Question 1

The purpose of this question is to write a complete Python program that represents some trash cans using a two dimensional array. Each column of the array represents a trash can. Each row of the array represents bags of trash in the cans. Each trash can holds the same number of bags of trash. When one can is filled with bags of trash a message is displayed and the program terminates.

Write a function that begins with the following header:

```
def getPosInt(prompt):
```

Call this function to get a positive integer from the user. Valid input is an *int* greater than zero. The function displays the *prompt* to tell the user what to enter. If the user does not enter valid input display the appropriate error message as described below and display the *prompt* again asking for more input from the user. Repeat this until the user enters valid input. When the user enters valid input return that input.

Error situations:

- If the user presses enter/return without entering anything display the message 'Missing input!'
- If the input causes an exception when passed to *eval* display the value of the input and the message 'is not valid!'
- If the input is not an *int* display the value of the input and the message 'is not an integer!'
- If the input is not greater than 0 display the value of the input and the message 'is not greater than 0!'

Write a function that begins with the following header:

```
def getBoundedInt(prompt, lowerBound, upperBound):
```

Call this function to get an integer between *lowerBound* and *upperBound* from the user. Valid input is an *int* between *lowerBound* and *upperBound* inclusive. The function displays the *prompt* to tell the user what to enter. If the user does not enter valid input display the appropriate error message as described below and display the *prompt* again asking for more input from the user. Repeat this until the user enters valid input. When the user enters valid input return that input.

Error situations:

- If the user presses enter/return without entering anything display the message 'Missing input!'

- If the input causes an exception when passed to *eval* display the value of the input and the message 'is not valid!'
- If the input is not an *int* display the value of the input and the message 'is not an integer!'.
- If the input is not between the lower bound and the upper bound display the value of the input followed by ' is not between ' followed by the value of the lower bound followed by ' and ' followed by the value of the upper bound followed by
  '!'

Write a function that begins with the following header:

```
def addTrashToCan(trashCans, can, counters):
```

This function is given the array representing the trash cans, the index of the can to which a bag is to be added and the array of counters of the number of bags in each trash can. For example if there are 3 trash cans and *counters* is [1, 0, 2] then trash can 0 contains 1 bag of trash, trash can 1 does not contain any bags of trash and trash can 2 contains 2 bags of trash. In this example if *can* has the value 0, add a bag of trash to *trashCans* where the column is the value of *can* and the row is the value of *counters[can]*. The value to assign to this location is the new number of bags in the trash can. Increment the counter for the number of bags in the trash can.

Return True if the trash can is full and False if the trash can is not full. A trash can is full if its counter is equal to the number of rows in *trashCans*.

Write a function that begins with the following header:

```
def displayTrashCans(trashCans):
```

This function is given an array that represents the trash cans. Display the array values row by row, starting with the last row. The output should be similar to the following:

```
 |  |  |  |  |  |
 |  |  |  3  |  |  |

 |  |  |  2  |  2  |  2  |
| 1  |  1  |  1  |  1  |  1  |

 ---  ---  ---  ---  ---
```

for 5 partially filled trash cans that can hold 4 bags of trash each. Trash can 0 is shown on the left and trash can 4 is shown on the right.

Write a function that begins with the following header:

```
def main():
```

This function calls *getPosInt* twice, once to get the number of trash cans and once to get the number of bags per trash can. Each trash can holds the same number of bags as the other trash cans. Using this information create two arrays, one that represents the trash cans where the number of rows is the number of bags per trash can and the number of columns is the number of trash cans, and another array that
holds the number of bags in each trash can. Initialize each element of these arrays to zero. Zero represents an array element that does not hold a bag of trash.

Repeatedly request the number of a trash can to which a bag of trash is to be added by calling *getBoundedInt*. Call *addTrashToCan* to add a bag of trash to the can. After each bag of trash is added to a trash can display the contents of the trash cans by calling *displayTrashCans*. If *addTrashToCan* returns True display a message indicating which can is full and that the trash should be picked up for disposal, and terminate the program.

Before it ends this function must display the termination message.
The main program should contain the function definitions, any imports needed by the functions and a call to *main*.
For 5 trash cans that can each hold three bags of trash the output from the program might be:

```
Enter the number of trash cans (> 0): 5
Enter the number of bags per trash can (> 0): 3

Enter a trash can number between 0 and 4: 1

|   |    |    |    |    |
|   |    |    |    |
    ||   |1|  |    |
    |
  --- --- --- --- ---


Enter a trash can number between 0 and 4: 2

|   |    |    |    |    |
|   |    |    |    |
    ||   |1|1||    |
  --- --- --- --- ---
```

```
  Enter a trash can number between 0 and 4: 3

 |   |    |    |    ||
 |   |    |    |    ||
 |   |1|1|1||
   --- --- --- --- ---

 Enter a trash can number between 0 and 4: 1

|    |    |    |    ||
|    |2|  |    ||
|    |1|  1|   1||
     --- --- --- --- ---


 Enter a trash can number between 0 and 4: 3

|    |    |    |    ||
|    |2|  |    2||| |
1|   1|   1||
     --- --- --- --- ---


 Enter a trash can number between 0 and 4: 4


    | | |      | |     |
    | | 2 |    | 2 |   |
    | | 1 | 1 | 1 | 1 |

    --- --- --- --- ---


 Enter a trash can number between 0 and 4: 1
 Trash can 1 is full! Time to have the trash picked up.

    | | 3 | | | |
    | | 2 | | 2 | |

    | | 1 | 1 | 1 | 1 |

    --- --- --- --- ---


 Programmed by Stew Dent.
```

```
Date: Thu Jul 15 09:45:01 2021.
End of processing.
```

Hand in your complete program.