Array Recursion Example

DIS has devised an inefficient, but interesting way to reverse the elements in an array. As shown below and on the next page, method **`flip`** reverses a general 1-D array of integers via a recursive method called **`flip2`** that has the signature **`flip2(int[] x, int a, int b)`**. Indices **`a`** and **`b`** represent the first and last indices of the input array **`x`**, respectively.

You need to complete the implementation of method **`flip2`**. *Do not use extra memory by creating arrays in* **`flip2`**!

To recursively reverse the array, you must follow this pattern:

- If the array length is zero or one, stop recursing.
- If the array length is greater than one, swap the left and right halves of that array between indices **`a`** and **`b`** (inclusive) without creating a new array. For example, for **`a`**=0 and **`b`**=3, flipping **`{1,2,3,4}`** *once* rearranges the array into **`{3,4,1,2}`** by swapping elements **`3`** and **`4`** with **`1`** and **`2`**. If the array length is odd, swap the elements around the middle element. Continue by flipping both of those halves recursively.

For example, reversing the array **`{2,3,1,4}`** would have this pattern:
`{2,3,1,4}` → **`{1,4,2,3}`** → **`{4,1,3,2}`**

An example of an odd-length array **`{1,2,3,4,5}`** has this pattern:
`{1,2,3,4,5}` → **`{4,5,3,1,2}`** → **`{5,4,3,2,1}`**

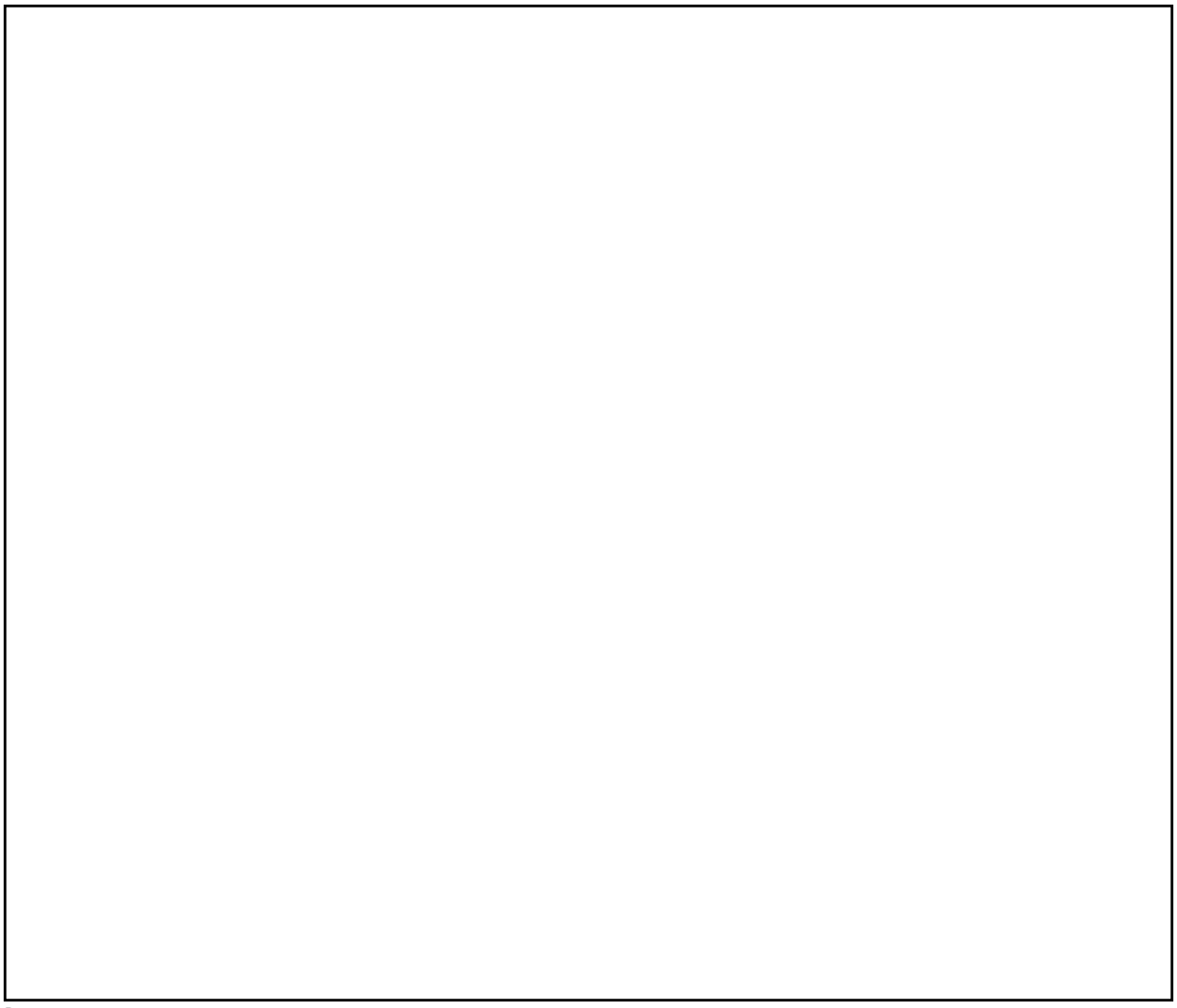
[code appears on next page; use the following space to refine your algorithm; Hint: Work out formulas for figuring out the index for each half of the array between **`a`** and **`b`**.]

```
public class ReverseArray {

   public static void main(String[] args) {
      int[] x1 = {2,3,1,4};
      int[] x2 = {1,2,3,4,5};
      print(flip(x1)); // outputs {4,1,3,2}
      print(flip(x2)); // outputs {5,4,3,2,1}
   }

   // Reverse the elements in x and return that array:
      public static int[] flip(int[] x) {
         flip2(x, 0, x.length-1);
         return x;
      }

   // Reverse the elements in x in place, so do not create new arrays:
      private static void flip2( int[]x , int a, int b ) {
```



```
      }

   public static void print(int[] x) { /* code not shown */ }
} // Class ReverseArray
```