Challenge conversion problems:

1. In STAR TREK the starship U.S.S. Enterprise can travel faster than the speed of light. The various faster-than-light speeds are referred to as warp factors. Warp factor 1.71 is equal to five times the speed of light (3.00×10^8 m/s). What speed, in mi/hr, is the Enterprise traveling at when it is at warp factor 6? (0.914 meter = 1 yard)

2. The roof of a building measures 2.44 acres (an acre is 43,560 square feet). During a rainstorm one evening, 1.25 inches of rain fell. Assuming the density of the rain that fell was 1.00 grams per cubic centimeter, what is the weight, in pounds, of the rain on top of the building? (1 in = 2.54 cm; 454 g = 1 lb)

3. The Toyota Prius, a hybrid electric vehicle, has an EPA gas mileage rating of 22 km/L in the city and has a gas tank capable of holding 11.9 gallons of gas. A Lamborghini Aventador (not a hybrid vehicle) has a city gas mileage of 4.7 km/L and a 23.8 gallon gas tank. Which car will go further in miles? By how much?

4. Recently, Dr. Jacob Frankel has suggested that Earth may be pelted by thousands of house-sized comets. Satellite imagery has been inconclusive, and the idea remains controversial. When Frank first considered the idea of mini-comets falling to Earth, he no doubt scrambled to make a quick dimensional analysis calculation. Comets can be thought of as dirty snowballs—maybe Earth's oceans have accumulated from these comets over the ages! Use the following information to estimate what percent of Earth's oceans could be accounted for given a constant bombardment by comets over the last 4 billion years (the estimated age of the earth). You will need the following information: Each mini-comet contains about 30.0 tons of water; density of water is 1.00 g/cm^3; 15 000 mini-comets hit the Earth each day; Earth's oceans occupy 1.36 billion km^3.

Challenge conversion problems ANSWERS:

1. In *Star Trek* the starship U.S.S. Enterprise can travel faster than the speed of light. The various faster-than-light speeds are referred to as warp factors. Warp factor 1.71 is equal to five times the speed of light (3.00×10^8 m/s). What speed, in mi/hr, is the Enterprise traveling at when it is at warp factor 6? (0.914 meter = 1 yard)
   1.18x10^{10} mi/hr

2. The roof of a building measures 2.44 acres (an acre is 43,560 square feet). During a rainstorm one evening, 1.25 inches of rain fell. Assuming the density of the rain that fell was 1.00 grams per cubic centimeter, what is the weight, in pounds, of the rain on top of the building? (1 in = 2.54 cm; 454 g = 1 lb)
   6.91x10^5 lb

3. The Toyota Prius, a hybrid electric vehicle, has an EPA gas mileage rating of 22 km/L in the city and has a gas tank capable of holding 11.9 gallons of gas. A Lamborghini Aventador (not a hybrid vehicle) has a city gas mileage of 4.7 km/L and a 23.8 gallon gas tank. Which car will go further in miles? By how much?
   Prius by 360 mi

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   40%