

**High School Programming Competition**  
Computer Science Department, Saint Anselm College

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**Problem1.**

**Circular Permutations.** Generate all the circular permutations for a given **N** (ask for **N**,  $N > 1$ ).

*Input:*

Enter N? 5

*Output:*

```
0 1 2 3 4
1 2 3 4 0
2 3 4 0 1
3 4 0 1 2
4 0 1 2 3
```

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**Problem2.**

**Check magic square.** Enter a square of positive integers and check if it is *magic*. A magic square is a  $n \times n$  array where the sum of lines and columns are equal. Assume ( $n=3$ ).

**Testing examples:**

```
{ {7,3,5}, {6,8,1}, {2,4,9} }
{ {5,9,1}, {3,4,8}, {7,2,6} }
{ {5,1,9}, {3,8,4}, {7,6,2} }
```

*Input:*

Line 0? 7 3 5

Line 1? 6 8 1

Line 2? 2 4 9

*Output:*

YES, magic square (otherwise: NOT a magic square)

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**Problem3.**

**Display the first  $n=4$  perfect numbers.** A perfect number is the sum of its factors. Example:  $6 = 1 + 2 + 3$  and  $28 = 1 + 2 + 4 + 7 + 14$

*Output:*

```
6
28
?
?
```

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**Problem4.**

Enter a word (without blanks) and display its letters on each row in increasing number. Last row contains the last letters that remain after you apply this algorithm.

*Input:*

Enter word? Mathematician

*Output:*

```
M
a t
h e m
a t i c
i a n
```

Problem 5.

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Display all the Pythagorean triplets (a,b,c) (a, b, c positive integers,  $a > 0, b > 0, c > 0$  with  $a^2 + b^2 = c^2$ ) where  $a < 100, b < 100$ , without repetitions. The program should also have a counter and finally we can see how many they are.

Output:

#1 3 4 5

..