Lesson 9: Reversing Arrays

45 minutes

Overview

How would I reverse the elements in a 1D array?

Students develop an algorithm to reverse elements in a 1D array. Students plan their algorithms using manipulatives to identify the steps to solve the problem and write pseudocode to outline these steps.

Standards

Full Course Alignment

CSA Conceptual Framework

- **CON-2** - Programmers incorporate iteration and selection into code as a way of providing instructions for the computer to process each of the many possible input values

Agenda

Warm Up (10 minutes)
- **CS Pyramid**

Activity (30 minutes)
- **Planning the Algorithm**
- **Implementing the Algorithm**

Wrap Up (5 minutes)
- **Software Engineering Skills**
- **Assessment: Check for Understanding**
- **AP Classroom Topic Questions**

Objectives

Students will be able to:

- Implement an algorithm to reverse the elements in a one-dimensional (1D) array

Preparation

- Print copies of the Reversing an Array handout (one for each pair of students)
- (Optional) Cut out the Reversing an Array manipulatives
- Create code review groups if you are not reusing the same groups
- Check the **Teacher's Lounge** for verified teachers on the CSA Forum to find additional strategies or resources shared by fellow teachers

Links

Heads Up! Please make a copy of any documents you plan to share with students.

For the students

- **Reversing an Array** - Handout
- **U3L9 Extra Practice** - Handout

Teaching Guide

Warm Up (10 minutes)

CS Pyramid

Remarks

> We have learned a lot of new terms so far! Let's review some of these terms through a game of CS Pyramid.

Group: Place students in pairs.

Do This: Review the instructions for playing CS Pyramid.

Do This: Play the music clip to cue the CS Pyramid activity, and direct students to play CS Pyramid. Click through the animated slide to display each pyramid, and direct students to switch roles with each new pyramid.

Activity (30 minutes)

Planning the Algorithm (15 minutes)

Remarks

> Sometimes, the data stored in a 1D array needs to be rearranged. It may be entered in reverse order, values may be swapped, or maybe the user just needs to perform these changes temporarily to answer questions.

Do This: Review the lesson objectives.

Do This: Direct students to Level 1 on Code Studio to predict the program's outcome, then run the program to compare their predictions to the actual outcome.

1 **Predict: In the Wrong Order**

Discuss: Click through the animated slide to display the prompts.

- *What is wrong with the output of this program?*
- *How could we fix the array to store the values in the correct order?*

Discussion Goal: Students notice that the original array is in reverse order. Students suggest creating a new array and copying the elements in the correct order to the new array or swapping the values from the front to the back until they are in the correct order.

Teaching Tip

> Have students consider the benefits and drawbacks of their proposed solutions. Ask students whether their solutions are efficient and easy to maintain.

Group: Place students in pairs.

Distribute: Give each pair a copy of the Reversing an Array handout and manipulatives.

Do This: Have students write pseudocode for reversing a one-dimensional array.

Teaching Tip

Using the manipulatives is optional but helps students identify the steps in a task by physically acting out the algorithm. Encourage students to use the manipulatives to act out the problem and write down the steps they are taking to develop a solution.

There are multiple ways students can solve this problem. For example, students can swap the values in the original array to reverse the order, or students may choose to create a new array and copy the values from the original array to the new array in reverse order.

Implementing the Algorithm (15 minutes)

Remarks

> Reversing an array is another standard algorithm that works for many scenarios.

Do This: Direct students to Level 2 on Code Studio to complete Levels 2, 3, and 4. Students complete a Check for Understanding, then continue to Level 3 to implement their algorithm to reverse a 1D array. On Level 4, students complete a choice level to reverse a 1D array.

2-4 **Reversing a 1D Array**

2 3 4

Do This: Click through the animated slide to have students participate in the Code Review Call and Response.

Do This: Direct students to complete a code review on Level 5.

5 **Code Review: Reversing a 1D Array**

Wrap Up (5 minutes)

Software Engineering Skills

Remarks

> Software engineers write algorithms to process and analyze data in programs to answer questions and solve problems. You have made a lot of progress developing your software engineering skills in this unit as you learned how to work with data to find information.

Discuss: Click through the animated slide to display the prompts.

- *How has your perception of software engineering changed in this unit?*
- *How have your software engineering skills improved in this unit?*

Discussion Goal: Students share how their perception of software engineering has changed, including how computer science influences different industries and decisions. Students identify the software engineering skills and characteristics they feel they improved in this unit.

Do This: Review the concepts covered in this lesson.

Assessment: Check for Understanding

Check For Understanding Question(s) and solutions can be found in each lesson on Code Studio. These questions can be used for an exit ticket.

6 **Check for Understanding**

AP Classroom Topic Questions

To assign questions from the AP Classroom Question Bank that align with this lesson, create a custom quiz in AP Classroom by searching the Question Bank for the Essential Knowledge statements listed at the top of this lesson plan. You can find instructions and video demonstrations to do this on **AP Central**.

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