

AP Computer Science A  
'for' Loop Practice

Write a program named LastnameForLoopsPractice that contains the following:

(Note: You may place all of your code in your main method or write a method for each problem and call those methods from main.)

1. Determine the output from the following program and place your answer in your LastnameForLoopsPractice program as a comment.

```
public class ForOutputProblems {
    public static void main(String[] args) {
        for (int i = 1; i <= 10; i += 2) {
            System.out.print(i + " ");
        }
        System.out.println();
        System.out.println();

        for (int i = 1; i < 20; i += 3 * i - 1)
            System.out.print(i + " * ");
        System.out.println();
        System.out.println();

        for (int i = 1; i < 4; i++) {
            for (int j = 3; j >= 1; j--) {
                System.out.print(i + " " + j + " ");
            }
            System.out.println();
        }
        System.out.println();

        for (int i = 4; i < 6; i++) {
            for (int j = 0; j < 4; j += i / 2 + 1) {
                System.out.print(i + " " + j + " ");
            }
            System.out.println();
        }
        System.out.println();

        for (int i = 1; i < 3; i++) {
            for (int j = 3; j >= 1; j--) {
                for (int k = 0; k < 2; k++) {
                    System.out.print(i + " " + j + " " + k + " ");
                }
                System.out.println();
            }
            System.out.println();
        }
    }
}
```

2. Add a comment to your LastnameForLoopsPractice program that fills in the table below for the following Loops class.

```
public class Loops {
    public static void main(String[] args) {
        for (int i = 1; i <= 3; i++) {
            for (int j = 1; j <= 4 - i; j++) {
                System.out.print(" ");
            }
            for (int j = 1; j <= 2 * i - 1; j++) {
                System.out.print("*");
            }
            System.out.println();
        }
    }
}
```

| Loop Counter 'i' | Loop Counter 'j' | Output |
|------------------|------------------|--------|
|                  |                  |        |
|                  |                  |        |
|                  |                  |        |
|                  |                  |        |
|                  |                  |        |
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|                  |                  |        |
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|                  |                  |        |
|                  |                  |        |
|                  |                  |        |

3. Assume that you have a control variable called *i* that will take on the values 1, 2, 3, 4, and so on. Note that the control variable starts with 1 and not 0. You are going to formulate expressions in terms of *i* that will yield different sequences. Remember the formula:  $y = mx + b$ , where *i* is *x* and the sequence output is *y*. For example, to get the sequence 2, 4, 6, 8, 10, 12, ..., you would use the expression  $(2 * i)$ . Fill in the table below, indicating an expression that will generate each sequence. Complete at least 2 of 4 sequence expressions and place your responses in your LastnameForLoopsPractice program as a comment.

| Sequence                     | Expression |
|------------------------------|------------|
| 4, 19, 34, 49, 64, 79, ...   |            |
| 30, 20, 10, 0, -10, -20, ... |            |
| -7, -3, 1, 5, 9, 13, ...     |            |
| 97, 94, 91, 88, 85, 82, ...  |            |

4. Write code that uses a 'for' loop structure to produce 21. Start with initializing a variable named *sum* to 0 prior to the 'for' loop. Then each time through the 'for' loop, add the control variable value to *sum*. The first time through the 'for' loop the control variable should have a value of 1. More specifically, add 1, which is the value of the control variable, to *sum* the first time through the 'for' loop, then add 2, which is not the value of the control variable, to *sum* on the second time through the 'for' loop, then 3 then 4 then 5 then 6.  $(1 + 2 + 3 + 4 + 5 + 6 = 21)$ . The algorithm used is often referred to as a cumulative sum.

5. Each time Sara re-reads her Java book, she learns 10% of whatever material she didn't know before. She reads the book every month. She needs to score at least 95% on the comprehensive exam to become a certified Java developer. When Sara started, she knew nothing about Java. Write code that simulates Sara's learning progress and prints her percentage learned after 20 months of reading her Java book.

6. Fibonacci numbers are a sequence of integers in which the first two elements are 1, and each following element is the sum of the preceding elements. The mathematical definition of each kth Fibonacci number is the following:

$$\begin{aligned} \text{a. } F(k) &= F(k-1) + F(k-2), k > 2 \\ &= 1, k \leq 2 \end{aligned}$$

The first 12 Fibonacci numbers are 1 1 2 3 5 8 13 21 34 55 89 144

Add to your program LastnameForLoopPractice code that computes and prints the first 12 Fibonacci numbers.

Consider using the following two statements to update number values within the for loop, where n3 is F(k), n2 is F(k-1) and n1 is F(k-2).

```
n1 = n2;
n2 = n3;
```

You may start by initializing n1 and n2 to 1 outside of the 'for' loop and calculating the remaining numbers from within the 'for' loop.

7. Use nested for loops to produce the following output:

```
*****
*****
*****
```

8. Add to your LastnameForLoopsPractice program by writing nested for loops to produce the output shown in a) OR b) below:

| a)      | b)          |
|---------|-------------|
| 1       | ----1----   |
| 22      | ----333---- |
| 333     | ---55555--- |
| 4444    | --7777777-- |
| 55555   | -999999999- |
| 666666  |             |
| 7777777 |             |