# Astronomy C10 / L&S C70U, Fall 2006
## Math Review: Sample Problems

Here are some sample problems, arranged to correspond to the topics on the **Math Review: Summary of Required Skills** sheet.

1. **Scientific Notation**
   Express the following in scientific notation:

   $$503,000,000 \ =$$
   $$0.0062 \ =$$
   $$452.6 \ =$$
   $$0.3 \ =$$

   Write the following in standard decimal notation:

   $$4.35 \times 10^{-2} \ =$$
   $$2.078 \times 10^{3} \ =$$
   $$3.3 \times 10^{-5} \ =$$
   $$8.30 \times 10^{0} \ =$$

   Perform the following operations *without* converting to decimal notation or using your calculator:

   $$(3 \times 10^{4}) \times (2 \times 10^{-3}) \ =$$
   $$(6.5 \times 10^{2}) \times (2 \times 10^{3}) \ =$$
   $$(8 \times 10^{-2}) / (4 \times 10^{2}) \ =$$

2. **Unit Conversions**
   A ruler is 12 inches long. How long is it in centimeters (1 in. = 2.54 cm)?

   $$12 \text{ in} \times \left( \frac{\text{cm}}{\text{in}} \right) = \underline{\quad} \text{ cm}$$

   How many centimeters are in 53 km?

   How many seconds are in a year?

   Convert 65 miles per hour to meters per second (1 mi. = 5280 ft., 1 in. = 2.54 cm).

3. **Solving Basic Equations**

If a car travels 250 km in 5 hrs, what is the velocity of the car?

Solve $2x^2 - 8 = 24$ for $x$.

If $z = 3y^4$, what is $z$ when $y = 2$?

4. **Ratios**

Suppose you're building a scale model of California. The actual distance from San Francisco to Berkeley is 20 km, which you are representing in your scale model as being separated by only 30 cm. If L.A. is 640 km away in real life, how far away will it be on your scale model? (Remember that by 'scale model', we want the ratio of real distance to scale distance to be a constant for any two points.)

Earth's radius is about 6400 km. Mars' radius is about 3200 km (actually it's a bit more, but this value will make the math easier.) The surface area of a planet is given by $A = 4\pi R^2$.

How many times larger is Earth's surface than Mars'? (Hint: $4\pi$ should cancel out.)

It takes about 8 minutes for light to travel from the Sun to the Earth. How long would it take an airplane traveling at 300 m/s to make the same trip? The speed of light is $3 \times 10^8$ m/s. Use the relationship $distance = velocity \times time$.

(Hint: you do not need to know the distance to the Sun.)