

2A**Scientific Measurement****Extra Practice Problems****Significant Figures and Uncertainty**

To review the rules concerning the use of significant figures, refer to text section 2.3 as you proceed through the following examples.

Example A

How many significant figures are in the following numbers?

2.3

a. 136

Solution None of the digits is zero. All of the digits are significant. The answer to the question is three.

b. 2.70×10^2

Solution You now know that all non-zero digits are always significant, so the only digit in question in this problem is the zero. Since it is to the right of the decimal point it is significant. The exponent, 2, is ignored when determining significant figures. There are three significant figures.

c. 0.450

Solution Again, the digits 4 and 5 are significant, so you must check the zeros. The zero at the left of the decimal point is *not* significant. The zero to the right of the decimal point is significant. There are three sig figs in this problem: the 4, 5, and final 0.

You Try It

1. How many significant figures are in each of the following measurements?

2.4

a. 32.4°C _____

b. 41.05 kg _____

c. 3 000 001 m _____

d. 0.000 89 kg _____

e. 0.340 dL _____

f. 7 301.00 g _____

Example B

Calculate the answer to the following problem and report the answer to the proper number of significant figures:

2.4

$$21.59 \text{ cm} \times 27.9 \text{ cm} = ?$$

Solution $21.59 \text{ cm} \times 27.9 \text{ cm} = 602.361 \text{ cm}^2$

The number 602.361 has six significant figures, while the numbers 21.59 and 27.9 have four and three significant figures, respectively. Because the answer can have no more significant figures than the least number of significant figures in any of the numbers you are multiplying, the answer here must be rounded off to three significant figures. The answer 602.361 cm^2 should be reported as 602 cm^2 , or better, as $6.02 \times 10^2 \text{ cm}^2$.

You Try It

2. Perform the prescribed operations, giving your answers to the proper degree of precision. Be sure to include units. Remember that when you add or subtract numbers you round the answer to the least precise digit. When you multiply or divide numbers, your answer can have no more significant figures than the least number of significant figures in the problem.

2·4

- a. $22 \text{ g} + 14.3 \text{ g} + 97.03 \text{ g} =$ _____
- b. $71.6 \text{ mL} + 45.32 \text{ mL} - 8 \text{ mL} =$ _____
- c. $3.14159 \times 4.0 \text{ cm} =$ _____
- d. $27.2 \text{ g} \div 2.0 \text{ cm}^3 =$ _____
- e. $25.4 \text{ dm} \times 2.00 =$ _____
- f. $100.0 \text{ g} \times 1.00 \text{ cal/g} \times ^\circ\text{C} \times 28.6^\circ\text{C} =$ _____

Problems For You To Try

3. Round off the following numbers to the proper number of significant figures.

2·3

- a. 1.034 (to 2 sig. fig.) _____
- b. 40.06 (to 3 sig. fig.) _____
- c. 0.000 062 4 (to 2 sig. fig.) _____
- d. 1.549 (to 2 sig. fig.) _____
- e. 739.51 (to 3 sig. fig.) _____
- f. 82.000 (to 1 sig. fig.) _____

4. Perform the prescribed operations. Round your answers to the proper number of significant figures.

2·4

- a. $44 \text{ g} + 13.4 + 87.40 \text{ g} =$ _____
- b. $21.6 \text{ mL} + 43.57 \text{ mL} - 1 \text{ mL} =$ _____
- c. $6.79 \text{ cm} \times 13.5 \text{ cm} =$ _____
- d. $25.1 \text{ g} \div 5.9 \text{ cm}^3 =$ _____
- e. $43.2 \text{ dm} \times 3.00 =$ _____
- f. $3.14159 \times 5.0 \text{ cm} =$ _____
- h. $2.00 \times 10^2 \text{ g} \times 1 \text{ cal/g} \times ^\circ\text{C} \times 28.6^\circ\text{C} =$ _____