

Math Tutor

SIGNIFICANT FIGURES

The certainty of a measurement is expressed by significant figures. Significant figures in a measurement consist of all the digits known with certainty plus one final digit. Look at the reading below, which was obtained when measuring the mass of a paper clip.

mass of paperclip



Balance reading = 2.37 g

You know with certainty that the paper clip has a mass of 2.3 g. You can also estimate an additional mass of 0.07 g for a total of 2.37 g. Each of the three digits in 2.37 g is significant because it is either certain or estimated.

Problem-Solving TIPS

- Every nonzero digit is significant. Zeros between nonzero digits are significant.
- Zeros appearing in front of the first nonzero digit are not significant.
- If there is no decimal point, zeros that follow the last nonzero digit are not significant.
- If there is a decimal point, zeros that follow the last nonzero digit are significant.
- When measurements are added or subtracted, the result must be rounded to the same number of decimal places that the quantity with the fewest decimal places has.
- When measurements are multiplied or divided, the result must be rounded to the same number of significant figures that the quantity with the smallest number of significant figures has.

SAMPLE 1

How many significant figures does 0.007 09 kg have?

All nonzero digits are significant. The zero between the 7 and 9 is significant. The zeros to the left of the decimal point are not significant. The quantity 0.007 09 kg has 3 significant figures.

SAMPLE 2

Divide 79.7 g by 0.89 cm³.

The quantity 79.7 g has 3 significant figures, but 0.89 cm³ has only 2 significant figures. So, the product 8.955 056 18 g/cm³ must be rounded to 2 significant figures. The rounded quantity is 9.0 g/cm³.

PRACTICE PROBLEMS

1. Determine the number of significant figures.
 - a. 42.200 L
 - b. 0.055 00 mol
2. Perform the following calculations and apply the rules for significant figures.
 - a. $56.05 \text{ g} \div 13.3 \text{ cm}^3$
 - b. $1.057 \text{ g} + 3.02 \text{ g} + 12.4 \text{ g}$