# Great Computer Challenge JAVA Level IV

### Complete all three problems.

# Problem #1: How do I love thee? Let Me Count the Ways (20 Points)



Write a program which asks the user to input a whole number (positive integer). The program should respond by printing out all the ways that smaller numbers could be used to add up to the user's number. Here is a sample of the way the user dialog might look:

> Do you wish to quit the program (Y/N)? <u>N</u> What is your number? -12.7Illegal number; try again. What is your number? <u>5</u> The ways of adding to 5 are: 1+4 1+1+3 1+1+1+2 1+1+1+1+1 1+2+2 2+3

Do you wish to quit the program (Y/N)? etc.....

The exact dialog and the order of output might vary in your program. However, you should avoid giving the same answer twice. For example,

"1+4" and "4+1" are both the same answer.

Page 1 of 4 JAVA, Level IV Great Computer Challenge, 2007

# Problem #2: Down to the Basics (30 points)

The BASIC program starts off by asking the user for a mathematical expression that could be used in a BASIC program. For example,

#### Enter expression: $T^{*}(V-43+(A^{*}7))+(32-C)$ This is correctly formed.

The program then checks and reports (as shown) whether the expression is correctly written--no calculations need. If the expression is not correct, the program simply replies. **This is not correctly formed.** 

All the rules for correct expressions in BASIC apply. There are some extra rules for this program which should make your job simpler. Here are the rules:

- The only characters allowed are: 26 letters, 10 digits and the symbols + \* / ( and ).
- No negative numbers or variables. Only integer (whole) numbers.
- Variables must be a single capital letter.
- The operations are +,-,\* and /. (Addition, subtraction, multiplication and division--again, no unary negatives). Obviously, two operation symbols cannot appear next to each other.
- Parentheses may be used, but they must be properly nested and balanced.
- Assume no more than 40 characters in the expression. No spaces.

Here are a few examples of incorrectly formed expressions:

P*13)+((I)	Parentheses not balanced
-45.2*P	Negative number and decimal number
-(S**S)	Negative expression,
	use of two operators in a row and
	variable is too long.

Page 2 of 4 JAVA, Level IV Great Computer Challenge, 2007

## Problem #3: Roman Numeral Calculator (50 points)

The Romans were noted for many significant advances in math, the sciences and fine arts. The numbering system they developed used Roman Numerals to common numeric values. The values of the Roman digits are as follows:

I 1 V 5 X 10 L 50 C 100 D 500 M 1,000

Design an applet that will allow the user to perform calculations on Roman Numerals. The arithmetic operators that your program should incorporate include: +, -, \*, and /.

#### EXAMPLE:

a. The number **MCCXXVI** is entered.

Hex Info Start Stop Exit	
Roman Numeral Calculator	
MCCXXVI	
C D -	
Clear =	

Page 3 of 4 JAVA, Level IV Great Computer Challenge, 2007

- b. The "plus" sign is pressed.
- c. The second number **LXIX** is entered.
- d. The "equal" sign is pressed.
- e. The following is the output generated.

Info     Start     Stop	
Roman Numeral Calculator	
MCCLXXXXV	
I V I X L X	
C D -	
Clear	