



Fall 2021 AP CS A Lesson 2.4

Dr. O'Brien
Herbert H. Lehman High School
10 February 2022

STANDARDS REFERENCED:

CSTA 11-12th grade standards: 3B-AP-12: Compare and contrast fundamental data structures and their uses.

NY State: 9-12.CT.7

Design or remix a program that utilizes a data structure to maintain changes to related pieces of data.

9-12.CT.6

Demonstrate how at least two classic algorithms work and analyze the trade-offs related to two or more algorithms for completing the same task.



Do now

be sure to: Get out your binder. Copy goal and answer do now questions below. Show all work or write a complete sentence for each answer:

1. Describe how array traversal works in plain English.
2. How can array traversal be used for mathematical computations?
3. How do you think array traversal can be used for **reordering** arrays?

class: AP CS A goal: HDW recognize and identify common algorithms that utilize array traversals?

1. traversal uses a for loop to go through each element of an array in order, one element at a time. this can be done with a standard or an enhanced for loop.
2. Lots of ways, finding max or min value, calculating mean, median, or mode, etc.
3. Go through array one at a time and move elements around.



framing

- **what:** recognize and identify common algorithms that utilize array traversals to reorder arrays.
- **why:** These algorithms are widely used and will prove useful in the future!
- **where to:** Getting some practice utilizing these algorithms

class: AP CS A goal: HDW recognize and identify common algorithms that utilize array traversals?



Vocab (review)

be sure to: Keep your **notebook** open. These definitions should be in your Glossary. If not Copy each definition, in your [Java Glossary](#).

Algorithm

A step-by-step procedure for solving a problem

Statement execution count

The number of times a statement is executed by a program.

class: AP CS A goal: HDW recognize and identify common algorithms that utilize array traversals?



Mini-lesson: Reordering arrays offline

be sure to: Follow Dr. O'Brien's directions carefully. Sit in a row. Move each student one space to the right. Rule: Only one student can be standing at a time.

class: AP CS A goal: HDW recognize and identify common algorithms that utilize array traversals?

Start with no empty chairs. Students realize they can't move.

Add one, then two, then a whole extra array.



Mini-lesson: Types of algorithms (continued)

be sure to: Take notes and answer questions in your **notebook**.

Reordering arrays: These are a big more complicated. They require:

- Create a new temp array that is the same size as the original
- Copy elements from the original array to the new array in the order that you want
- When finished, copy the temp array back over on top of the original array to replace it.

class: AP CS A goal: HDW recognize and identify common algorithms that utilize array traversals?



Coding to learn: live coding
be sure to: [Log in to Workstation](#). Follow along, but try to stay one step ahead!

- Reordering arrays: Let's shift the elements in an array to the right by one.

class: AP CS A goal: HDW recognize and identify common algorithms that utilize array traversals?

+see LessonFive.java for fully implemented code.

Mathematical analysis: We already saw one example in lesson 5.2 (calculating the mean). Let's try finding the maximum value in an array.

+What should the condition be inside of the if statement? is the current max val less than the current item, if so then that item becomes the max val.

Finding values: Let's find out how many of a given item show up in an array.

+what goes wrong if we make the condition for this loop $i < \text{arr.length}$? we run into an array index out of bounds error in the last iteration. How can we fix this? instead make it $i < \text{arr.length} - 1$

+What's still missing? the first element in the array will still be empty. deal with this edge case by: `temp[0] = arr[arr.length-1];`

Reordering arrays: Let's shift the elements in an array to the right by one.



Reflection: Thinking about thinking
be sure to: Answer each question below with a complete sentence.

1. Explain the procedure (in natural language) of how to reorder an array.
2. What is an "edge case"?
3. How can you account for edge cases?



class: AP CS A goal: HDW recognize and identify common algorithms that utilize array traversals?

+Explain the procedure (in natural language) of how to reorder an array.

Create a new temp array that is the same size as the original, copy elements from the original array to the new array in the order that you want and then copy the temp array back over on top of the original array to replace it.

+What is an "edge case"?

An edge case is a situation that requires special handling. A loop may leave out an edge case in order to avoid an error.

+How can you account for edge cases?

Edge cases can be handled after the loop!



exit ticket
be sure to: Answer the question below on a sheet of loose leaf paper and write a sentence justifying your answer.

The code segment below is intended to print the length of the shortest string in the array `wordArray`. Assume that `wordArray` contains at least one element.

```
int shortest = /* missing value */;
for (String word : wordArray)
{
    if (word.length() < shortest)
    {
        shortest = word.length();
    }
}
System.out.println(shortest);
```

Which of the following should be used as the initial value assigned to `shortest` so that the code segment works as intended?

- Ⓐ Integer.MAX_VALUE
- Ⓑ Integer.MIN_VALUE
- Ⓒ 0
- Ⓓ word.length()
- Ⓔ wordArray.length

class: AP CS A goal: HDW recognize and identify common algorithms that utilize array traversals?

string length is counted in integers. The edge case here is the longest possible countable string, which is the max value of integers, so A is the correct answer.