**Computer Science 2**   **Lab # 03**



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**CS2 Section # \_\_\_\_**

**Due:** Problem A by the **end of the lab** and Problems B by the end of **Saturday** of the same week.

**Problem B: HeadsAndTails**

**Problem Description:**

Nine coins are placed in a 3x3 matrix with some face up and some face down. You can represent the state of the coins using a 3x3 matrix with [values](https://pearson.turingscraft.com/codelab/jsp/core_dhtml.jsp?) 0 (heads) and 1 (tails). Here are some examples:  
  
0 0 0 1 0 1 1 1 0  
0 1 0 0 0 1 1 0 0  
0 0 0 1 0 0 0 0 1  
  
Each state can also be represented using a binary number. For example, the preceding matrices correspond to the numbers:  
  
000010000 101001100 110100001  
  
There are a total of 512 possibilities, so you can use decimal numbers 0, 1, 2, 3,...,511 to represent all the states of the matrix.   
  
Write a [program](https://pearson.turingscraft.com/codelab/jsp/core_dhtml.jsp?) that prompts the user to enter a number [between](https://pearson.turingscraft.com/codelab/jsp/core_dhtml.jsp?) 0 and 511 and displays the corresponding matrix with the [characters](https://pearson.turingscraft.com/codelab/jsp/core_dhtml.jsp?) H and T.

**Analysis:**

(Describe the problem including input and output in your own words. Type your answer in the following with **BLUE font color**)

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| **Use a 2D to create a 3x3 matrix with values 0 and 1 to represent heads and tails. Since there are a total of 512 possibilities, the user can use numbers 0-511 to represent the state of the coins in the matrix.** |

**Design:**

(Describe the major steps for solving the problem. Type your answer in the following with **BLUE font color**)

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| 1. **Ask the user to enter a number to represent the state of the coins.** 2. **Convert the number entered to a string** 3. **Use a nested for loop to go into the indices of the 2D array** |

**Coding:** (Copy and Paste Source Code here. Type your answer in the following with **BLUE font color**)

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| **import java.util.Scanner;  public class HeadsAndTails{  public static void main(String[] args){  Scanner input = new Scanner(System.in);  char [][] array = new char[3][3];  System.out.print("Enter an integer representing the state of the coins:");  int num = input.nextInt();    String binary = Integer.toBinaryString(num);  binary = String.format("%09d", Integer.parseInt(binary));  num = 0;   for(int i=0; i<3; i++){  for(int j=0; j<3; j++){  char a = binary.charAt(num);  if(a=='0'){  array[i][j] = 'H';  }else{  array[i][j] = 'T';  }  num++;  if(j==2){  System.out.print(array[i][j]);  }else{  System.out.print(array[i][j] + " ");  }  }  System.out.println("");  }  } }** |

**Testing:** (Describe how you test this program. Type your answer in the following with **BLUE font color**)

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| **Test 1**  **Enter·an·integer·representing·the·state·of·the·coins:255↵**  **H·T·T↵**  **T·T·T↵**  **T·T·T↵** |