EECS 2032
Practice C Programs
Fall 2019

1. Write a program that display an isosceles triangle that made of '*'. The program reads an integer from the standard input. Then it display on the standard output a triangle with the base equal to *n* *'s. The row above that have *n*-2 *'s and so on until the first row contains either 1 or 2 *'s (depending on *n* being odd or even.
   The figure below shows the triangle with *n* =7.

```
      *
    * * *
  * * * * *
* * * * * * *
```

2. Write a program that displays a rectangle on the screen. The program reads from the standard input three parameters, width, height, and a character. Them it display a rectangle with width and height using the character read. For example, if the input 7 5 x. The output should be

```
XXXXXXX
X     X
X     X
X     X
XXXXXXX
```

3. Write a program that encodes a message. The message is read from the standard input. The key is an integer (*k*). The program arranges the message in a r-by-K rectangle. Then the program displays the message column by column. For example if the key is 11, the message is

   If you are looking for ransom, I can tell you I don't have money. But what I do have are a very particular set of skills, skills I have acquired over a very long career. Skills that make me a nightmare for people like you\n

   The program arranges it in a x-by-~~11~~ (22) matrix (the number of columns is ~~11~~ 22)

```
If you are looking for
 ransom, I can tell yo
u I don't have money.
But what I do have are
 a very particular set
 of skills, skills I h
ave acquired over a ve
ry long career. Skills
 that make me a nightm
are for people like yo
u\n
```

Then, the output is displayed column by column

```
I uB  ar aufr uaovytr
 aIt fe
```
and so on

4. Can you think of a decoder program for the previous encoder?

5. Write a program that reads a person name on the form first name followed by either middle name and last name, or just last name. Then the program should display the name as last name followed by comma, then first letter of the first name followed by a period. For example

Input	Output
John Smith	Smith, J.
John D. Smith	Smith, J. D.
John David Smith	Smith, J. D.

The words in the input should be separated by any number of white spaces.

6. Write a program that calculates the average word length in a sentence. The input is a stream of words with no punctuations except the period at the end of the sentence. The program then displays the average word length. If the first character is a period, the program should display an appropriate message. The program should also ignores every thing after the first period.

7. Write a program that accepts an integer from the standard input and display the positions of the digits that are repeated.
   For example if the input is 56257278 the output should be 0,2,3,4,5,6
   Explaination: 56257278
   positions   01234567
   repeated   rnrrrrrn

where r means repeated, n means not repeated. Note that the first digit (5) is at position 0.

8. Write a program that reads a text file on the form

Student first name, last name, email addresses, three test scores.

Student names (first and last) are a maximum of 20 characters. Email address is a maximum of 20 characters. Then test scores are out of a 100. Each record (line) is read and stored in a struct with the above fields. Fields are separated by white spaces.

For simplicity, you should allocate (reallocate) memory each time you read 5 records.

Then your program should read inquires from the user, the query is on the form

`command    data`

The allowed commands are

`Tn   lastname`

Where n is either 1,2, or 3 followed by student last name

Your program should display

first name, last name of the student followed by result of test n

`Av lastname`

Your program should display firstname lastname and the average of the 3 scores with 2 decimal places

`CAV Tn`

where n is 1, 2, or 3. Your program should display the class average for test n.

`CAV`

Your program should display class average for all the three tests

average_test_1 average_test_2 average_test_3