1. When the metric system was created by French revolutionaries around the year 1800, the meter was defined so that the circumference of the Earth was 40 million meters. Assume that this definition is still accurate and find the radius of the Earth in km, miles, feet and inches. Use scientific notation to express your results, where appropriate.

2. Convert the speed of each of the following into meters per second:
   (a) a sprinter running 20.0 mph
   (b) a car on the freeway at 65.0 mph
   (c) a jet flying at 510 mph

3. Automobile manufacturers in the United States provide efficiency ratings for their vehicles in “miles per gallon” (larger number is better), while in Europe these ratings are expressed in “liters per 100 km” (so for them, a smaller number is better... Europe does some things backwards.) A certain small car in Europe has a rating of 6.92 liters per 100 km while a larger truck has a rating of 11.3 liters per 100 km. Determine the equivalent rating for each vehicle in miles per gallon.

4. Approximately 70% of Earth’s surface is covered with water, to an average depth of 12,000 feet. Calculate the approximate volume, in cubic miles, m³, and gallons of Earth’s oceans. Express your answers in scientific notation. (Hint: the oceans are a thin layer on the surface of the Earth. Consider the volume of the paint in Webassign problem 4.)

5. Having just earned your pilot’s license, you set out on your first solo flight across the ocean. But you’re no Amelia Earhart... so you decide to just go as far as Catalina Island. You leave Riverside Municipal airport and fly to Catalina Airport, a distance of 67.3 miles at a heading of 34.0° south of west. After spending the day on the island, you depart and fly 84.4 miles on heading of 28.9° south of east to Montgomery Field in San Diego (where you’ll visit some friends and impress them with your plane.) But eventually you have to get home. How far and what direction must you fly to get from Montgomery Field back to Riverside Municipal? (Note: see the diagram posted to the website.)

6. (For this problem, draw a good picture and label right triangles. Although the “law of sines” could be used to get the “answer”, please do not... it is a gimmicky shortcut for people that don’t know how to do this problem properly. I want you to create a solution using right triangles. If your picture is done well, you will see the solution.) The planet Venus is currently visible in the eastern sky just before sunrise (it’s the bright dot hanging over the horizon, above the sun.) When viewed from Earth (because that’s where we are), the angle between Venus and the sun is currently 31.6°. If the distance from Earth to the sun is 150 million km and the distance from Venus to the sun is 108 million km, find the two possible distances from Earth to Venus right now. (Your picture should clearly show why there are two possible distances.)

Mercury is also barely visible, just above the sun.

**Answers**

1. 6370 km, 3960 mi, 2.09 x 10⁷ ft, 2.51 x 10⁸ in
2. 8.94 m/s, 29.1 m/s, 228 m/s
3. 34.0 mpg, 20.8 mpg
4. 3.13 x 10⁶ mi³, 1.30 x 10¹⁸ m³, 3.45 x 10²⁰ gallons
5. 80.5 miles, 77.0° north of west
6. 53.7 million km, 202 million km