



Fall 2021 AP CS A Lesson 5.2

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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.



Do now

be sure to: Get out your **binder**. Copy **goal** and answer **do now** questions below. Write a complete sentence for each answer:

1. Review your notes from yesterday. How are **arrays** similar to **strings**?
2. What sorts of things can you do with arrays that cannot be done with strings?

class: AP CS A **goal:** HDW use loops to traverse an array?

1. They both contain data that is associated with an index and can be accessed.
2. Arrays are different in that they don't print as a string and they can contain other datatypes than just characters.



framing

- **what:** use loops to traverse an array
- **why:** These techniques allow us to access the elements of an array sequentially, and will be important for developing algorithms on arrays.
- **where to:** Enhanced for loops for traversing arrays

class: AP CS A goal: HDW use loops to traverse an array?



Vocab

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

Traversal (review)

The process of looping through a string or array and accessing each element sequentially

```
String str = "Java is cool.";
for (int i = 0; i < str.length(); i++){
    System.out.println(str.charAt(i));
}
```

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1. What will this block of code output?

Writing to learn: warm up

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

```
String str = "Java is cool.";
for (int i = 0; i < str.length(); i++){
    System.out.println(str.charAt(i));
}
```

class: AP CS A goal: HDW use loops to traverse an array?

+What will this program do?

It will print out each character in the string "Java is cool" with each character on a new line



Writing to learn: warm up

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

1. What will this block of code output?
2. How does the second block of code work? Describe each step in the computation.
3. How are these two blocks of code similar? How are they different?

```
String str = "Java is cool.";
for (int i = 0; i < str.length(); i++){
    System.out.println(str.charAt(i));
}
```

```
int[] grades = {80, 92, 91, 68, 88, 54};
for (int i = 0; i < grades.length; i++){
    System.out.println(grades[i]);
}
```

class: AP CS A **goal:** HDW use loops to traverse an array?

2. The second program initializes an array of integers called grades. It looks like it's printing out each grade on a separate line.
3. They're similar in that they both involve traversing an indexed collection of data. a string in the first case, an array in the second.



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

1. How do we calculate the mean data set?
2. Let's use array traversal to do this in Java

```
public static int gradeMean(int[] gradeList){  
    //to be completed in class  
    return -1;  
}  
  
int[] grades = {80, 92, 91, 68, 88, 54};  
System.out.println("Mean Grade: " + gradeMean(grades));
```

class: AP CS A goal: HDW use loops to traverse an array?

1. add up the values and divide by the number of values!

+Walk through the following code with students

```
public static int gradeMean(int[] gradeList){  
    int numGrades = gradeList.length;  
    int sum = 0;  
    for (int i = 0; i < numGrades; i++){  
        sum += gradeList[i];  
    }  
    return sum / numGrades;  
}
```

+Why is it important that i remain *less* than numGrades, what do you think will go wrong if we had i <= numGrades?
Test it out, show students java.lang.ArrayIndexOutOfBoundsException.



Coding to learn: live coding
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1. Now let's try to build a method that returns the number of students with passing grades.

```
public static int getPassing(int[] gradeList, int passingGrade){  
    //to be completed in class  
  
    return -1;  
}  
  
System.out.println("# of students' passing: " + getPassing(grades, 65));
```

class: AP CS A goal: HDW use loops to traverse an array?

```
public static int getPassing(int[] gradeList, int passingGrade){  
    int numPassing, index;  
    numPassing = 0;  
    index = 0;  
    while (index < gradeList.length){  
        int grade = gradeList[index];  
        if (grade >= passingGrade){  
            numPassing++;  
        }  
        index++;  
    }  
  
    return numPassing;  
}
```

+Could we also do this with a for loop? of course! I just wanted to show that it doesn't require one.



Practice problems

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

The method `countTarget` below is intended to return the number of times the value `target` appears in the array `arr`.

```
public int countTarget(int[] arr, int target)
{
    int count = 0;
    for (int j = 0; j <= arr.length; j++) // line 4
    {
        if (arr[j] == target)
        {
            count++;
        }
    }
    return count;
}
```

1. Why will this program not work as intended?

2. How should we change the code to make sure it works?

class: AP CS A goal: HDW use loops to traverse an array?

1. It will return an array index out of bounds error.
2. We should change it to `j < arr.length`;



Practice problems

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

Consider the following code segment.

```
int[] arr = {1, 2, 3, 4, 5, 6, 7};  
for (int i = 1; i < arr.length; i += 2)  
{  
    arr[i] = arr[i - 1];  
}
```

Use a code tracing table to determine the output of this code segment.

class: AP CS A **goal:** HDW use loops to traverse an array?

i. | arr[i - 1] | | arr

i=1 | arr[i-1] = 1 | arr = {1,1,3,4,5,6,7}

i = 3 | arr[i-1] = 3 | arr = {1,1,3,3,5,6,7}

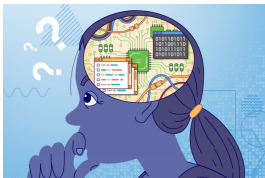
i = 5 | arr[i-1] = 5 | arr = {1,1,3,3,5,5,7}



exit ticket

be sure to: Answer each question below with a complete sentence or code.

1. How could you build a program that adds a 5 point bonus to each students grade? Write it out in Java code.
2. How could you modify your algorithm so it only applies the bonus to students with a grade of higher than 80?



class: AP CS A goal: HDW use loops to traverse an array?

```
for (int i=0; i<grades.length; i++){  
    grades[i]+= 5;  
}
```

add an if statement