Fall 2021 AP CS A
Lesson 3.2

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Herbert H. Lehman High School
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Do now

Be sure to…

1. **Get out your binder. Copy goal and date.**
2. **Read through the 2021 AP penalty points guidelines (handout). This is what AP exam graders use to evaluate free response submissions on the test.**
3. **Answer the questions below about the guidelines in complete sentences.**

A. What do you think structure clearly conveys intent means?
B. Do you lose a point if two variables are used but only one is declared? Explain why or why not.
C. What are three remaining questions you have about the scoring criteria?

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- A. this means that you use some other means, such as indentation, to indicate the scope of a function or control structure. If you forget a bracket, semi-colon, or parens but it's clear from the code what's going on, you won't be docked points. In other words, the code is allowed to look more Python-like than actual code that would be read by a Java compiler (which begs the question why we aren't just using Python…).

B. No, only one variable actually has to be declared. I assume this shows you know how to declare variables so they don't care if you fail to consistently declare new variables.

C. Possible questions:
+what is a side-effect? code has a side effect if it has effects outside of its intended scope. +What is a non-op? A 'non-op' is a statement that has no effect on the program. This would be a ; with nothing else in Java (or pass in Python). Also a slang term in coding world for someone who doesn't contribute anything to a project.
+What does collection access refer to? A collection is another way to store data in Java. We'll learn about it next unit.
+What does it mean to use a keyword as an identifier? This means, e.g., to use a word like 'class' as a variable name

framing

- **what:** use AP scoring guidelines to self-assess on free response questions
- **why:** This will help you understand what a good answer looks like on AP free response questions.
- **where to:** Review (tomorrow). Arrays exam (Thursday)

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Warm up

Be sure to… Silently read through the instructions below to a free response question. Write down any questions in your notes.

The `divBySum` method is intended to return the sum of all the elements in the `int` array parameter `arr` that are divisible by the `int` parameter `num`. Consider the following examples, in which the array `arr` contains `{4, 1, 3, 6, 2, 9}`.

- The call `divBySum(arr, 3)` will return 18, which is the sum of 3, 6, and 9, since those are the only integers in `arr` that are divisible by 3.
- The call `divBySum(arr, 5)` will return `0`, since none of the integers in `arr` are divisible by 5.

Complete the `divBySum` method using an enhanced `for` loop. Assume that `arr` is properly declared and initialized. The method must use an enhanced `for` loop to earn full credit.

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Give 1-2 minutes to silently read. Then have students read aloud.

Pass out handout.

How to grade a free response question

Be sure to…
1. Read the question scoring rubric (below).
2. Examine the student's solution (handout).
3. On the back page of your worksheet,
   A. use the penalty points guidelines and rubric criteria to assign a grade to this student's work, citing specific reasons to justify your grade.
   B. Remember: You can give points for the reasons below and also take points away.
4. Be prepared to share out.

Points earned	Rubric criteria	Response does not earn points if it
+1	Traverse all elements of `arr` using an enhanced for loop	confuses array access with collection access
+1	Identifies elements in `arr` that are divisible by `num`.	
+1	Correctly increments `sum`.	

Canonical solution:

```
public static int divBySum(int[] arr, int num)
{
   int sum = 0;
   for (int x : arr)
   {
      if (x % num == 0)
      {
         sum += x;
      }
   }
   return sum;
}
```

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+Why don't we take points away for missing curly brackets? Because curly brackets are unnecessary as long as "structure conveys intent", which in this case is accomplished through indentation
+ why does the student lose points for not declaring the sum variable? because they don't declare any other variables anywhere else.

This student would end up with +1 point. They gain two points for (i) traversing the elements of arr with an enhanced for loop, and (ii) identifying divisibility with %. They fail to gain points for not correctly incrementing sum. They lose one point for not declaring any variables.

Independent work:

For each problem on workhseet, be sure to…
1. Carefully read the question prompt.
2. On scrap paper, make a plan by working out solution using pseudocode.
3. Implement your solution in Java (on worksheet)
4. When you're finished with a question:
   A. Ask Dr. O'Brien for question scoring criteria.
   B. use the penalty points guidelines and scoring criteria to assign a grade to your own work, citing specific reasons to justify your self-assessed grade. Write down your grade and explanation on the back page of your worksheet.

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hand out main worksheet.

Practice problem #1

be sure to: Review your work. Be prepared to share out!

