The Significance of Significant Figures

Significant figures are how we keep track of our numbers in science classes. We always try to measure as perfectly as we can, but we are limited by our own abilities and by our instruments. We strive to make the best measures, and use these measures in math formulas. The significant figures limit our mathematical answers, we are not allowed to get "more accurate" with a calculator, to somehow measure better by math, nor should we ever give away our exact measures by rounding casually.

There are rules to follow, they are sometimes easy to forget, but you must memorize them. In truth, you will likely lose more points to significant figures than any other one thing in our class. Unless you learn them.

In chemistry we usually measure with numbers and units, those are quantitative measures. We write them neatly, we keep track of them, and we use them properly, especially when it comes to rounding our answers correctly.

Our thermometers measure to the nearest whole degree, we MUST estimate this measurement one more place, our temperature would be 23.0ºC rather than just 23ºC. We could not measure the temperature to be 23.094ºC in our class, that would take an extremely accurate device.

Our electronic balances do not get estimates, they are digital measurements. They might read 45.89 grams, we don't estimate at all, since we can't estimate with a digital device. We would never just "round down" to 45 grams, nor up to 46 grams. Our scale gives us an accurate measurement to the hundredth's of a gram.

THE RULES for SIGNIFICANT FIGURES

1. Any digit 1 to 9 will always be a significant figure.
2. All zeros between significant figures will be significant.
3. Zeros before significant figures are not significant.
4. Zeros before a "missing" decimal point are not significant, but if the decimal point is included, then the zeros before it are significant.
5. Zeros at the far right of a decimal are significant.
6. Unlimited significant figures happen with Equalities, such as 12 inches = 1 foot, both have unlimited SF because these are not measures, we understand they are equal to the "nth" degree.
   12.00... inches = 1.000… foot with as many zeros (as many SF) as you like.
7. With math, answers must have the same number of significant figures as the LEAST number of SF in the measurements you are calculating with.
8. With Scientific Notation, SF are counted only in the co-efficient portion of the scientific notation.

23 grams has 2 SF 23.5 grams has 3 SF 23.54 grams has 4 SF	1000 has 1 SF 1001 has 4 SF 1001001 has 7 SF	100 has 1 SF 100. has 3 SF 90 has 1 SF 99. has 2 SF
0.005 kJ has 1 SF 1.005 has 4 SF 0.000000000001 has just 1 SF	12.00 inches has 4 SF 1.00 g/cm^3 has 3 SF	5 fingers has unlimited SF three pigs has unlimited SF
454 grams = 1 pound with equalities, both have unlimited SF	6.02 x 10^{23} has 3 SF 3.550 X $10^{-4\|}$ has 4 SF	2.5 X 5.6788 = ? the answer has just 2 SF