

Homework: Calculating Error, due Tuesday, February 8.

Answer the questions below in complete sentences. For example in (2), you should write "The position of uncertainty for ... is the (ones, one hundreds, tenths,...) place, and the position..." One of the goals of this course is for you to communicate concepts from math and science in English. You will not receive full credit if you do not use complete sentences.

Suppose you put water into two different graduated cylinders. Furthermore, let's say your two cylinders were graduated differently, so that when you correctly record the volume of water using significant figures, your two measurements have different positions of uncertainty.

1. Make up an example of two measurements that you could have reported for the volumes of water in these cylinders (i.e. make up two numbers). Remember, your measurements should be expressed using the conventions for significant figures, and your two measurements should have different positions of uncertainty.
2. What are the positions of uncertainty for your two measurements?
3. Draw two graduated cylinders showing water levels and the tick marks that must have been used to make the measurements you invented. Use appropriate scales for your diagrams, so that you present the important information clearly.
4. Draw two number lines and show the intervals containing the possible values for the exact volume of water in the two cylinders. Use appropriate scales for your diagrams, so that you present the important information clearly.
5. Suppose you combined the water in these two cylinders in a beaker. Draw a number line showing the interval containing the possible values for the exact volume of water in the beaker, and write your result in interval notation.
6. What are the midpoint and radius of the interval? Express the volume of water in the beaker as a value plus or minus an error.
7. Chemists have decided that it is inconvenient to keep track of the exact error in each mathematical operation. Instead, each group of chemists that wants to communicate results agrees on conventions (rules) that they will follow to express calculations in which error is present. The rules we will use in this class are the same as those in Chem 101. I typed up the rules from the Chem 101 book for those of you not taking that class and included them on the class web site. Memorize them.
8. Express the volume of the water in your hypothetical beaker using the conventions for significant figures. Express your answer in a sentence that explains that you have used the rules for doing calculations with significant figures to get your answer.