

PROBLEM OF THE WEEK
Solution of Problem No. 9 (Spring 2011 Series)

Problem: Prove that every positive integer has a multiple whose decimal representation involves the sequence 20102011.

Solution: (by Kevin Laster, Indianapolis, IN)

If n is a positive integer and p is any other positive integer, then one of integers

$$p + 1, p + 2, \dots, p + n \quad \text{is a multiple of } n.$$

So given n , let $p = 20102011 \times 10^k$ where k is so large that $10^k > n$. Then all of the integers $p + 1, p + 2, \dots, p + n$ have decimal representation beginning with 20102011... and one of these is a multiple of n .

The problem was also solved by:

Undergraduates: Cameron Cecil (So. ME), Kaibo Gong (Math), Lifan Wu (So.), Joselito Wong Yau (So. Civil Engr.)

Graduates: Richard Eden (Math), Benjamin Philabaum (Phys.), Dharhin Swaminathaw (ME), Tairan Yuwen (Chemistry)

Others: Manuel Barbero (New York), Gruian Cornel (IT, Romania), Jonathan Dorfman (Bloomberg, LP, NY), Tom Engelsman (Chicago, IL), Elie Ghosn (Montreal, Quebec), Jeff Krimmel (Houston, TX), Steven Landy (IUPUI Physics staff), Denes Molnar (Physics, Assistant Professor), Sorin Rubinstein (TAU faculty, Israel), Craig Schroeder (Ph.D. student, Stanford Univ.), Steve Spindler (Chicago), Stephen Taylor (Bloomberg L.P. NY), William Wu (JPL), Allen Zhang (Undergraduate, U. of British Columbia)