The Department of Mathematics, Computer Science, and Statistics
presents the mathematics

Problem of the Week

Week Eleven
Solutions due by 5pm on Friday, April 22, 2016

Les Bits has been asked by his boss to compute factorials of very large numbers, but he is worried about space on his hard drive. He has decided that, instead of storing the entire decimal factorial, he will only store the leftmost non-zero decimal digits of the factorial and then just store a count of the number of rightmost zero digits.

Recall that n factorial is equal to the product of all the integers from 1 to n. For example, 6 factorial is $1 \cdot 2 \cdot 3 \cdot 4 \cdot 5 \cdot 6 = 720$ and 10 factorial is $3,628,800$. So the decimal representation of 6 factorial has 1 rightmost zero digit, and the decimal representation of 10 factorial has 2 rightmost zero digits.

Les needs to figure out a way to calculate the number of rightmost zeroes in the decimal representation of n factorial without actually computing the entire factorial. Construct a function $f$ in terms of $n$ to do this.

Here are some example inputs and outputs of $f$.

$$f(4) = 0$$
$$f(17) = 3$$
$$f(626) = 156$$
$$f(74972975) = 18743238$$

4 factorial has no zeroes on the right
17 factorial has three zeroes on the right
626 factorial has 156 zeroes on the right

Extra credit for writing a small computer program to do this

This problem is brought to you by Prof. Ed Harcourt.

Submit your solutions to Prof. Choong-Soo Lee. You may submit either a hard copy or an electronic copy via Dropbox on the POW website.


Good Luck!!