CHAPTER 2

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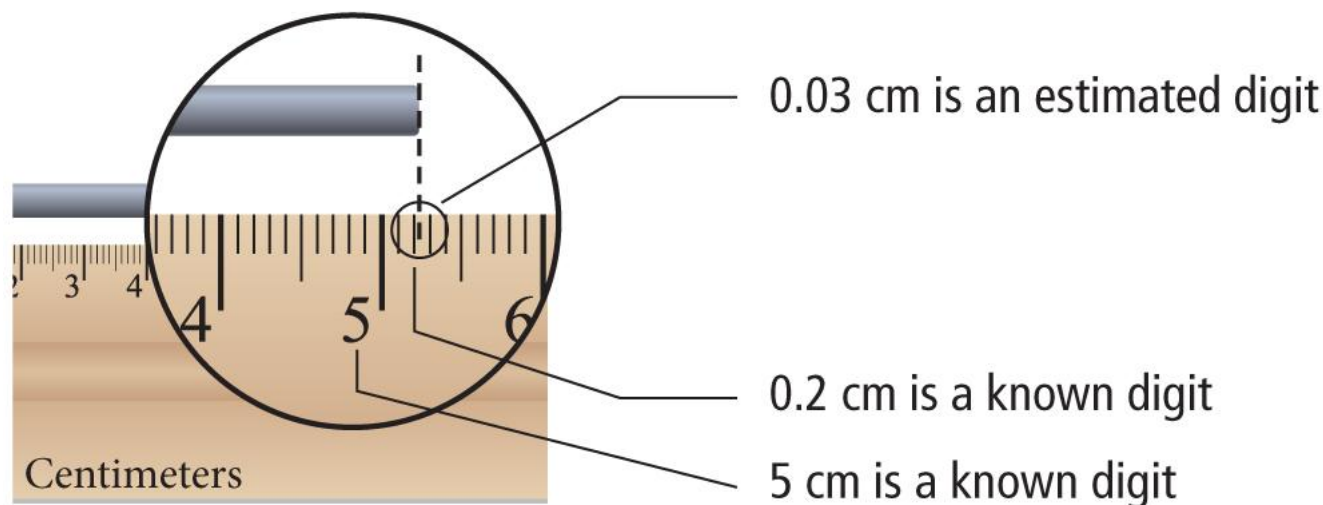
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Significant Figures

- Often, precision is limited by the tools available.

- **Significant figures** include all known digits plus one estimated digit.

0.03 cm is an estimated digit

0.2 cm is a known digit

5 cm is a known digit

Centimeters

- Sig figs are used to help scientists report the most accurate data.

- One should NEVER have to ask where to round a number to in an answer because the rules of significant figures tell you what to do!

Significant Figures (cont.)

- Rules for <u>significant figures</u>

  - **Rule 1:** Nonzero numbers are always significant.

  - **Rule 2:** Zeros between nonzero numbers are always significant.

  - **Rule 3:** All final zeros to the right of the decimal are significant.

– **Rule 4:** Placeholder zeros are not significant. To remove placeholder zeros, rewrite the number in scientific notation.

– **Rule 5:** Counting numbers and defined constants have an infinite number of significant figures.

Section 2.3 Assessment

CheckPoint

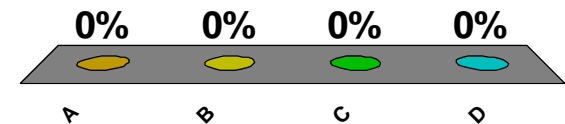**Determine the number of significant figures in the following: 8,200, 723.0, and 0.01.**

A. 4, 4, and 3

B. 4, 3, and 3

C. 2, 3, and 1

D. 2, 4, and 1

0% 0% 0% 0%

A B C D

- Answer the following:

How many sigs figs are there in:

1000?

     1

10.?

     2

10.00?

     4

0.00001050?

     4

Rounding Numbers

- Calculators are <u>not</u> aware of significant figures.

- Answers should not have more significant figures than the original data with the fewest figures, and should be rounded.

- Normally in our labs, I will ask you to report 3 sig figs in your answers, unless told otherwise!

Rounding Numbers (cont.)

- Rules for Rounding (Using Sig Figs)

  – **Rule 1:** If the digit to the right of the last significant figure is less than 5, do not change the last significant figure.

  – **Rule 2:** If the digit to the right of the last significant figure is greater than 5, round up to the last significant figure.

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Rounding Numbers (cont.)

- Rules for rounding (cont.)

  - **Rule 3:** If the digits to the right of the last significant figure are a 5 followed by a nonzero digit, round up to the last significant figure.

  - **Rule 4:** If the digits to the right of the last significant figure are a 5 followed by a 0 or no other number at all, look at the last significant figure. If it is odd, round it up; if it is even, do not round up.

- Examples of Rounding w/ Sig Figs

  Round to 2 sig figs: 2.35×10^2 =

  Round to 2 sig figs: 2 2.45×10^2 =

  Round to 4 sig figs: 10.5660 =

  Round to 4 sig figs: 10.5640 =

Rounding Numbers (cont.)

- <u>Addition and subtraction</u>

  – Round numbers so all numbers have the <u>same number of digits to the right of the decimal</u>.

  – Then add/subtract

- <u>Examples of Adding Sig Figs</u>

1. 5.6070 + 2.43 =

2. 0.0023 + 1.230 =

3. 2.030 + 1.34501 =

- <u>Examples of Subtracting Sig Figs</u>

1. 5.6070 - 2.43 =

2. 1.230 – 0.0023 =

3. 2.030 - 1.34501 =

Multiplication and division

- Perform the calculation first

- Round the answer to the same number of significant figures as the original measurement with the fewest significant figures.

- <u>Examples of Multiplying Sig Figs</u>

1. 2.53 x 1.20 =

2. 33.00 x 2.1 =

3. 105.01 x 23 =

- <u>Examples of Dividing Sig Figs</u>

1. $2.53 \div 1.20 =$

2. $33.00 \div 2.1 =$

3. $105.01 \div 23 =$