

**2017 AP<sup>®</sup> COMPUTER SCIENCE A FREE-RESPONSE QUESTIONS**

**COMPUTER SCIENCE A  
SECTION II**

**Time—1 hour and 30 minutes**

**Number of questions—4**

**Percent of total score—50**

**Directions: SHOW ALL YOUR WORK. REMEMBER THAT PROGRAM SEGMENTS ARE TO BE WRITTEN IN JAVA.**

Notes:

- Assume that the interface and classes listed in the Java Quick Reference have been imported where appropriate.
- Unless otherwise noted in the question, assume that parameters in method calls are not `null` and that methods are called only when their preconditions are satisfied.
- In writing solutions for each question, you may use any of the accessible methods that are listed in classes defined in that question. Writing significant amounts of code that can be replaced by a call to one of these methods will not receive full credit.

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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 `n`th 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)
```