### **SIENA COLLEGE**

**29th Annual** High School Programming Contest

##### **April 1, 2016**

###### Problem #4:  Multiplicative Digital Roots

Background Information:  The multiplicative digital root or MDR of a non-negative integer N is found by multiplying the digits of N together and then repeating this process until only a single digit remains. For example, the MDR of 468 is 8 because 4x6x8 = 192 and 1x9x2 = 18 and 1x8 = 8. The multiplicative persistence or MP of 468 is 3 because it took 3 steps (468 → 192 → 18 → 8) to reach the MDR.

The following table for 1234 ≤ N ≤ 1240 may help your understanding of above definitions.

 N MDR MP

1234 8 2

 1235 0 2

 1236 8 **3 (the largest MP)**

 1237 8 2

 1238 6 3

 1239 0 3

 1240 0 1

 1241 8 1

###### Programming Problem:

Input:   A pair of non-negative integers A and B with A < B < 100,000,000.

 The A and B will be input on two lines.

Output:  On separate lines, the integers A and B. On the third output line, the largest

multiplicative persistence for the integers between A and B (inclusive) and the smallest number in the input range with this MP. Starting on the fourth line, a frequency table of multiplicative digital roots from 0 to 9. The output for the frequency table must be on ten lines with each line containing an MDR and the number of values in the A to B range with that root.

###### Example : Input:  1234

1241

######  Output:  1234

 1241

 3 1236

 0 3

 1 0

 2 0

 3 0

 4 0

 5 0

 6 1

 7 0

 8 4

 9 0