**Question 1** **(25 marks)**

Write a program that asks the user to enter a number of rows, and then a number of columns. A valid number of rows is a number between 3 and 10 (inclusive). A valid number of columns is a number between 5 and 10 (inclusive). The program should validate the user inputs and continue to ask for the values until they are in the correct range.

The program should then use for loops to print a multiplication table with the number of rows and columns that the user entered. However, in place of the diagonals of a standard multiplication table (see 5x5 standard table below),

1 2 3 4 5

2 4 6 8 10

3 6 9 12 15

4 8 12 16 20

5 10 15 20 25

the program should:

* Print the capitalised first letter of your initials (first letter of first name) in place of the (left to right) diagonal starting at the first row, first column.
* Print the capitalised second letter of your initials (first letter of surname) in place of the (right to left) diagonal starting at the first row, last column.
* Print both of your initials at the point where/if the diagonals intersect.

Assuming your initials are CR, the following are example outputs, with user inputs shown in green:

Example 1

Enter rows (min 3, max 10): 5

Enter cols (min 5, max 10): 5

C 2 3 4 R

2 C 6 R 10

3 6 CR 12 15

4 R 12 C 20

R 10 15 20 C

Example 2

Enter rows (min 3, max 10): 7

Enter cols (min 5, max 10): 8

C 2 3 4 5 6 7 R

2 C 6 8 10 12 R 16

3 6 C 12 15 R 21 24

4 8 12 C R 24 28 32

5 10 15 R C 30 35 40

6 12 R 24 30 C 42 48

7 R 21 28 35 42 C 56**Question 2** **(25 marks)**

Follow these guidelines to print a pattern forming the capitalised first letter of your initials (i.e. the first letter of your first name), followed by the capitalised second letter of your initials (i.e. the first letter of your surname). The pattern of each initial should be five rows in height.

The pattern for each letter of your initials should be defined as an array of strings with five rows. Each row is a string of that letter and a number of spaces in relevant positions so that they form a pattern of that letter when the five rows are printed out.

The answer must make use of array(s) and for loop(s).

Example output (where your initials are CR):

CCCCC RRRRRR

C R R

C RRRRRR

C R R

CCCCC R R

Example output (where your initials are AW):

A W W

A A W W

AAAAA W W W

A A W W W W

A A W W

**Question 3 (25 marks)**

Write a java program that reads a user input of a four digit number. If a user enters a character or a symbol, the program should display an *Invalid entry* message and prompt the user to try again.

On a valid user entry, the program should pass the input to a method that converts each digit to the capitalized first letter and lowercase last letter of its respective name (i.e. 0 is Zo, 1 is Oe, 2 is To, 3 is Te, 4 is Fr, 5 is Fe, 6 is Sx, 7 is Sn, 8 is Et, 9 is Ne). The program should then display the converted string to the user.

Example behaviour on a valid user entry:

|  |
| --- |
| Please enter a four digit number: *5392*  Its string representation is: FeTeNeTo |

**Question 4** **(25 marks)**

Write a java program to display a completed version of the following table

such that:

* For each row in the table assign the values in the three columns on the left to variables x, y and z respectively.
* For each row in the table the program should evaluate each of the boolean expressions in the three columns on the right. If the expression evaluates to true, display the letter ‘T’ followed by your initials in the corresponding cell, otherwise display the letter ‘F’ followed by your initials.
* The program should format the output so that each column is neatly aligned.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| X | y | z | x || (y && z) | !x && (y || z) | (!x && y) || z |
| True | true | true |  |  |  |
| True | false | true |  |  |  |
| False | true | true |  |  |  |
| False | false | false |  |  |  |

**Deliverables:**

**A zip file containing:**

**For Question 1:** A program called c2*a1****q1****\_2022\_StudentName.java*

**For Question 2:** A program called c*2a1****q2****\_2022\_StudentName.java*

**For Question 3:** A program called c*2a1****q3****\_2022\_StudentName.java*

**For Question 4:** A program called c*2a1****q4****\_2022\_StudentName.java*

* **All programs must**
* INCLUDE COMMENTS
* INCLUDE CODE THAT IS CORRECTLY ALIGNED AND INDENTED
* COMPILE WITH NO ERRORS
* RUN WITHOUT CRASHING