November 15, 2008

Computer Science Competition

Hands-On Programming Set

I. General Notes

1. Do the problems in any order you like. They do not have to be done in order from 1 to 12.

2. All problems have a value of 60 points.

3. There is no extraneous input. All input is exactly as specified in the problem. Unless specified by the problem, integer inputs will not have leading zeros. Unless otherwise specified, your program should read to the end of file.

4. Your program should not print extraneous output. Follow the form exactly as given in the problem.

5. A penalty of 5 points will be assessed each time that an incorrect solution is submitted. This penalty will only be assessed if a solution is ultimately judged as correct.

II. Point Values and Names of Problems

Number	Name	Point Value
Problem 00	Cow Time!!!	0
Problem 01	Tremendous Triangle!!!	60
Problem 02	Salute the Champions!!!	60
Problem 03	Oh Boy Let's Operate!!!	60
Problem 04	The Fantastic Four!!!	60
Problem 05	The Great Gauntlet!!!	60
Problem 06	Roar for the Romans!!!	60
Problem 07	Love Those Loops!!!	60
Problem 08	Super String!!!	60
Problem 09	Can't Beat Binary!!!	60
Problem 10	Bravo Bouncing Numbers!!!	60
Problem 11	Oh, Pascal!!!	60
Problem 12	Terrific Trees!!!	60
	Total	**720**

Problem #01 60 Points

Tremendous Triangle

Program Name: Team##p01.java

This problem will print the given triangle on the screen.

Prompt
None

Input
None

Output
You will print the given 26-line triangle.

Example Input
No input

Example Output to Screen

```
A
BB
CCC
DDDD
EEEEE
FFFFFF
GGGGGGG
HHHHHHHH
IIIIIIIII
JJJJJJJJJJ
KKKKKKKKKKK
LLLLLLLLLLLL
MMMMMMMMMMMM
NNNNNNNNNNNNN
OOOOOOOOOOOOOO
PPPPPPPPPPPPPPP
QQQQQQQQQQQQQQQQ
RRRRRRRRRRRRRRRRR
SSSSSSSSSSSSSSSSSS
TTTTTTTTTTTTTTTTTTT
UUUUUUUUUUUUUUUUUUUU
VVVVVVVVVVVVVVVVVVVVV
WWWWWWWWWWWWWWWWWWWWWW
XXXXXXXXXXXXXXXXXXXXXXX
YYYYYYYYYYYYYYYYYYYYYYYY
ZZZZZZZZZZZZZZZZZZZZZZZZZ
```

Problem #02 60 Points

Salute the Champions

Program Name: Team##p02.java

This problem will print the given output on the screen. These are the 4A and 5A schools that have won State UIL Computer Science since the beginning of the contest in 1991.

Prompt
None

Input
None

Output
You will print the given list of champions.

Example Input
No input

Example Output to Screen

```
UIL 5A and 4A STATE COMPSCI CHAMPIONS
1991 5A – Houston Bellaire    4A – Sweetwater
1992 5A – Langham Creek       4A – Austin Westlake
1993 5A – Langham Creek       4A – Fort Stockton
1994 5A – Ft. Worth Dunbar    4A – Bridge City
1995 5A – Ft. Worth Dunbar    4A – Austin LBJ
1996 5A – Ft. Worth Dunbar    4A – Stephenville
1997 5A – Cypress Falls       4A – Whitehouse
1998 5A – Round Rock          4A – Sulphur Springs
1999 5A – Langham Creek       4A – Ft. Worth Dunbar
2000 5A – Dallas Sci/Eng      4A – Cedar Hill
2001 5A – Dallas Sci/Eng.     4A – Southlake Carroll
2002 5A – Katy Taylor         4A – Southlake Carroll
2003 5A – Southlake Carroll   4A – Austin LBJ
2004 5A – Katy Taylor         4A – Waller
2005 5A – Katy Taylor         4A – Waller
2006 5A – Cypress Falls       4A – Friendswood
2007 5A – Katy Taylor         4A – Midlothian
2008 5A – Clements            4A – Seven Lakes
```

Problem #03 60 Points

Oh Boy Let's Operate!!!

