COMP 208: Computers in Engineering
Winter 2016
Assignment 4 -- Frugal Numbers

Due Date

Assignment 4 is due on March 22, 2016 at 23:59. The cutoff is automated and is exactly at this time. Assignments submitted within the next hour will be considered late. After that time they will not be accepted at all.

Integrity

These assignments are to be done individually. You can collaborate on understanding the problem but you must write the solution **individually**. Your submission might be subject to Plagiarism detection software.

Prime Factorization:

A Prime Number is a whole number, greater than 1, that can only be divided evenly by 1 or itself.

The Prime Factors of a given number are the prime numbers that divide it evenly. **Prime factorization** is the process of finding the combination of prime numbers that multiply to give a particular number. Every integer greater than 1 has a unique prime factorization.

For example, the prime factorization of 225 is

$225 = 3^2 \times 5^2$

Frugal Numbers:

Numbers can be classified based on their prime factorization. One classification is as follows:

- **Frugal Number:**
  A number that has more digits than the digits in its prime factorization (including the number of digits in the powers)

  Ex: $1024 = 2^{10}$
  1024 is frugal since it has 4 digits, whereas 2^{10} has 3 digits (2 digits in the power).

However in the example above, 225 has 4 digits in its prime factorization and therefore is **not** frugal.

- **Equidigital Number:**
  A number that has digits equal to the digits in its prime factorization (including powers)

  Ex1: 7 = 7
  Both sides have 1 digit
  NOTE: when the power is 1 it is not written, therefore the number of digits is only 1.

  Ex2: 10 = 2x5
  10 has 2 digits and so does '5x2'.

- **Extravagant Number:**
  A number that has fewer digits than the digits in its prime factorization (including powers)

  Ex: $4 = 2^2$
  4 is a single digit number whereas 2^2 has two digits.
  The number 225 that we looked at above is aldo extravagant.

Assignment

You are to write a program that reads a number '**n**' and then generates and outputs the first '**n**' frugal numbers.

For example the frugal numbers up to 2000 are:

125, 128, 243, 256, 343, 512, 625, 729, 1024, 1029, 1215, 1250, 1280, 1331, 1369, 1458, 1536, 1681, 1701, 1715, 1792, 1849, 1875

Your program should use at least 1 function besides main(). Make sure to run the program with values of n larger than 2000.

Requirements

Your code must meet these requirements:

- The program must be written in **C**
- Your program must **read** from **standard input**
- Your program must **write** the resulting Frugal Numbers to the screen
- Use **sensible** variables names. **Comment** and **indent** your code
- Use at least **1 function** (besides `main( )`)
- Submit **only** the .c file. **Don't** submit the .exe (name your source file A4_123456789.c where 123456789 is your ID)