */
32
33         int a = 6;
34         int b = 7;
35         swap(a, b);
36
37         /* Value of a: _____ Value of b: _____ */
38     }
39 }
```

**Solution:**

```
line 23: /* Value of arr: {2, 3, 3, 4} */  
line 28: /* Value of arr: {4, 6, 6, 8} */  
line 34: /* Value of a: 6   Value of b: 7 */
```

### 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 `totalBooks` variable to **non static**
  2. Change the `lastBookTitle` method to **non static**
  3. Change the `addBook` method to **static**
  4. Change the `last` variable to **non static**
  5. Change the `library` variable to **static**

**Solution:**

1. Compile
2. Compile
3. Error
4. Error
5. Compile

- (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.

**Solution:**

```

1  public class Main {
2      public static void main(String[] args) {
3          System.out.println(Library.totalBooks);           0
4          System.out.println(Book.lastBookTitle());        Error, NullPointerException
5          System.out.println(Book.getTitle());              Error, does not compile
6
7          Book goneGirl = new Book("Gone Girl");
8          Book fightClub = new 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 = new Library(1);
16         Library libraryB = new Library(2);
17         libraryA.addBook(goneGirl);
18
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
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 }
```