Program Name: Team##p03.java

This problem will have you enter two integers. Your program will find the answer to a series of arithmetic problems.

The sum, the difference, the product, the quotient, the remainder, the sum of the squares, and the square of the sum

Prompt
"Please input two integers."

Input
Two positive integers. Hit enter after each input.

Output
Your program output seven integers with the proper format.

Example Input
```
10
3
```

Example Output to Screen
```
THE SUM IS 13
THE DIFFERENCE IS 7
THE PRODUCT IS 30
THE QUOTIENT IS 3
THE REMAINDER IS 1
THE SUM OF THE SQUARES IS 109
THE SQUARE OF THE SUM IS 169
```

Problem #04 60 Points

The Fantastic Four!!!

Program Name: Team##p04.java

This problem will have you enter four integers with values 1-20. Your program will list the integers from largest to smallest and list the word form of each word. No integer will be equal to any other integer among the four.

Prompt
"Please input four integers."

Input
Four positive integers with values 1-20. Hit enter after each input.

Output
Your program will have four lines of output listing the numbers from largest to smallest and using the word form for each one.

Example Input
```
7
11
2
5
```

Example Output to Screen
```
11 MEANS ELEVEN
7 MEANS SEVEN
5 MEANS FIVE
2 MEANS TWO
```

Problem #05 60 Points

The Great Gauntlet!!!

Program Name: Team##p05.java

Here is a list of the prime numbers that are less than 100.
2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, 97

Your job is to enter an integer and let it run the gauntlet. See if the largest number in this list is a factor. If not, proceed to the next largest prime number. If it is a factor, subtract that number from your original number. Take your answer to the next step. Continue the process until you try every number in the list. Along the way, output the number whenever it changes.

Example 970
97 is a factor of 970, so subtract 97 to get 873.
Now use 873.
None of the primes are factors of 873 moving down the list until you reach 3.
3 is a factor of 873, so subtract 3 to get 870.
Now use 870.
2 is a factor of 870, so subtract 2 to get 868.
You are finished.
Your output would be.
970
873
870
868

Prompt
"Please input one integer."

Input
One positive integer.

Output
Your program will print out a series of integers each on a different line.

Example Input
287

Example Output to Screen
287
246
243

Problem #06 60 Points

Roar for the Romans!!!

Program Name: Team##p06.java

Here is a list of the Roman numerals from 1- 100 that we will use for this problem.
I, II, III, IV, V, VI, VII, VIII. IX, X
XI, XII, XIII, XIV, XV, XVI, XVII, XVIII, XIX, XX
XXI, XXII, XXIII, XXIV, XXV, XXVI, XXVII, XXVIII, XXIX, XXX
XXXI, XXXII, XXXIII, XXXIV, XXXV, XXXVI, XXXVII, XXXVIII, XXXIX, XL
XLI, XLII, XLIII, XLIV, XLV, XLVI, XLVII, XLVIII, XLIX, L
LI, LII, LIII, LIV, LV, LVI, LVII, LVIII, LIX, LX
LXI, LXII, LXIII, LXIV, LXV, LXVI, LXVII, LXVIII, LXIX, LXX
LXXI, LXXII, LXXIII, LXXIV, LXXV, LXXVI, LXXVII, LXXVIII, LXXIX, LXXX
LXXXI, LXXXII, LXXXIII, LXXXIV, LXXXV, LXXXVI, LXXXVII, LXXXVIII, LXXXIX, XC
XCI, XCII, XCIII, XCIV, XCV, XCVI, XCVII, XCVIII, XCIX, C

Your job is to enter a Roman numeral from I to C and print its factors out as roman numerals.

Prompt
"Please input one string."

Input
One Roman numeral using all caps.

Output
Your program will print out a list of Roman numerals representing the factors of the number. List from smallest to greatest.

