

Programming Problems

ID1063: Introduction to Programming

1. Write a program that accepts a string and a number k and prints the string left-rotated k times.

Example runs:

Enter the string: APPLE

Enter the number of left-rotations: 1

The rotated string is: PPLEA

Enter the string: CHROME

Enter the number of left-rotations: 4

The rotated string is: MECHRO

2. Write a program that accepts a string of length at most 100 and displays the characters vertically in columns of size 10. Ignore spaces and punctuation marks.

Example run:

```
Enter a string: It was the best of times, it was the worst of times.
I s t s
t t w t
w o a o
a f s f
s t t t
t i h i
h m e m
e e w e
b s o s
e i r
```

3. Accept a string as input and print all subsets of the string (in any order). You may assume that the characters of the input string are distinct.

Example run:

Enter the string: CAT

T

A

TA

C

TC

AC

TAC

4. (a) Write a function `squareRoot` that accepts a non-negative floating point number, and computes its square root, up to 4 digits of accuracy after the decimal point.

(b) Write a function called `iterateFunction` that accepts the name f of a function, an argument x , and a natural number n , and computes the value of $f(f(f(\dots x)))$, where the function is iterated n times.

For example, if f is the `squareRoot` function from (a) and $x = 256$ and $n = 3$, then the output is 2.

5. Write a program that accepts the time of the day in India from the user and the name of a country, and prints the corresponding time in that country. Use the file `utcOffsets.txt` for this.

Example run:

Enter Indian time. Hours: 14 Min: 45

Enter name of the country: France

The time in France is 10 hours and 15 minutes.

6. The 15-puzzle is played as follows: There is a 4 by 4 matrix consisting of entries $1, 2, \dots, 9, A, B, C, D, E, F$ in 15 different positions and one empty position. The goal of the game is to start with an initial configuration of the grid and reach the configuration where the characters are in the right order by a sequence of moves, where each move consists of swapping the empty location with any of its neighboring values.

The matrix on the left is the desirable configuration. This can be reached from the configuration on the right by swapping the blank location value with B and then swapping the blank location value with C.

1	2	3	4
5	6	7	8
9	A	B	C
D	E	F	

1	2	3	4
5	6	7	8
9	A		B
D	E	F	C

Write a program that lets the user play the 15-puzzle. Display some initial configuration and accept a sequence of moves from the user and after each move, display the new matrix. The moves may be accepted as N,W,E or S, where N implies that the blank square has to be swapped with the square above it. W,E,S are self-explanatory. The program will stop if the user inputs the character X. Use zero (0) for the blank location.