### **SIENA COLLEGE**

**28th Annual** High School Programming Contest

##### **March 27, 2015**

###### Problem #4: Four-Digit Number Cycler

Background Information: Start with any four-digit number between 1000 and 9999 with at least two different digits. Form an updated four-digit number by putting the digits in descending order. Form a second updated four-digit number by putting the digits in ascending order, including leading zeros if necessary. Subtract the second number from the first to form a new number. If this difference is less than 1000, pad the difference with leading 0s so that it is 4-digits long with the leading 0s. Repeat this process until you get the same answer twice in a row. It has been proven that this is guaranteed to happen eventually for any four-digit value, but when all the digits are the same this is not very interesting, since you get 0000 immediately.

For example, if your starting number is 7213, the following computations are executed:

 7321 8640 8721 7443 9963 6642 7641 7641

 7213 → -1237 → -0468 → -1278 → -3447 → -3699 → -2466 → -1467 → -1467 …

 6084 8172 7443 3996 6264 4176 6174 6174

In this example, eight subtractions were required before there was a repetition.

From the above example it can be observed if your starting number is 7641 (or any permutation of the digits 7641) then only two subtractions are needed to produce a repetition.

###### Programming Problem:

Input: A positive four-digit integer where at least one of the digits is different from the rest

Output:  The number of subtractions needed before a differenence is repeated twice in a row

###### Example 1:  Input:  7213

######  Output:  8

###### Example 2:  Input:  7215

######  Output:  4

###### Example 3:  Input:  7641

######  Output:  2