

Unit 4 AP Computer Science A Practice Exam

Iteration

Section I—Multiple Choice

Optional Time – 20 minutes

14 Questions

- 1) Which of the following are true about *while* loops?

- I. *While* loops change the flow of control by repeating a set of statements zero or more times until a condition is met.
- II. A *while* loop is an infinite loop when the boolean expression always evaluates to *true*.
- III. If the boolean expression evaluates to false initially, the loop body is not executed at all.

- (A) I only
- (B) II only
- (C) I and II
- (D) II and III
- (E) I, II, and III

- 2) Which of the following is the output of the code below?

```
int a = 1;

while (a < 10) {
    System.out.print(a);
    System.out.print(" ");
    a++;
}
```

- (A) 1 2 3 4 5 6 7 8 9
- (B) 1 2 3 4 5 6 7 8 9 10
- (C) 1 2 3 4 5 6 7 8 9 10 11
- (D) 2 3 4 5 6 7 8 9 10
- (E) This is an infinite loop

- 3) Which of the following is the output of the code below?

```
boolean a = true;
int b = 1;
int c = 0;
while (a) {

    if (b > 10)
        a = false;

    c += 1;
    b--;
}

System.out.println(c);
```

- (A) 8
- (B) 9
- (C) 10
- (D) 11
- (E) This is an infinite loop

- 4) Which of the following is the output of the code below?

```
int a = 0;
int b = 0;

while (a < 3) {

    while (b < 4) {

        System.out.print("* ");
        b++;
    }
    b = 0;
    a++;
}
```

- (A) * * * * *
- (B) * * * * *
- (C) * * * * *
- (D) * * * * *
- (E) This is an infinite loop

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Good luck!

Answer questions 5 and 6 based on the code below.

```
int a = 0;
int endARange = ? ;

int b = 0;
int endBRange = ? ;

while (a < endARange) {
    while (b < endBRange) {
        System.out.print("* ");
        b++;
    }
    System.out.println();
    b = 0;
    a++;
}
```

- 5) Which of the following best describes the output from the code above?
- (A) There is a table of “*” outputted, with the number of rows equal to the *endARange* variable and the number of columns equal to the *endBRange* variable.
 - (B) There is a table of “*” outputted, with the number of rows equal to the *endBRange* variable and the number of columns equal to the *endARange* variable.
 - (C) There is a table of “*” outputted, with the number of rows one less than the *endARange* variable and the number of columns one less than the *endBRange* variable.
 - (D) There is a table of “*” outputted, with the number of columns one less than the *endARange* variable and the number of rows one less than the *endBRange* variable.

- 6) Which of the following best describes the output from the code above, if *endARange* is equal to 5 and the *endBRange* is equal to 4?

(A)

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

(B)

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

(C)

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

(D)

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

-
- 7) Which of the following is the output of the code below?

```
int a = 5;
int b = 7
while (a > 10 && b < 10) {
    a--;
    b++;
}

System.out.print(a);
System.out.print(" ");
System.out.print(b);
```

- (A) 10 10
- (B) 5 10
- (C) This is an infinite loop
- (D) There will be no output
- (E) There will be an error

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8) Which of the following are true about *for* loops?

- I. There are three parts in a *for* loop header: The initialization of a variable, the boolean expression, and the increment or decrement.
- II. *For* loops can rarely be written to an equivalent *while* loop.
- III. If the boolean expression evaluates to false initially, the loop body is not executed at all.

- (A) I only
- (B) I and II
- (C) I and III
- (D) II and III
- (E) I, II, and III

9) Which of the following is the output of the code below?

```
for (int i = 0; i < 5; i++) {  
    System.out.print(i);  
    System.out.print(" ");  
}
```

- (A) 0 1 2 3 4
- (B) 0 1 2 3 4 5
- (C) 1 2 3 4
- (D) 1 2 3 4 5
- (E) This is an infinite loop

10) Which of the following is the output of the code below?

```
int a = 2;  
for (int i = a - 1; true; i++) {  
    System.out.print(i);  
    System.out.print(" ");  
}
```

- (A) 2 1 0
- (B) 0 1 2
- (C) 1 2
- (D) Nothing would output
- (E) This is an infinite loop

11) How many "*" are shown in the output for the code below?

```
for (int a = 0; a < 4; a++) {  
    for (int b = 0; b < 5; b++) {  
        System.out.println("*");  
    }  
}
```

- (A) 12
- (B) 16
- (C) 20
- (D) 25

12) What is the exception raised when a loop runs infinitely?

- (A) Indefinite loop error
- (B) Infinite loop error
- (C) Stack overflow error
- (D) No exception is raised

13) If a *for* loop executes infinitely, this most likely indicates a problem with which part in the header?

