

2017 AP[®] COMPUTER SCIENCE A FREE-RESPONSE QUESTIONS

3. This question involves analyzing and modifying a string. The following `Phrase` class maintains a phrase in an instance variable and has methods that access and make changes to the phrase. You will write two methods of the `Phrase` class.

```
public class Phrase
{
    private String currentPhrase;

    /** Constructs a new Phrase object. */
    public Phrase(String p)
    {   currentPhrase = p;   }

    /** Returns the index of the nth occurrence of str in the current phrase;
     *   returns -1 if the nth occurrence does not exist.
     *   Precondition: str.length() > 0 and n > 0
     *   Postcondition: the current phrase is not modified.
     */
    public int findNthOccurrence(String str, int n)
    {   /* implementation not shown */   }

    /** Modifies the current phrase by replacing the nth occurrence of str with repl.
     *   If the nth occurrence does not exist, the current phrase is unchanged.
     *   Precondition: str.length() > 0 and n > 0
     */
    public void replaceNthOccurrence(String str, int n, String repl)
    {   /* to be implemented in part (a) */   }

    /** Returns the index of the last occurrence of str in the current phrase;
     *   returns -1 if str is not found.
     *   Precondition: str.length() > 0
     *   Postcondition: the current phrase is not modified.
     */
    public int findLastOccurrence(String str)
    {   /* to be implemented in part (b) */   }

    /** Returns a string containing the current phrase. */
    public String toString()
    {   return currentPhrase;   }
}
```

Part (a) begins on page 12.

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- (a) Write the `Phrase` method `replaceNthOccurrence`, which will replace the `nth` occurrence of the string `str` with the string `repl`. If the `nth` occurrence does not exist, `currentPhrase` remains unchanged.

Several examples of the behavior of the method `replaceNthOccurrence` are shown below.

Code segments	Output produced
<pre>Phrase phrase1 = new Phrase("A cat ate late."); phrase1.replaceNthOccurrence("at", 1, "rane"); System.out.println(phrase1);</pre>	A crane ate late.
<pre>Phrase phrase2 = new Phrase("A cat ate late."); phrase2.replaceNthOccurrence("at", 6, "xx"); System.out.println(phrase2);</pre>	A cat ate late.
<pre>Phrase phrase3 = new Phrase("A cat ate late."); phrase3.replaceNthOccurrence("bat", 2, "xx"); System.out.println(phrase3);</pre>	A cat ate late.
<pre>Phrase phrase4 = new Phrase("aaaa"); phrase4.replaceNthOccurrence("aa", 1, "xx"); System.out.println(phrase4);</pre>	xxaa
<pre>Phrase phrase5 = new Phrase("aaaa"); phrase5.replaceNthOccurrence("aa", 2, "bbb"); System.out.println(phrase5);</pre>	abbba

Class information for this question

```
public class Phrase
```

```
private String currentPhrase
```

```
public Phrase(String p)
```

```
public int findNthOccurrence(String str, int n)
```

```
public void replaceNthOccurrence(String str, int n, String repl)
```

```
public int findLastOccurrence(String str)
```

```
public String toString()
```

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The `Phrase` class includes the method `findNthOccurrence`, which returns the `nth` occurrence of a given string. You must use `findNthOccurrence` appropriately to receive full credit.

Complete method `replaceNthOccurrence` below.

```
/** Modifies the current phrase by replacing the nth occurrence of str with repl.
 * If the nth occurrence does not exist, the current phrase is unchanged.
 * Precondition: str.length() > 0 and n > 0
 */
public void replaceNthOccurrence(String str, int n, String repl)
```

Part (b) begins on page 14.

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- (b) Write the `Phrase` method `findLastOccurrence`. This method finds and returns the index of the last occurrence of a given string in `currentPhrase`. If the given string is not found, `-1` is returned. The following tables show several examples of the behavior of the method `findLastOccurrence`.

```
Phrase phrase1 = new Phrase("A cat ate late.");
```

Method call	Value returned
<code>phrase1.findLastOccurrence("at")</code>	11
<code>phrase1.findLastOccurrence("cat")</code>	2
<code>phrase1.findLastOccurrence("bat")</code>	-1

Class information for this question

```
public class Phrase
```

```
private String currentPhrase
public Phrase(String p)
public int findNthOccurrence(String str, int n)
public void replaceNthOccurrence(String str, int n, String repl)
public int findLastOccurrence(String str)
public String toString()
```

WRITE YOUR SOLUTION ON THE NEXT PAGE.

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You must use `findNthOccurrence` appropriately to receive full credit.

Complete method `findLastOccurrence` below.

```
/** Returns the index of the last occurrence of str in the current phrase;  
 * returns -1 if str is not found.  
 * Precondition: str.length() > 0  
 * Postcondition: the current phrase is not modified.  
 */  
public int findLastOccurrence(String str)
```