Homework 1

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Problem 2

I could theoretically verify all of the Wikipedia claims. However, the amount of time it would require is unrealistic. The logical solution is to work up from the smallest domain, verify what I can, and estimate the amount of time that would be required for me to verify any larger domains which I do not have time to test.

As can be seen below, my program was able to verify the Wikipedia claim for the number less than 100 million with the largest HOPTO length. My program returned the same value for n and the same HOPTO as the Wikipedia page.

The program took about 2 hours 6 minutes when given 100 million as input. Looking at the trend of time taken for each power of ten greater input, it seems to take about 11 times as much time as the previous run. This gives an estimated time of about 24 hours 13 minutes to calculate for 1 billion, and 11 days 15 hours for 10 billion. I need my computer for other classes, so it is unrealistic for me to calculate n for these domains, and I was unable to verify Wikipedia's claims for them.

Input	Seconds Spent	Number Returned	HOPTO Returned
100	0.0036	97	118
1,000	0.032	871	178
10,000	0.37	6,171	261
100,000	4.6	77,031	350
1,000,000	56	837,799	524
10,000,000	657	840,0511	685
100,000,000	7,568	63,728,127	949

Problem 3

Given the input 100 million, the program outputs the following, where the topmost number is the number of numbers with HOPTO at most 250, and the bottommost is HOPTO over 750:

1-250: 85802000
251-500: 14171606
501-750: 26389
Over 750: 4