PreIBSc9 – Spindlove + Kovacevic

**Measurement + Significant Digits (aka “sig figs”)**

**Measured Values**

There are two types of quantities, those that include **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ values** and those that include **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ values**.

* ***\_\_\_\_\_\_\_\_\_\_\_\_\_ values*** can either be ***counting numbers*** or ***defined values,*** both of which are *perfect and exact*.
  + ***Counting numbers***: If Johnny has 5 loonies, he has exactly 5 and not 5.7 loonies.
  + ***Defined values***: Values that have been created by scientists, such as 1 dozen = 12, are also said to be perfect and exact. Another example is that 1 cm = 10 mm.
* ***\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ values*** are created by reading a measurement instrument, such as a centigram balance, a graduated cylinder or a ruler. Measured values are NOT perfect or exact.

***A Few Measurement Tools:***

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| Graduated Cylinder (measures volume) | Centigram Balance (measures mass) | Ruler (measures length) |

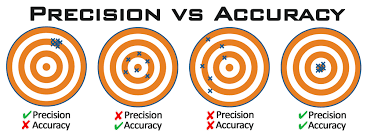
All ***measured values*** obtained from these instruments have limited precision, and those quantities must be recorded to the correct number of digits, or ***\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_***

***\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (aka “\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_” in your future science courses)***.

When reading ***measured values*** on an instrument in the laboratory, one must decide upon how

many ***significant digits*** (or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_) these quantities should include, which reflects the precision of the instrument used. These values are recorded to be as **accurate** as possible, as well as **precise**.

*\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ refers to how close a value is to its true value, whereas \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ refers to how repeatable a measurement is.*



When reading ***measured values*** on an instrument, we obtain a measurement reading by using the markings (division lines, graduations, “tick lines”, partition lines, etc.) as seen on the instrument. Our measurement readings will always involve some degree of ***\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_,*** however,because the item being measured doesn’t always exactly line up with the marking/division lines on the measuring device – this is why the measurement readings must contain \_\_\_\_\_\_\_\_ more reasonably estimated place value than what we are certain of, called

the ***\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.***

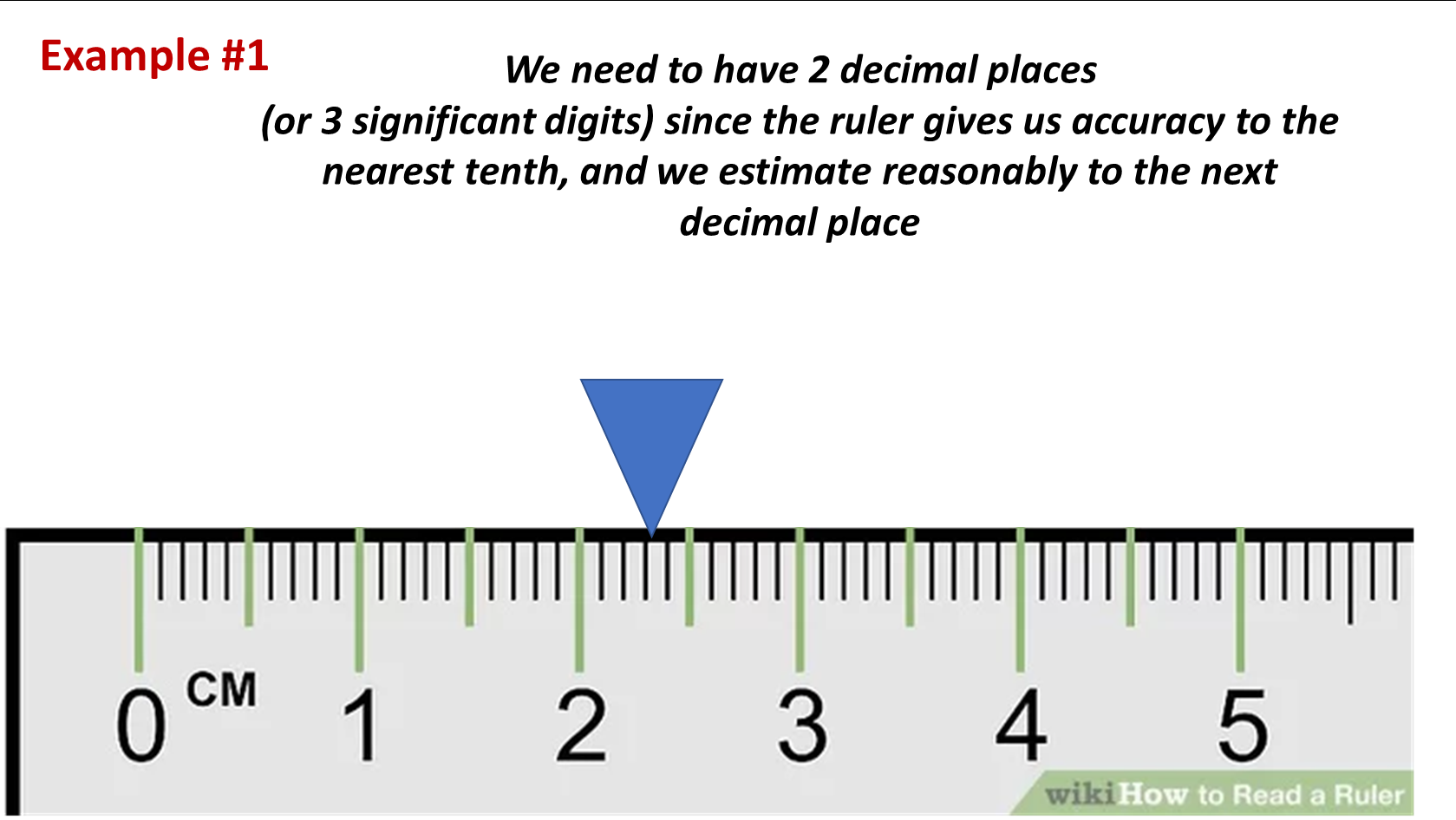
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**Significant Digits**

Your ***measured values*** with the correct number of ***significant digits*** are thus:

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ that contain the digits you are sure of (that correspond to the markings/division lines on the measuring device) ***and***
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (the estimated number will be one more place value than the value of the smallest marking/division line on the measuring device and needs to be reasonable!).



**Measuring Mass**

Our balances for measuring mass here at REMSS are ***\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_***, meaning they provide measurement to the nearest **centigram** (1/100 of a gram, or 0.01 g).

**How many decimal places should our mass measurements have?**