Long Division and Periods of Decimals

Given a decimal expansion $q = \sum_{k=0}^{\infty} a_i 10^i$, where a_0 is a non- negative integer, and $0 \leq a_i \leq 9$ for all $i > 0$, we say that q has period t if there exists an integer s such that $a_i = a_{i+t}$ for all $i > s$. For example, the decimal expansion $.\overline{73}$ has period 2. Here we want to examine the periods of integers.

Write a program for your calculator or a computer spreadsheet that does long division of integers. In particular, it should calculate the nth digit after the decimal of the decimal expansion for a/b (where $a < b$ are positive integers) and give you its period.

While writing this program, think about what "bringing down a zero" means. Also think about what portions of the algorithm repeat themselves.

Using this program, do questions 1-3, 11, and 12 on page 31 of the class notes.

Important: There is a typo on problem three. It should read: find the least positive integer k_n such that n divides $10^{k_n} - 1$ if such an integers exists.

Homework #2
Due Friday, September 8

I. Problems 1,2,3,5,6,7, 11, 12, 14.

II. Solve the following: In a certain town, two-thirds of the men are married and two-fifths of the women are married. Assuming all marriages are between one man and one woman (and everyone is monogamous), what fraction of the people in the town are married? What are the key ideas in the solution of this problem? Can you make your "proof" simple?

Now, find a student that is not in the sciences (ideally someone who has not taken calculus), and try and help them solve the problem. Reflect upon their difficulties (if any) in solving the problem. Also explain how you helped them work through the problem. (This portion of the response should be well-written, spell-checked, and make sense.)