Percent uncertainty

= the ratio of the uncertainty to the measured value, multiplied by 100

5.2 ± 0.1 cm

$$\text{percent uncertainty} = \frac{0.1}{5.2} \times 100 = 1.9 \approx 2\%$$

11.6 ± 0.5 in

$$\text{percent uncertainty} = \frac{0.5}{11.6} \times 100 = 4.31 \approx 4\%$$

5.34 m

$$\text{percent uncertainty} = \frac{0.01}{5.34} \times 100 = 0.187 \approx 0.2\%$$

Homework (due first meeting next week)
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4. How many significant figures do each of the numbers have: (*a*) 142, (*b*) 81.60, (*c*) 7.63, (*d*) 0.03, (*e*) 0.0086, (*f*) 3236, (*g*) 8700?

5. What is the percent uncertainty in the measurement 2.26 ± 0.25 m?

6. What, approximately, is the percent uncertainty for the measurement 1.67?

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7. Time intervals measured with a stopwatch typically have an uncertainty of about a half second, due to human reaction time at the start and stop moments. What is the percent uncertainty of a hand-timed measurement of (*a*) 5 s, (*b*) 50 s, (*c*) 5 min?

8. Multiply 2.079×10^{2} m by 0.072×10^{-1}, taking into account significant figures.

9. Add 7.2×10^{3} s + 8.3×10^{4} s + 0.09×10^{6} s.

10. What is the area, and its approximate uncertainty, of a circle of radius 2.8×10^{4} cm?

11. What is the percent uncertainty in the volume of a spherical beach ball whose radius is $r = 3.86 \pm 0.08$ m?

12. Express the following using the prefixes of Table 1-4: (*a*) 10^{6} volts, (*b*) 10^{-6} meters, (*c*) 5×10^{3} days, (*d*) 8×10^{2} bucks, and (*e*) 8×10^{9} pieces.

13. Write the following as full (decimal) numbers with standard units: (*a*) 86.6 mm, (*b*) 35 μV, (*c*) 860 mg, (*d*) 600 picoseconds, (*e*) 12.5 femtometers, (*f*) 250 gigavolts.

14. Express the following sum with the correct number of significant figures:

    1.00 m + 142.5 cm + 1.24×10^{5} μm.

15. Determine the conversion factor between (*a*) km/h and mi/h, (*b*) m/s and ft/s, and (*c*) km/h and m/s.

21. A *light-year* is the distance light (speed = 2.998×10^{8} m/s) travels in 1.00 year. (*a*) How many meters are there in 1.00 light year? (*b*) An astronomical unit (AU) is the average distance from the Sun to Earth, 1.50×10^{8}km. How many AU are there in 1.00 light year? (*c*) What is the speed of light in AU/h?

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42. The volume of an object is 1000 m^3. Express this volume in (*a*) cm^3, (*b*) ft^3, (*c*) in^3.

43. Estimate how long it would take to walk around the world.