**Siena College’s 35th Annual High School Programming Contest**

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##### March 31, 2023

###### Green Problem #6: Quits and Quytes!

Background Information:

The QUAD Computer Company builds a computer which uses 4-state devices for basic memory cells. These cells called QUITS can be set to 0, 1, 2, or 3. Four QUITS are used to form a QUYTE. This is similar to a binary computer which has BITS and BYTES with 8 BITS to a BYTE. The architecture of a QUAD computer uses base-4 including base-4 arithmetic (naturally!) and so there is a need for people to convert integers from base-10 to base-4.

To convert a base-10 positive integer N into base-4, repeated division can be used. The remainders from the repeated divisions by 4 starting with N will be the digits for the base-4 representation of N. The division is repeated until a quotient of 0 is obtained. The following is an example of such a conversion.

199999910 = 132201013334 because 1999999 divided by 4 = 499999 remainder 3

and 499999 divided by 4 = 124999 remainder 3

and 124999 divided by 4 = 31249 remainder 3

and 31249 divided by 4 = 7812 remainder 1

and 7812 divided by 4 = 1955 remainder 0

and 1955 divided by 4 = 488 remainder 1

and 488 divided by 4 = 122 remainder 0

and 122 divided by 4 = 30 remainder 2

and 30 divided by 4 = 7 remainder 2

and 7 divided by 4 = 1 remainder 3

and 1 divided by 4 = 0 remainder 1

Write a program that converts a base-10 integer to base-4. For both Java and Python the mod operator is %. So if N and K are integers and N = 58 and K = 4 then N % K is 2. This operator will probably be useful.

###### Programming Problem:

Input:  A positive integer N less than 2 billion.

Output: Each on a separate line as in the example below, the number N followed by the steps of the algorithm described above followed by a line with 40 hyphens followed by a final line of the value of N followed by the string “base-10 =” followed by the base-4 equivalent of N followed by the string “base-4”.

###### Example : Input: 39

Output: 39 divided by 4 = 9 remainder 3

9 divided by 4 = 2 remainder 1

2 divided by 4 = 0 remainder 2

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39 base-10 = 213 base-4