Discussion questions:
1. When you self-assessed, what did you lose points on?
2. What do you understand better than you did before?

An array of `String` objects, `words`, has been properly declared and initialized. Each element of `words` contains a `String` consisting of at least 3 lowercase letters (a–z).

Write a code segment that uses an enhanced `for` loop to print all elements of `words` that end with `"ing"`. As an example, if `words` contains `{"ten", "fading", "post", "card", "thunder", "hinge", "trailing", "batting"}`, then the following output should be produced by the code segment.

```
fading
trailing
batting
```

Write the code segment as described above. The code segment must use an enhanced `for` loop to earn full credit.

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1. What is this problem asking you to do?
   Traverse a loop, finding each word ending in "-ing", then printing that word.
2. How could you make a plan by writing a pseudo code algorithm
   for each item in ARRAY:
      if last three letters of item == "ing": then print(item)
3. How do you implement this in Java?

```
for (String word : words){
  int length = word.length();
  String ending = word.substring(length - 3, length);
  if (ending.equals("ing"){
    System.out.println(word)
  }
}
```

+Why is it important to use .equals(), instead of == here? because "==" means reference equality (comparing locations in memory). we want to compare the content of the two strings.

+how do I isolate the final three characters in a string? Use the subString method.

Practice problem #2a

Discussion questions:
1. When you self-assessed, what did you lose points on?
2. What do you understand better than you did before?

(a) Write the `countNotInVocab` method. Assume that there are no duplicates in `wordArray`. You must use `findWord` appropriately to receive full credit. text

```
/** Counts how many strings in wordArray are not found in theVocab, as described in
 * part (a).
 */
public int countNotInVocab(String[] wordArray)
```

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+what is this problem asking me to do?
Traverse wordArray, count how many words are not in theVocab list.

+how do I make a plan?
For each word in wordArray:
   If word not in theVocab: then add 1 to counter

+how do I implement my plan in Java?

```
public static int divBySum(int[] arr, int num)
{
  int counter = 0;
  for (int word : wordArray){
    if ( !(word.findWord()){
       counter ++;
    }
  }
 return counter
```

Practice problem #2b

Discussion questions:
1. When you self-assessed, what did you lose points on?
2. What do you understand better than you did before?

Write the `notInVocab` method (**see handout**). Assume that there are no duplicates in `wordArray`. You must call `findWord` and `countNotInVocab` appropriately in order to receive full credit.

```
/** Returns an array containing strings from wordArray not found in theVocab,
 * as described in part (b).
 */
public String[] notInVocab(String[] wordArray)
```

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+what are you trying to do in this problem?
Make an array of all strings not found in theVocab.

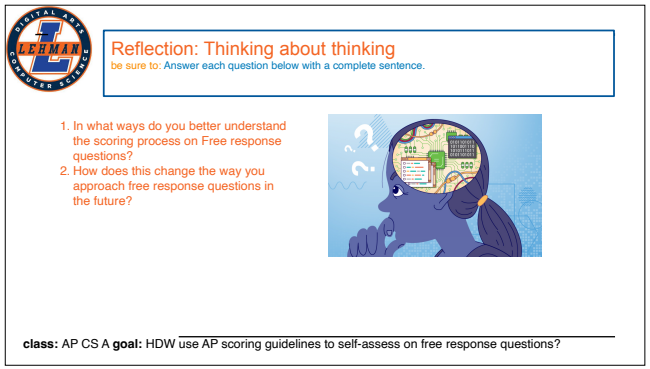
+how do I make a plan?
Make ARRAY of length countNotInVocab
For word in wordarrray:
   If word not in theVocab:
      Add to ARRAY

+how do we implement this in Java ?

```
public String[] notInVocab(String[] wordArray) {
  int count = CountNotInVocab(wordArray)
 Counter = 0
  String[] newArray = new String[count];
 For (String word : wordArray{
     If !word.findaWord() :
          newArray[counter] = word
          counter++
```

+why is it a good idea to use countnotinvocab? Arrays need to be of a specific size so this helps in initializing the array.

+how could you solve this problem without countNotInVocab? You could make the array the same length as wordArray, since this is the max possible length of this array.



1. Answers will vary, but students should have a better understanding of how the questions will be graded.
2. Students should pay less attention to certain details of Java syntax (brackets, parens, and so on) and more to the logical structure of their programs. This is why making a plan with pseudocode is helpful.
