

SE 2S03 — Assignment 1

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Due date: 30 September in class.

Problem 1 (10 points) Write a program that prints n , 3×3 staircases to the screen, where n is an integer in¹ $[0, 100]$. A 3×3 staircase must be represented by the following ASCII image:

```
#
##
###
```

There must be 5 staircases per row, except the last one, which can contain < 5 staircases. They must be separated by a blank “vertical line”. For example, your input and output should look like:

Enter number of staircases: 13

```
# # # # #
## ## ## ## ##
### ### ### ### ###
# # # # #
## ## ## ## ##
### ### ### ### ###
# # #
## ## ##
### ### ###
```

The main program should obtain the input n from the standard input. If $n \notin [0, 100]$, your program should print a message exactly as e.g.

```
Enter number of staircases: 123
n=123, must be in [0,100]
```

and return 1.

Store your program in a file with name `staircase.c`.

¹The notation $[a, b]$ means the integers $a, a + 1, a + 2, \dots, b$.

Problem 2 (5 points) Modify `staircase.c` such that it takes three **unsigned int** inputs:

n : number of staircases, where $n \in [0, 100]$

m : number of stairs, where $m \in [1, 9]$

p : number of staircases per row, where $p \in [1, 100]$

Then it should produce output as e.g.

Enter number of: staircases, stairs, rows: 13 7 5

```

  7      7      7      7      7
 77     77     77     77     77
777    777    777    777    777
7777   7777   7777   7777   7777
77777  77777  77777  77777  77777
777777 777777 777777 777777 777777
7777777 7777777 7777777 7777777 7777777
  7      7      7      7      7
 77     77     77     77     77
777    777    777    777    777
7777   7777   7777   7777   7777
77777  77777  77777  77777  77777
777777 777777 777777 777777 777777
7777777 7777777 7777777 7777777 7777777
  7      7      7
 77     77     77
777    777    777
7777   7777   7777
77777  77777  77777
777777 777777 777777
7777777 7777777 7777777

```

That is, instead of `#`, display the number of stairs.

If any of n, m , or p (or all) are outside their domain, your program should produce a message as the following:

Enter number of: staircases, stairs, rows: 101 11 2

n=101, must be in [1,100]

m=11, must be in [1,9]

Store your program in a file with name `staircase2.c`.

Problem 3 (10 points) Write a program that asks the user to input two positive integers separated by single space and computes their

(a) common factors,

(b) greatest common factor² (GCF),

²see https://en.wikipedia.org/wiki/Greatest_common_divisor

- (c) least common multiple³ (LCM), and
- (d) the sum of all common factors, the GCF, and the LCM.

This program should output the results for (a–d) exactly as e.g. with input 12 and 36

```
Enter two positive integers: 12 36
Common factors of (12, 36): 1 2 3 4 6 12
GCF: 12
LCM: 36
sum: 76
```

The input integers must be stored as **unsigned int**. To obtain full marks, your program must work correctly with integers up to 4294967295.

Store your program in file `factors.c`.

Problem 4 (5 points) Write a program that reads an **unsigned long int** from the standard input and outputs the number with the digits reversed. For example, the input 12345678 should result in the output 87654321 as

```
Enter an integer: 12345678
87654321
```

Store your program in file `reverse_long.c`.

Problem 5 (10 points) Write a program that reads a string of at most 20 characters, where each character stores a decimal digit. Then your program should output the string in reverse order, where leading and trailing zeros are omitted. For example, the input string 00010203040500 should result in the output 504030201 as

```
Enter a decimal string: 00010203040500
504030201
```

If the length of the input string is > 20 , your program should reverse the first 20 characters of this string as e.g.

```
Enter decimal string: 00123456789012345678900
876543210987654321
```

Note: if the input contains only zeros, the output should be the empty string.

Store your program in file `reverse_dec_string.c`.

Submit

- The above C files to Avenue. DO NOT CHANGE THE FILE NAMES.
- Hardcopy containing these files.

³see https://en.wikipedia.org/wiki/Least_common_multiple