

# Unit 7 Lesson 13: Multiplying, Dividing, and Estimating with Scientific Notation

## 1 True or False: Equations (Warm up)

### Student Task Statement

Is each equation true or false? Explain your reasoning.

1.  $4 \times 10^5 \times 4 \times 10^4 = 4 \times 10^{20}$

2.  $\frac{7 \times 10^6}{2 \times 10^4} = (7 \div 2) \times 10^{(6-4)}$

3.  $8.4 \times 10^3 \times 2 = (8.4 \times 2) \times 10^{(3 \times 2)}$

## 2 Biomass

### Student Task Statement

Use the table to answer questions about different creatures on the planet. Be prepared to explain your reasoning.

creature	number	mass of one individual (kg)
humans	$7.5 \times 10^9$	$6.2 \times 10^1$
cows	$1.3 \times 10^9$	$4 \times 10^2$
sheep	$1.75 \times 10^9$	$6 \times 10^1$
chickens	$2.4 \times 10^{10}$	$2 \times 10^0$
ants	$5 \times 10^{16}$	$3 \times 10^{-6}$
blue whales	$4.7 \times 10^3$	$1.9 \times 10^5$
Antarctic krill	$7.8 \times 10^{14}$	$4.86 \times 10^{-4}$
zooplankton	$1 \times 10^{20}$	$5 \times 10^{-8}$
bacteria	$5 \times 10^{30}$	$1 \times 10^{-12}$

1. Which creature is least numerous? Estimate how many times more ants there are.
2. Which creature is the least massive? Estimate how many times more massive a human is.
3. Which is more massive, the total mass of all the humans or the total mass of all the ants?  
About how many times more massive is it?
4. Which is more massive, the total mass of all the krill or the total mass of all the blue whales?  
About how many times more massive is it?

### 3 Info Gap: Distances in the Solar System

#### Student Task Statement

Your teacher will give you either a problem card or a data card. Do not show or read your card to your partner.

If your teacher gives you the *problem card*:

1. Silently read your card and think about what information you need to answer the question.
2. Ask your partner for the specific information that you need.
3. Explain to your partner how you are using the information to solve the problem.
4. Solve the problem and explain your reasoning to your partner.

If your teacher gives you the *data card*:

1. Silently read the information on your card.
2. Ask your partner "What specific information do you need?" and wait for your partner to *ask* for information. *Only* give information that is on your card. (Do not figure out anything for your partner!)
3. Before telling your partner the information, ask "Why do you need that information?"
4. After your partner solves the problem, ask them to explain their reasoning and listen to their explanation.

Pause here so your teacher can review your work. Ask your teacher for a new set of cards and repeat the activity, trading roles with your partner.

## 4 Professions in the United States (Optional)

### Student Task Statement

Use the table to answer questions about professions in the United States as of 2012.

profession	number	typical annual salary (U.S. dollars)
architect	$1.074 \times 10^5$	$7.3 \times 10^4$
artist	$5.14 \times 10^4$	$4.4 \times 10^4$
programmer	$1.36 \times 10^6$	$8.85 \times 10^4$
doctor	$6.9 \times 10^5$	$1.87 \times 10^5$
engineer	$6.17 \times 10^5$	$8.6 \times 10^4$
firefighter	$3.07 \times 10^5$	$4.5 \times 10^4$
military—enlisted	$1.16 \times 10^6$	$4.38 \times 10^4$
military—officer	$2.5 \times 10^5$	$1 \times 10^5$
nurse	$3.45 \times 10^6$	$6.03 \times 10^4$
police officer	$7.8 \times 10^5$	$5.7 \times 10^4$
college professor	$1.27 \times 10^6$	$6.9 \times 10^4$
retail sales	$4.67 \times 10^6$	$2.14 \times 10^4$
truck driver	$1.7 \times 10^6$	$3.82 \times 10^4$

Answer the following questions about professions in the United States. Express each answer in scientific notation.

1. Estimate how many times more nurses there are than doctors.
2. Estimate how much money all doctors make put together.

3. Estimate how much money all police officers make put together.
4. Who makes more money, all enlisted military put together or all military officers put together?  
Estimate how many times more.