Self-answering Problems

The results are in from our September 2005 contest. Chris Hill asked you to pose problems in such a way that they contained their own answers. Thank you to everyone who participated—the response was tremendous! Entries were judged by the *Math Horizons* Board and Student Advisory Group. The best entries are given below with the answers highlighted in **blue**.

Grand Prize Winner

At time $t = 0$, water begins pouring into an empty tank so that the volume of water is changing at a rate $V'(t)=\sec^2 t$. For time $t=k$, where $0 < k < \pi / 2$, determine the amount of water in the **tan*k***.

Raymond N. Greenwell
Hofstra University, New York

Runners-up

In 1978, Raymond Smullyan wrote a book about logical puzzles. **What is the name of this book?**

Roger Nelsen, Lewis & Clark College, Oregon

I am the square root of -1. Who am ***i***?

What would the value of 190 in hexidecimal **be**?

Head-Royce School Math Club in Oakland, California

An amicable pair of self-answering questions:

1. What fraction of the letters in **three-eighths** are vowels?
2. What fraction of the letters in **one-third** are vowels?

Rheta Rubenstein, Univeristy of Michigan-Dearborn

Honorable Mention

Find $\dfrac{d^8 y}{dx^8}$ if $y = e^{x/\sqrt{2}}[\sin(x/\sqrt{2}) + \cos(x/\sqrt{2})]$.

Find the a) mean and b) variance of a Poisson random variable with parameter **2**.

Roger Nelsen, Lewis & Clark College, Oregon

Bob took a $1 million inheritance **to the Second** National Bank, where he let it sit for forty years at 5% continuously compounded interest. How many millions did he have after the forty years?

When **I net** young fish to tag them for studies, I keep a count. If last week my daily totals were 101, 88, 87 and 84, what was my average for a day?

Dave Ehren, Macalester College, Minnesota

Twenty-nine is a **prime** example of what kind of number?

The reciprocal of $\sqrt{2}$ is half of what number?

How many consonants are in "**one**?" How many consonants are in "**two**?" How many consonants are in "**three**?"

What do you do to the length of an edge of a **cube** to find its volume?

Rheta Rubenstein, Univeristy of Michigan-Dearborn

Describe the set points in the xy-plane that satisfies the following inequality:

$$\frac{1}{2} < \left\lfloor \mathrm{mod}\left(\left\lfloor \frac{y}{17} \right\rfloor 2^{-17\lfloor x \rfloor - \mathrm{mod}(\lfloor y \rfloor, 17)}, 2 \right) \right\rfloor$$

where x is between 0 and 107 and y is between k and $k + 17$, where k is the following 544-digit integer.

4858 45063 61897 13423 58209 59624 94202 04458 14005 87983 24454 94830 93085 06193 47047 08809 92845 06447 69865 52436 48499 97247 02491 51191 10411 60573 91774 07856 91975 43265 71855 44205 72104 45735 88368 18298 23754 13963 43382 25199 45219 16512 84348 33290 51311 93199 95350 24137 58765 23926 48746 13394 90687 01305 62295 81321 94811 13685 33953 55652 90850 02387 50928 56892 69455 59742 81546 38651 07300 49106 72305 89335 86052 54409 66643 51265 34936 36439 57125 56569 59368 15184 33485 76052 66940 16125 12669 51421 55053 95545 19153 78545 75257 56590 74054 01579 29001 76596 79654 80064 42782 91314 88548 25991 47212 48506 35268 66304 76300.

Jeff Tupper, Pedagoguery Software Inc, Terrace, B.C., Canada
Stan Wagon, Macalester College, Minnesota

For the Mathematica code to verify the final entry or to enjoy more self-answering questions, please visit the *Math Horizons* web site `www.maa.org/mathhorizons`.