

1: Up and Atom
Significant Figures: A Fable

Name:

Class:

Date:

A student once needed a cube of metal which had to have a mass of 80 grams. He knew the density of this metal was 8.67 g/mL, which told him the cube's volume. Believing significant figures were invented just to make life difficult for chemistry students and had no practical use in the real world, he calculated the volume of the cube as 9.227 mL. He thus determined that the edge of the cube had to be 2.097 cm. He took his plans to the machine shop where his friend had the same type of work done the previous year. The shop foreman said, "Yes, we can make this according to your specifications - but it will be expensive."

"That's OK," replied the student. "It's important." He knew his friend has paid \$35, and he had been given \$50 out of the school's research budget to get the job done.

He returned the next day, expecting the job to be done. "Sorry," said the foreman. "We're still working on it. Try next week." Finally the day came, and our friend got his cube. It looked very, very smooth and shiny and beautiful in its velvet case.

Seeing it, our hero had a premonition of disaster and became a bit nervous. But he summoned up enough courage to ask for the bill. "\$500, and cheap at the price. We had a terrific job getting it right -- had to make three before we got one right."

"But--but--my friend paid only \$35 for the same thing!"

"No. He wanted a cube 2.1 cm on an edge, and your specifications called for 2.097 cm. We had yours roughed out to 2.1 that very afternoon, but it was the precision grinding and lapping to get it down to 2.097 which took so long and cost the big money. The first one we made was 2.089 on one edge when we got finished, so we had to scrap it. The second was closer, but still not what you specified. That's why the three tries."

"Oh!"