#### M/J Grade 8 Pre-Algebra

# Warm-Up 13

#### **Problem 1: Astronomy**

The distance from Earth to the nearest star, Proxima Centauri, is approximately 4.24 light years, which is equal to  $4.02 \times 10^{16}$ meters. If NASA sends a spacecraft that travels at a speed of  $3.0 \times 10^4$ meters/second, how many years will it take for the spacecraft to reach Proxima Centauri?

## **Problem 2: Microbiology**

A single Escherichia coli (E. coli) bacterium has a mass of approximately  $2.2 \times 10^{-15}$  kg. Suppose a culture of E. coli has a total mass of 2.2 kg. Approximately how many E. coli bacteria are in the culture?

## **Problem 3: Physics**

The observable universe is estimated to be  $8.8 \times 10^{26}$  meters in diameter. Light travels at a speed of  $3.0 \times 10^8$  meters/second. How many years does it take for light to travel across the observable universe?

## **Problem 4: Chemistry**

One molecule of water ( $H_2O$ ) has a mass of 2.99 × 10<sup>-26</sup> kg. If you have 1.0 kg of water, how many water molecules do you have?

#### Note:

For these problems, you can use the approximation that 1 year = 3.15 × 10<sup>7</sup> seconds.