

2016 AP[®] COMPUTER SCIENCE A FREE-RESPONSE QUESTIONS

4. This question involves the process of taking a list of words, called `wordList`, and producing a formatted string of a specified length. The list `wordList` contains at least two words, consisting of letters only.

When the formatted string is constructed, spaces are placed in the gaps between words so that as many spaces as possible are evenly distributed to each gap. The equal number of spaces inserted into each gap is referred to as the *basic gap width*. Any *leftover spaces* are inserted one at a time into the gaps from left to right until there are no more leftover spaces.

The following three examples illustrate these concepts. In each example, the list of words is to be placed into a formatted string of length 20.

Example 1: wordList: ["AP", "COMP", "SCI", "ROCKS"]

Total number of letters in words: 14

Number of gaps between words: 3

Basic gap width: 2

Leftover spaces: 0

Formatted string:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
A	P			C	O	M	P			S	C	I			R	O	C	K	S

Example 2: wordList: ["GREEN", "EGGS", "AND", "HAM"]

Total number of letters in words: 15

Number of gaps between words: 3

Basic gap width: 1

Leftover spaces: 2

The leftover spaces are inserted one at a time between the words from left to right until there are no more leftover spaces. In this example, the first two gaps get an extra space.

Formatted string:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
G	R	E	E	N			E	G	G	S			A	N	D		H	A	M

Example 3: wordList: ["BEACH", "BALL"]

Total number of letters in words: 9

Number of gaps between words: 1

Basic gap width: 11

Leftover spaces: 0

Formatted string:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
B	E	A	C	H												B	A	L	L

You will implement three `static` methods in a class named `StringFormatter` that is not shown.

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- (a) Write the `StringFormatter` method `totalLetters`, which returns the total number of letters in the words in its parameter `wordList`. For example, if the variable `List<String> words` is `["A", "frog", "is"]`, then the call `StringFormatter.totalLetters(words)` returns 7. You may assume that all words in `wordList` consist of one or more letters.

Complete method `totalLetters` below.

```
/** Returns the total number of letters in wordList.  
 * Precondition: wordList contains at least two words, consisting of letters only.  
 */  
public static int totalLetters(List<String> wordList)
```

Part (b) begins on page 20.

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2016 SCORING GUIDELINES

Question 4: String Formatter

Part (a)	<code>totalLetters</code>	2 points
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Intent: Calculate the total number of letters in a list of words

- +1 Accesses all strings in `wordList` and adds length of each to accumulated count
(no bounds errors)
- +1 Initializes and returns accumulated count

Part (b)	<code>basicGapWidth</code>	2 points
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Intent: Calculate the minimum number of spaces (basic gap width) to be placed between each word in the formatted string

- +1 Calls `totalLetters` correctly and uses result
- +1 Returns correct calculated value

Part (c)	<code>format</code>	5 points
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Intent: Return a formatted string consisting of words from `wordList` separated by one or more spaces

- +1 Calls `basicGapWidth` and `leftoverSpaces` correctly and uses results
- +1 Adds all strings in `wordList` to formatted string in original order (no bounds errors)
- +1 Inserts `basicGapWidth` spaces between each pair of words in formatted string
- +1 Inserts one space between first `leftoverSpaces` pairs of words in formatted string
- +1 Initializes and returns formatted string (no extra or deleted characters)