
Problem of the Week

Number One

September 1, 2014

In Yellowstone National Park there is a geyser known as Old Faithful. Every ninety minutes or so it spews forth thousands of gallons of boiling water from the Earth's interior. It has been doing so with perfect dependability going back at least to 1870, when it was first discovered.

Here at JMU we have our own version of Old Faithful. We call it Problem of the Week! Granted, it only goes back a few semesters instead of a century and a half, and spews forth chewy bonbons of mathematical tastiness instead of boiling water, and has yet to attract any significant number of tourists, but other than that it's totally comparable.

As it happens, there is a rather stark point of contrast between POTW and Old Faithful. Whereas Old Faithful has been gradually slowing down over the years, with eruptions nowadays occurring less frequently than in the past, POTW just keeps getting better and better. That's right! We're in for a real barn burner of a semester this time, since our theme is

FUN WITH ARITHMETIC!

Do I detect a look of skepticism? Are you thinking that arithmetic was precisely the part of mathematics you hated in elementary school? Well, let's just see if you're still saying that at the end of the semester. To kick things off, let's start with one of the slam-dunk classics of arithmetic puzzles:

Using exactly four 4s (and no other digits at all), the standard arithmetic operations, and whatever standard mathematical notation you like (such as fraction bars, square roots, factorials, decimal points, parentheses and exponents), show how to express all of the numbers from 2 to 10. Concatenation is also acceptable, meaning that, if you wish, you may take two of the 4s and turn them into the number 44.

$\Rightarrow$

To clarify what is intended, here is how you might obtain 0 and 1:

$$(4 - 4) + (4 - 4) = 0$$

$$4 - \sqrt{4} - \frac{4}{4} = 1$$

Of course, these answers are not unique. There are other ways of obtaining the numbers 0 and 1. You only need to provide one way each of obtaining the numbers 2 through 10.

*Solutions are due to Jason Rosenhouse by 5:00 on Friday, September 5. **Solutions should be written on an official POTW handout, in the space below.** 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. Please make sure that the answer to the problem is displayed clearly and prominently, in a box when appropriate. Problems are available at the bulletin board outside Roop 119, and also at the website:*

<http://educ.jmu.edu/~rosenhjd/POTW/Fall14/homepage.html>