Shower vs Bath

How quickly did the water flow in the shower?

In 27 seconds, one gallon of water was used.

- What are the units?

$$\frac{seconds}{gallon}$$

a rate compares 2 amounts in different units.

xamples: RATE: 55 mph $\frac{27sec}{1\ gallon}$ $\frac{\$}{LB}$

- When we were figuring out how much water was used, why didn't we just multiply

2:24 by $\frac{1\ gallon}{27\ seconds}$?

min   seconds   Just seconds

Time is being expressed in Different units

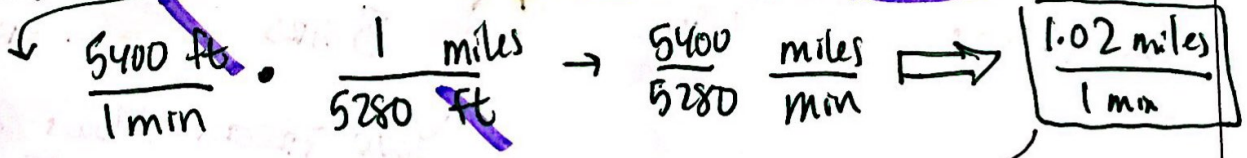- This process in which we convert from one type of unit to another is called: __Unit Analysis__

like feet to inches
or
ounces to pounds
or
seconds to hours

o What happens to units as we multiply?

2 minutes • $\frac{60\ seconds}{1\ minute}$ THEY CAN CANCEL JUST LIKE VALUES

o How can we tell if we set it up correctly? CAN, IF THEY ARE DIAGONAL FROM EACH OTHER.

IN ORDER TO CANCEL, ↓
THE UNITS WE WANT TO GET RID OF ARE DIAGONAL FROM EACH OTHER

Example 1: Remember the Cheetah chasing down the Gazelle?
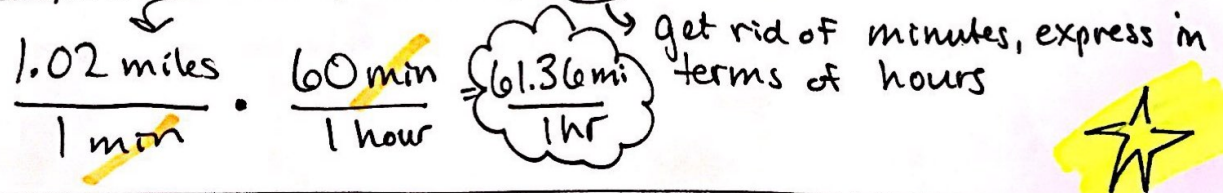
a. What is the top speed of the cheetah? $\frac{90\ ft}{second}$ conversion

b. Use unit analysis to determine the speed in feet per minute.

$$\frac{90\ ft}{1\ sec} \cdot \frac{60\ sec}{1\ minute} = \frac{5400\ ft}{1\ minute}$$

c. Use unit analysis to determine the speed in miles per minute. (Hint: there are 5,280 feet in a mile)

$$\frac{5400\ ft}{1\ min} \cdot \frac{1\ miles}{5280\ ft} \rightarrow \frac{5400}{5280}\ \frac{miles}{min} \Rightarrow \frac{1.02\ miles}{1\ min}$$

d. Use unit analysis to determine the speed in miles per hour.

$$\frac{1.02\ miles}{1\ min} \cdot \frac{60\ min}{1\ hour} = \frac{61.36\ mi}{1\ hr}$$

get rid of minutes, express in terms of hours

Birth rate

Example 2: In 2010, the population of Japan was roughly 128,100,000. For every 1,000 people, 9 babies were born. About how many of Japan's population were babies? Use unit analysis

$$128,100,000 \text{ people} \cdot \frac{9 \text{ Babies}}{1,000 \text{ people}} \rightarrow \boxed{1,152,900 \text{ BABIES}}$$

A specific type of application of rate is called a <u>UNIT RATE</u>.

rewriting a rate so its per one unit

Example 3: Which is a better deal? Justify your answer using unit rate. Label your units!

8, 15oz cans for $5.59

120 oz

$$\frac{\$5.59}{120} \approx \frac{\$0.046}{1 oz}$$

One 117oz can for $4.49

$$\frac{\$4.49}{117 oz}$$

$$\frac{\$0.038}{1 oz}$$

CHEAPER PER OUNCE! THAN

Example 4: On Saturday mornings, you cut 3 lawns in 5 hours and your friend cuts 5 lawns in 8 hours. Assuming the lawns are all the same size, who cuts lawns at a faster rate? Label your units!

You

$$\frac{3 \text{ LAWNS}}{5 \text{ HOURS}} \rightarrow \frac{0.6 \text{ LAWNS}}{1 \text{ HR}}$$

Your Friend

$$\frac{5 \text{ LAWNS}}{8 \text{ HRS}} \rightarrow \frac{0.625 \text{ LAWNS}}{1 \text{ HR}}$$

YOUR FRIEND MOWS MORE LAWNS THAN YOU - FASTER RATE!

Ticket out the Door

Explain the role units play in mathematics. When do you use them outside of class?