Calculating With Significant Digits

Every measurement has some error associated with it. Even if you are extremely careful, the best you can do is estimate the last digit beyond where your measuring tool measures. This causes some trouble with calculations. If you are finding the area of a piece of land, for example, when you multiply the length by the width, you are multiplying estimates by estimates. This can only multiply the uncertainty. There are rules to keep extra uncertain numbers from cropping up in your calculations.

★ **multiplication and division** - the number of significant figures in a product or quotient is the same as the measurement with the smaller number of significant figures

> *Problem*
> $3.1415 \times 2.25 = 7.068375$
>
> *Correct number of Significant Figures = 3*
>
> *Solution* 7.07

★ **addition and subtraction** - the number of decimal places in the sum or difference is equal to the number of decimal places in the measured quantity with the smallest number of decimal places

> *Problem*
> $6.357 - 2.4 = 3.957$
> *Correct number of Decimal Places = 1*
>
> *Solution* 4.0

Perform each of the following calculations, expressing the answer with the correct number of significant digits.

1) 3.482 cm + 8.51 cm + 16.324 cm   _____

2) 48.0032 g + 9.17 g + 65.4321 g   _____

3) 80.4 cm - 16.532 cm   _____

4) 106.5mL - 30. mL   _____

5) 48.2 cm × 1.6 cm × 2.12 cm   _____

6) 8.3 m × 4.0 m × 0.9823 m   _____

7) 64.34 cm^3 ÷ 8.149 cm   _____

8) 4.93 mm^2 ÷ 18.71 mm   _____

9) $0.57\,\text{mL} \times \dfrac{760\,\text{mm}}{740\,\text{mm}} \times \dfrac{273\,\text{K}}{250\,\text{K}}$ _____

10) $5.13\,\text{g} \times \dfrac{44.962\,\text{a.m.u.}}{115.874\,\text{a.m.u.}}$ _____