LVL 1

LEVEL 1 DAY 1

Name: Paul Polgyn

Working with Quantities and Rates

PRACTICE 112m ÷ 4 sec 1.3

READ

- A quantity describes an amount of something. It has two parts: a number and a unit. The number tells "how many." The unit tells "of what." For example, 10 apples is a quantity. **10** is the number, **apples** is the unit.
- You cannot combine quantities unless they have the same unit. For example, 5 apples + 5 pears can't be combined, but 5 apples + 5 apples can be combined to make 10 apples.
- When you multiply or divide quantities, the units get multiplied or divided too. For example, 10 cm ÷ 10 cm = 100 cm ÷cm, or 100 cm^2.
- A rate describes a relationship between two quantities. Rates are commonly described as something "per" something, like "50 miles *per* hour." *Per* means "for every" or "for each." In science, we often use a fraction bar or slash to represent the word per, as in 10 cookies/dollar. Rates are usually written in the fraction's lowest terms. For example, if you received $100 for working 10 hours, you could write:

$$\frac{100 \text{ dollars}}{10 \text{ hours}} = \frac{10 \text{ dollars}}{1 \text{ hour}}$$

- Sometimes you will be asked to multiply two rates. This is often done to change one unit to another. For example, if you wanted to know how much you were paid per minute, you could set up a problem like this:

$$\frac{10 \text{ dollars}}{1 \text{ hour}} \times \frac{1 \text{ hour}}{60 \text{ minutes}} = \frac{10 \text{ dollars}}{60 \text{ minutes}} = \frac{0.17 \text{ dollar}}{1 \text{ minute}}$$

Notice that the rules for multiplying fractions apply to units, too. Since "hour" appears in the numerator and the denominator, the "hour" unit is cancelled

PRACTICE

1. Practice your skills with quantities in the problems below. Make sure that you include units in your answer. If the quantities can't be combined, write "cannot combine" as your answer.

   a. 5 inches × 4 inches =

   b. 12 cookies – 5 cookies =

   c. 12 eggs + 12 eggs =

   d. 120 erasers ÷ 10 boxes =

   e. 12 cookies – 5 candy bars =

   f. 120 erasers ÷ 12 erasers =

Practice your skills with rates in the problems below. Some of the units you will see are real (like seconds) and some are made up (like blinks). Even with made up units, the rules for algebra and arithmetic still apply. Make sure that you reduce fractions to their lowest terms and include units in your answer.

2. $\frac{\$36}{3 \text{ hours}} =$

3. $\frac{48 \text{ students}}{2 \text{ classrooms}} =$

4. $\frac{10 \text{ meters}}{\text{second}} \times \frac{60 \text{ seconds}}{1 \text{ minute}} =$

5. $\frac{15 \text{ winks}}{5 \text{ clinks}} \times \frac{10 \text{ blinks}}{5 \text{ winks}} =$

In the space provided, write the unit that should go in the parentheses so that each side of the equation is equal. Use the example to help you get started. Note that singular and plural units do cancel one another.

Problem: $\frac{\text{miles}}{(\quad)} \times \text{hours} = \text{miles}$ **Answer:** $\frac{\text{miles}}{(\text{hour})} \times \text{hours} = \text{miles}$

6. $\frac{\text{cm}}{\text{second}} \times \text{seconds} = (\quad)$

7. $\frac{\text{commercials}}{(\quad)} \times \text{program} = \text{commercials}$

8. $\frac{(\quad)}{\text{pound}} \times \text{pound} = \text{shrimp}$

9. $\text{seconds} \times (\quad) = \text{seconds}^2$

10. $\text{cm}^2 \times (\quad) = \text{cm}^3$

11. $\frac{(\quad)}{(\quad)} \times \text{pencils} = \text{boxes}$

12. $\frac{(\text{kg} \times \text{m})}{\text{s}^2} \times (\quad) = \text{m}$

13. $(\text{clinks})(\text{winks}) \times \frac{1}{\text{blinks}} = (\quad)$

14. $\frac{\text{miles}}{\text{hours}} \times \frac{\text{hours}}{\text{minute}} \times \frac{\text{minutes}}{\text{second}} = (\quad)$

15. $\frac{\text{centimeter}}{\text{hour}} \times \frac{\text{millimeter}}{\text{centimeter}} = (\quad)$

16. $(\quad) \times \frac{\text{pizzas}}{\text{person}} \times \frac{\text{dollars}}{\text{pizza}} = \text{dollars}$

17. $\frac{\text{calories}}{\text{minute}} \times \frac{\text{minute}}{\text{hour}} \times (\quad) = \text{calories}$

18. $\frac{\text{games}}{\text{year}} \times \frac{\$}{(\quad)} \times \text{years} = \$$

19. $\frac{\text{heartbeats}}{\text{minute}} \times \frac{\text{minute}}{(\quad)} \times \frac{\text{hour}}{\text{day}} \times \text{days} = \text{heartbeats}$

20. $\frac{\text{centimeters}}{\text{second}} \times \frac{\text{second}}{\text{hour}} \times \frac{\text{meter}}{(\quad)} \times \frac{\text{kilometer}}{\text{meter}} \times \frac{\text{miles}}{\text{kilometer}} = \frac{\text{miles}}{\text{hour}}$