Homework – Nested Loop

1. Trace the following programs.

Program	Memory	Output
| ```java
final int SIZE = 5;
for (int i = 1; i < SIZE; i++) {
   for (int j = SIZE; j >= i; j--) {
      System.out.println(i * 2 + j);
   }
}
``` | SIZE (final int): 5<br>i (int): 1 2 3 4<br>j (int): 5 4 3 2 1 5 4 3 2<br>5 4 3 5 4 | 7<br>6<br>5<br>4<br>3<br>9<br>8<br>7<br>6<br>11<br>10<br>9<br>13<br>12<br>15<br>> |
| ```java
for (int j = 22; j <= 25; j++) {
   for (int k = 7; k <= 10; k++) {
      if (j % 2 == k % 2) {
         System.out.println(j);
      } else {
         System.out.println(k);
      }
   }
   System.out.println();
}
``` | j (int): 22 23 24<br>k (int): 7 8 9 10 | 7<br>22<br>9<br>22<br><br>23<br>8<br>23<br>10<br><br>7<br>24<br>9<br>24<br><br>25<br>8<br>25<br>10 |
| ```java
for (int j = 8; j > 2; j-=2) {
   System.out.println(j + ":");
   for (int k = 2; k <= j; k++) {
      System.out.print(j+k);
   }
   System.out.println();
}
``` | j (int): 8 6 4<br>k (int): 2 3 4 5 6 7 8 2 3<br>4 5 6 2 3 4 | 8:<br>10111213141516<br>6:<br>89101112<br>4:<br>678 |

2. **Rectange.java** Write a program that draws a rectangle with stars, given the number of rows and columns.

Sample Input	Sample Output
`Enter # of rows:   5` `Enter # of columns:   4`	`****` `****` `****` `****` `****`

3. **TableOfNumbers.java** Write a program that will prompt user for two numbers x & y then output a table of numbers with x rows and each of the rows lists number from 1 to y, separated by a space.

Sample Input	Sample Output
`Enter x:   5` `Enter y:   6`	`1 2 3 4 5 6` `1 2 3 4 5 6` `1 2 3 4 5 6` `1 2 3 4 5 6` `1 2 3 4 5 6`

4. **TriangleOfNumbers.java** Write a program using nested loops that prints the following pattern.
```
1
12
123
1234
12345
```

5. **PythagoreanTriples.java** Three positive integers a, b, and c with a < b < c form a Pythagorean triplet if $a^2 + b^2 = c^2$. For example 3, 4, 5 form a Pythagorean triplet since $3^2 + 4^2 = 5^2$. Write a program that first prompts the user for a positive integer and then finds and prints all Pythagorean triplets whose largest member is less than or equal to that integer.