
Problem of the Week

Number Eight

October 30, 2017

Plenty of tens for you in this week's problem, continuing our ten-themed edition of POTW.

Last week I mentioned the book *Those Fascinating Numbers*, by Jean-Marie De Koninck. Its amazing the goofy things you can learn from this book!

For example, you probably know that a *perfect number* is one that is equal to the sum of its proper divisors. For example:

$$6 = 1 + 2 + 3$$

$$28 = 1 + 2 + 4 + 7 + 14.$$

But have you ever heard of a *Canadian perfect number*? This is a number such that the sum of the squares of its digits is equal to the sum of its proper divisors greater than 1. Examples are the numbers 125 (proper divisors greater than 1: 5 and 25), and 581 (proper divisors greater than 1: 7 and 83):

$$1^2 + 2^2 + 5^2 = 5 + 25$$

$$5^2 + 8^2 + 1^2 = 7 + 83$$

The only other numbers that have this property are 8549 and 16999. The name comes from the fact that the notion was first formulated on the 125th anniversary of the Canadian Confederation. Good to know!

Now have a go at this week's problem:

Find the value of x that satisfies the following equation.

$$\log_{10} (10 [\log_{10} (\log_{10} (x^{-10}))]) = 1.$$

When you think you have the problem figured out, follow the instructions below.

*Submissions are due to Jason Rosenhouse by 5:00 on **Friday, November 3**. Solutions, complete with a brief explanation, should be written on the back of an official POTW hand-out. Place your name, e-mail address, and the section numbers and professors of any math courses you are taking, in the **upper right corner** of the front of the page. One weekly winner will receive a five-dollar gift card from Starbucks. Solutions will be posted at the POTW website:*

**[http://educ.jmu.edu/~rosenhjd/POTW/
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