High School Programming Competition

Saint Anselm College, Saturday, April 6, 2013 @9:00-11:00 AM

Contest Problems

Problem 1.

Second smallest.

Generate 1-5 RANDOM integers with 2 digits. Find the smallest element that is strictly greater than the minimum element of the sequence. Print the sequence. Output the value of the number you find. If the sequence does not have one, output 0.

OUTPUT:

```
96    49    73    18    36

The smallest element that is strictly greater than the minimum element is:   36
```

OUTPUT:

```
14    14

The smallest element that is strictly greater than the minimum element is:   0
```

Problem 2.

Goldbach (1690 – 1764)

The Goldbach Conjecture asserts that every even integer greater than 2 can be written as the sum of two primes. Get a number from the user, if it is not even ask again, and then find two prime numbers that sum to the number.

INPUT/OUPUT:

```
        Enter a number?  80
        80 = 7 + 73
```

INPUT/OUPUT:

```
        Enter a number?  5
        Enter a number?  6
        6 = 1 + 5
```

Problem 3.

Numerology.

The corresponding digit of a given positive integer is the sum of all digits if it is a digit, if not you add the digits until you get ONE digit. Read the number from the user and then print all the sums that you get. Example: If your number is 4987. Add all digits you get 28 , add them again you get 10 then adding them again you get 1.

INPUT:

```
Enter number? 4987
```

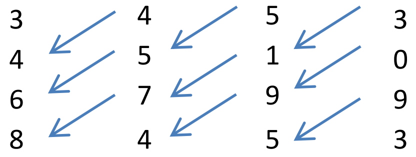
OUTPUT:

```
4987
28
10
1
```

Problem 4.

Matrix in Zigzag

Each time you run the program you generate a random size (between 2 and 7) matrix with numbers from 0-9. The program should display the random matrix and it should print it in this zigzag order. See order below. Always start from first line and follow the corresponding diagonal.



```
3   4   5   3
4   5   1   0
6   7   9   9
8   4   5   3
```

INPUT:

```
Enter size (2-7)? 4
```

OUTPUT:

```
3 4  5 3
4 5  1 0
6 7  9 9
8 4  5  3
3 4 4 5 5 6 3 1 7 8 0 9 4 9 5 3
```

INPUT:

```
Enter size (2-7)? 2
```

OUTPUT:

```
3 4
1 9
3 4 1 9
```

INPUT:

```
Enter size (2-7)? 9
Enter size (2-7)? 3
```

OUTPUT:

```
3 4 5
1 9 1
3 4 1
```

```
        3 4 1 5 9 3 1 4 1
```

Problem 5.

Arithmetical Expression.

Read an arithmetical expression using only **(**, **)**, **+**, **-**, ***** and positive digits (**0-9**). Elements in the expression are separated by no **spaces**. There are parenthesis for each allowed *binary* operation (**+,-,***). Compute the result of the correct arithmetic expression. If the expression does not follow the required format then you ask again.

Example.
(- 5) or (-5) are not admitted.
((3 + 7) *5 – 99)is not correct - should be (((3+7)*5)–9)

```
INPUT:
        Enter expression?  ( (3+7) *5)–9)
OUTPUT:
        41

INPUT:
        Enter expression?  ( ( 3 + 7 ) * 5 +  1 )
        Enter expression?  ( (3+7)*5)+1)
OUTPUT:
        51

INPUT:
        Enter expression?  (3)
        Enter expression?  (3+6)

OUTPUT:
        9
```