

Lesson 6: Mathematical operations with Significant Digits

Addition and Subtraction: - Round your answer to the least degree of precision in the original question.

$$\begin{array}{r} \text{e.g.,} \quad 13.05 \text{ g} \\ \quad 309.2 \text{ g} \\ \quad + \underline{3.785 \text{ g}} \\ \hline 326.035 \text{ g} \quad \sim \mathbf{326.0 \text{ g}} \text{ (Always round last).} \end{array}$$

$$\text{e.g.,} \quad 118.45 \text{ mL} - 3.3 \times 10^1 \text{ mL} \text{ (It may be easier to convert to decimal notation)}$$

$$\begin{array}{r} 118.45 \text{ mL} \\ - \underline{33 \text{ mL}} \\ \hline 85.45 \text{ mL} \quad \sim \mathbf{85 \text{ mL}} \end{array}$$

Multiplication and Division: - Round your answer to the least number of significant digits in the original question.

$$\text{e.g.,} \quad 3.54 \text{ cm} \times 4.8 \text{ cm} \times 0.5421 \text{ cm} = 9.2113632 \text{ cm}^3 \quad \sim \mathbf{9.2 \text{ cm}^3}$$

Orally: (Since 4.8 cm has the least number of sig dig's total, we use that measurement to determine the number of sig dig's in the final answer)

$$\text{e.g.,} \quad 81.2 \text{ g} \div 104.2 \text{ mL} = 0.7792706333 \text{ g/mL} \quad \sim \mathbf{0.779 \text{ g/mL}}$$

Q: How did we get the units for the last question?

A: When in doubt, treat all units like a fraction calculation.

For the question above we have $\text{g} \div \text{mL}$

Convert this question to a fraction: $\frac{g}{1} \div \frac{mL}{1} =$ (now solve)

$$\frac{g}{1} \times \frac{1}{mL} = \frac{g}{mL} \text{ or simply g/mL}$$

Exercises with units: Determine the final units.

$$1. \quad g \times g/mL \text{ -----} \rightarrow \frac{g}{1} \times \frac{g}{mL} = \frac{g^2}{mL} \text{ or simply } g^2/mL$$

Orally: Recall the exponent law: When multiplying a common base we add the exponents. Since no exponent is shown for grams, we assume the exponent is a one.

$$2. \quad ^\circ C/g \div mL/g \text{ -----} \rightarrow \frac{^{\circ}C}{g} \times \frac{g}{mL} = \frac{^{\circ}C}{mL}$$

(the unit of grams cancels just like a common factor when multiplying fractions)

$$3. \quad ^\circ C/g \times g^2/mL \text{ -----} \rightarrow \frac{^{\circ}C}{g} \times \frac{g^2}{mL} = \frac{^{\circ}C \cdot g}{mL}$$

Orally: The numerator is read, “degrees Celsius – grams.”

Provide students at least five practice calculations on the overhead before assigning the homework. Try at least two with scientific notation.

Homework: Worksheet on Sig Dig's.