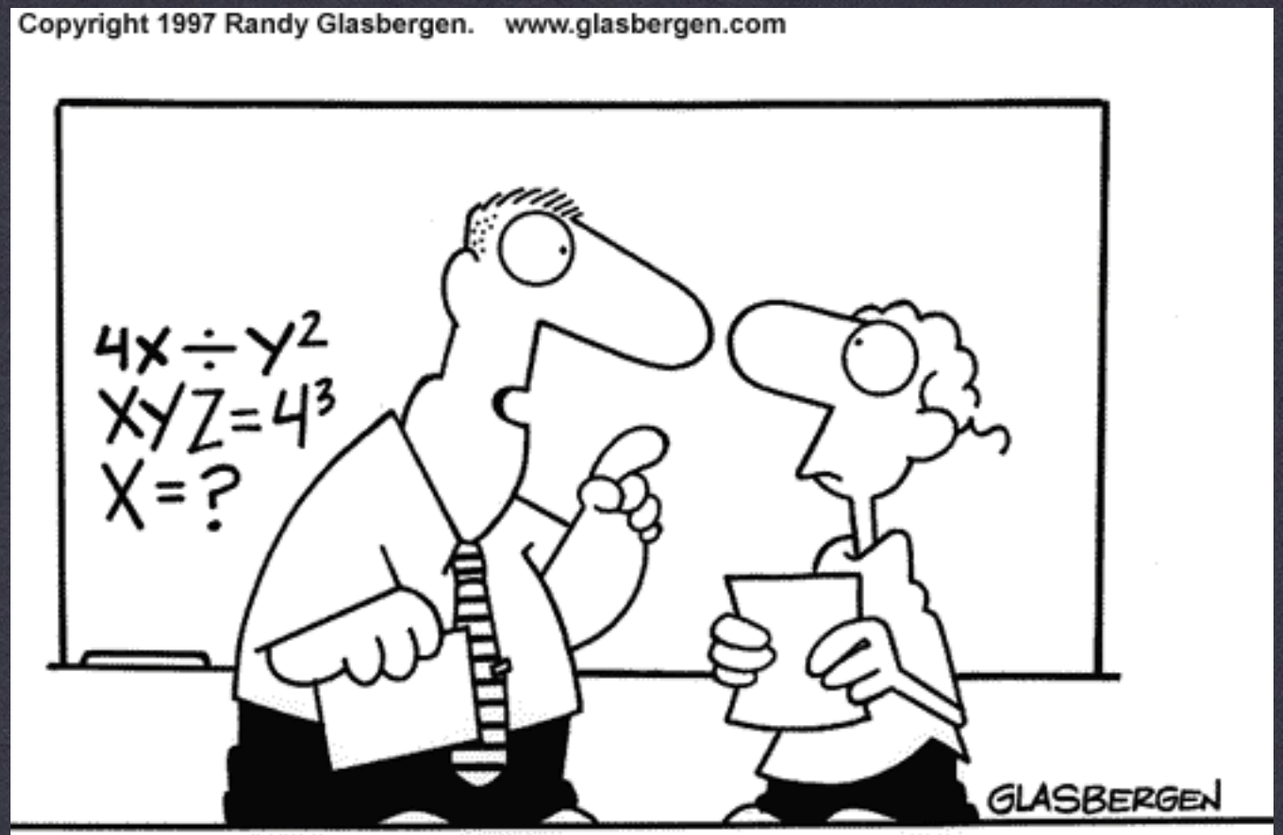

SOLVING PROBLEMS

GETTING ORGANIZED

Solution Process

- See Appendix II and III - Solving Mathematical Problems in Science

1. List known quantities and those that are required, including units.
2. Sketch the physical situation, at least roughly.
3. What type of problem? What equation(s) to use?
4. Do the math. (Rearrange equation, if necessary.)
5. Check the units.
6. Evaluate the answer for reasonableness.

Example:

The mass of a stone is 38.7 g and its volume was measured to be 11.5 mL . What is the stone's density in cc?

1. Known: m = 38.7g, v = 11.5mL.
   Required: density, ρ in g/cm^3
2. Sketch?
3. Type of problem: ρ = m/v
4. Do the math: ρ = 38.7g/11.5mL = 3.37g/mL
5. mL is the same as cc or cm^3 so ρ = $3.37 g/cm^3$
6. See p15. A rock has ρ of ~$3.3 g/cm^3$. Earth average density is $5.5 g/cm^3$. So, this seems quite reasonable

Units & Measurement

In buying a product, a shopper has a choice of the following amounts, all at the same price. Which is the best buy?

A) 432 cc

B) 1 pint

C) 1 half-liter

D) 450 mL

Units & Measurement

Our senses may obtain less-than-accurate information concerning our physical world because they

A) have limited sensitivity.

B) have a limited range.

C) are useless.

D) can be deceived.

Units & Measurement

A standard unit

A) is the same in all systems of units.

B) may not be fixed in value.

C) is found only in the British system.

D) is used for taking accurate measurements.

E) is found only in the metric system.

Units & Measurement

Which of the following is not a fundamental quantity?

A) Weight

B) Length

C) Time

D) Mass

Units & Measurement

The standard unit of mass in the mks system is the

A) meter

B) kilogram

C) pound

D) second

E) gram

Units & Measurement

Measure the length and width dimensions of your desk with the yard or meter-stick.

How accurate can you make this measurement?

Compare the meter-stick measurement with the yardstick measurement by unit conversion.

Numbers

Rounding the number 200.601 to three significant figures

A) gives 199.

B) gives 200.

C) gives 200.601

D) gives 201.

E) cannot be done.

Science Concepts

A very tentative explanation of observations of some regularity of nature is a(n)

A) scientific law.

B) theory.

C) experiment.

D) hypothesis.

Science Concepts

A proposed concept or model of nature is tested using the _____.

The scientific method holds that no theory is valid unless its predictions are in accord with _____.

A(n) _____ is a tested explanation of a broad segment of basic natural phenomena.

Motion

Motion necessarily involves

A) a change in velocity.

B) a change in speed.

C) a change in direction.

D) a change in position.

E) all of these

Motion

The magnitude of a displacement is _____ the magnitude of the distance traveled.

A) always unequal to

B) less than or equal to

C) always equal to

D) greater than or equal to

E) none of these; the two cannot be compared.

Motion

Distance covered per unit of time is called

A) speed.

B) acceleration.

C) velocity.

D) displacement.

Motion

If an object moves with constant velocity,

A) its speed is constant.

B) its direction is constant.

C) its average speed is constant.

D) its distance traveled per unit time is constant.

E) all of these

Motion

An object that is moving in a linear path with an acceleration at a right angle to the motion has a(n) _____ velocity.

A) changing

B) increasing

C) decreasing

D) constant

Motion

An object that is moving in a linear path with an acceleration in the direction of motion has a(n) _____ velocity.

A) constant

B) increasing

C) decreasing

D) none of these

Motion

A car is moving down a freeway in a straight line at a constant rate of 24.0 m/s for 4.0 s. Its acceleration is

A) 9.8 m/s^2.

B) 9.8 m/s.

C) zero.

D) 24.0 m/s.

E) 6.0 m/s^2.

Motion

Let's measure the height of the ceiling using a dropped object and a stopwatch.

Calculate the result from our time measurement in both meters and feet.