- (A) The initial value of the increment variable
- (B) The increment of the variable
- (C) The condition in the header
- (D) Any of the above

14) If a *while* loop executes infinitely, this most likely indicates which problem?

- (A) The condition expression is not a boolean type
- (B) The condition expression was never changed from *true* to *false*.
- (C) The condition expression was never changed from *false* to *true*
- (D) A *for* loop would work better in the scenario.

END OF SECTION I

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Section II – Free Response Section

Optional Time – 20 minutes

2 Questions

- 1) This question involves the implementation of a multiplication table generator represented by the `MultiplicationTable` class.

A multiplication table shows the products of the number in the header of the row and the header of the number in the column. There are two dimensions for a multiplication table, one for the x (horizontal) axis, and one for the y (vertical) axis. The following is a 12 x 12 multiplication table:

x	1	2	3	4	5	6	7	8	9	10	11	12
1	1	2	3	4	5	6	7	8	9	10	11	12
2	2	4	6	8	10	12	14	16	18	20	22	24
3	3	6	9	12	15	18	21	24	27	30	33	36
4	4	8	12	16	20	24	28	32	36	40	44	48
5	5	10	15	20	25	30	35	40	45	50	55	60
6	6	12	18	24	30	36	42	48	54	60	66	72
7	7	14	21	28	35	42	49	56	63	70	77	84
8	8	16	24	32	40	48	56	64	72	80	88	96
9	9	18	27	36	45	54	63	72	81	90	99	108
10	10	20	30	40	50	60	70	80	90	100	110	120
11	11	22	33	44	55	66	77	88	99	110	121	132
12	12	24	36	48	60	72	84	96	108	120	132	144

In the table above, all of the products of numbers between 1 and 12 are shown. For example, to see the product of 9 and 8 ($9 * 8$), you would look for the cell in row 9 with the column of 8.

Multiplication tables are generally symmetrical in terms of axis length, however it is possible that they are not.

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Good luck!

In this question, you will write two methods in the following `MultiplicationTable` class.

```
public class MultiplicationTable
{

    /** Returns the value of two numbers multiplied together. */
    private static int multiplyNumbers(int num1, int num2)
    { /* to be implemented in part (a) */ }

    /** Prints out a multiplication table with headers to the log with the dimensions
        * specified.
        */
    private static void renderTable(int xDim, int yDim)
    { /* to be implemented in part (b) */ }

}
```

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Good luck!

- (a) Write the static method `multiplyNumbers`, which returns product of the `num1` and `num2`.
1. This function **MUST** use **ONLY** loops and the addition operation to multiply both numbers.
 2. The multiplication operator or related compound operators must **NOT** be used to receive full credit.
 3. Assume the `num1` parameter and the `num2` parameter are non-negative integers.

Complete the method `multiplyNumbers` below.

```
/** Returns the value of two numbers multiplied together. */  
private static int multiplyNumbers(int num1, int num2)
```

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Good luck!

- (b) Write the method `renderTable`, which will print a multiplication table into the log based on the `xDim` and `yDim` variables, which represent the x-axis dimension and the y-axis dimension, respectively.
1. Each cell in a row printed in the multiplication table must be separated by the space character " ".
 2. Be sure to include the header row and header column, as row 1 and column 1 respectively.
 3. The top left corner of the multiplication table should be represented by a "x", which is a common multiplication symbol.
 4. Use the `multiplyNumbers` method defined above to determine the value that should be placed in each cell of the multiplication table. Assume the `multiplyNumbers` method was defined correctly.

Example 1

The following example shows the output for which the parameters `xDim` and `yDim` both equal 8.

```
x 1 2 3 4 5 6 7 8
1 1 2 3 4 5 6 7 8
2 2 4 6 8 10 12 14 16
3 3 6 9 12 15 18 21 24
4 4 8 12 16 20 24 28 32
5 5 10 15 20 25 30 35 40
6 6 12 18 24 30 36 42 48
7 7 14 21 28 35 42 49 56
8 8 16 24 32 40 48 56 64
```

NOTE: The table does not look even due to the varying lengths of the numbers, however it is acceptable this way.

Example 2

The following example shows the output for which the parameter `xDim` is equal to 5 and `yDim` is equal to 3.

```
x 1 2 3 4 5
1 1 2 3 4 5
2 2 4 6 8 10
3 3 6 9 12 15
```

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Good luck!

Complete the method `renderTable` below.

```
/** Prints out a multiplication table with headers to the log with the dimensions
 * specified.
 */
private static void renderTable(int xDim, int yDim)
```

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END OF SECTION II

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