Example Input
```
XXXVI
```

Example Output to Screen
```
HERE ARE THE FACTORS OF XXXVI
I
II
III
IV
VI
IX
XII
XVIII
XXXVI
```

Problem #07 60 Points

Love Those Loops!!!

Program Name: Team##p07.java

This problem will have you enter one integer N. Create five consecutive lists as shown.
1) Count forwards from 1 to N
2) Count backwards from N to 1
3) Print the even numbers 2 to N
4) Count backwards by threes starting at N and going to 0.
5) Count by fives from 0 to N

Prompt
"Please input one integer."

Input
One positive integer

Output
Your program will have five lines of output listing the proper numbers. There should be one space between each pair of numbers.

Example Input
```
17
```

Example Output to Screen
```
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
2 4 6 8 10 12 14 16
17 14 11 8 5 2
0 5 10 15
```

Problem #08 60 Points

Super String!!!

Program Name: Team##p08.java

This problem will have you enter one word that contains only uppercase letters. Systematically remove the letters from the string starting with A and proceeding until you reach Z. Print the word anytime it loses a letter or letters.

Prompt
"Please input one word."

Input
One string

Output
A list of strings

Example Input
```
ZIMBABWE
```

Example Output to Screen
```
ZIMBABWE
ZIMBBWE
ZIMWE
ZIMW
ZMW
ZW
Z
```

Problem #09 60 Points

Can't Beat Binary!!!

Program Name: Team##p09.java

This problem will have you enter one integer from 1-2047. Express is as a sum of base two numbers.

Prompt
"Please input an integer."

Input
One integer

Output
A list of integers separated by plus signs.

Example Input
```
300
```

Example Output to Screen
```
300 = 256 + 32 + 8 + 4
```

Problem #10 60 Points

Bravo Bouncing Numbers!!!

Program Name: Team##p10.java

This problem will have you enter one integer N from 1-99. Print the numbers 1 to N and N to 1 as shown.

Prompt
"Please input an integer."

Input
One integer

Output
A chart of integers. Make sure they line up properly.

Example Input
12

Example Output to Screen

```
 1 12  1 12  1 12
 2 11  2 11  2 11
 3 10  3 10  3 10
 4  9  4  9  4  9
 5  8  5  8  5  8
 6  7  6  7  6  7
 7  6  7  6  7  6
 8  5  8  5  8  5
 9  4  9  4  9  4
10  3 10  3 10  3
11  2 11  2 11  2
12  1 12  1 12  1
```

Problem #11 60 Points

Oh, Pascal!!!

Program Name: Team##p11.java

This problem will have you enter one integer N from 1-25. Generate the first N rows of Pascal's triangle. Make sure that it lines up as shown.

Prompt
"Please input an integer."

Input
One integer

Output
The first N rows of Pascal's triangle.

Example Input
7

Example Output to Screen

```
             1
           1   1
         1   2   1
       1   3   3   1
     1   4   6   4   1
   1   5  10  10   5   1
 1   6  15  20  15   6   1
```

Problem #12 60 Points

Terrific Trees!!!

Program Name: Team##p12.java

This problem will have you enter a string. Take the letters of the string and create a binary search tree. Now, go level by level through the tree until you reach the last level. Print the items that are on that particular level. Print the items you would see if you scanned the level from left to right.

Prompt
"Please input a string."

Input
One string (all caps).

Output
A list of levels and the items on that level..

Example Input
```
COWPASTE
```

Example Output to Screen
```
LEVEL 0 = C
LEVEL 1 = AO
LEVEL 2 = EW
LEVEL 3 = P
LEVEL 4 = S
LEVEL 5 = T
```

Problem #00 0 Points

Celebrate the Cows!!!

Program Name: Team##p00.java

This problem will have you enter an integer. Print "COW" that many times on the screen..

Prompt
"Please input an integer."

Input
One integer

Output
You will print "COW" the proper number of times.

Example Input
3

Example Output to Screen
```
COW COW COW
```