

What if the two captains sailed for the **same** amount of time? Since 3 and 5 are both factors of 15, we can figure out how far each captain could sail in 15 hours.

Conch:
 51 miles in 3 hours
 255 miles in 15 hours

Crusty:
 90 miles in 5 hours
 270 miles in 15 hours

Conch sailed 51 miles in 3 hours. At that speed, he could go $51 \cdot 5 = 255$ miles in $3 \cdot 5 = 15$ hours.

Crusty sailed 90 miles in 5 hours. At that speed, he could go $90 \cdot 3 = 270$ miles in $5 \cdot 3 = 15$ hours. Crusty was faster.

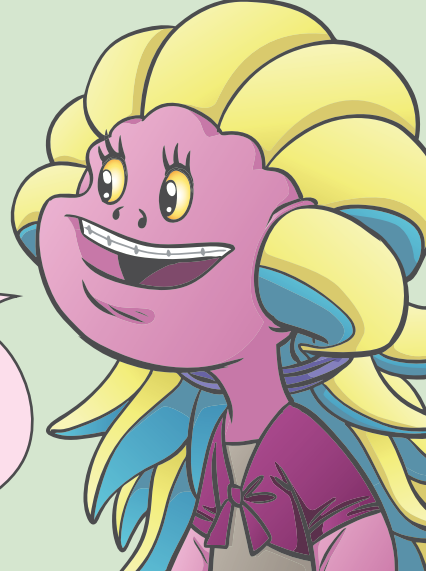
Conch:
 51 miles in 3 hours = 17 miles per hour

Crusty:
 90 miles in 5 hours = 18 miles per hour

Instead of figuring out how far each Captain could sail in **15** hours, I figured out how far each could go in **1** hour.

For Conch to travel 51 miles in 3 hours, he had to travel $51 \div 3 = 17$ miles per hour.

For Crusty to travel 90 miles in 5 hours, he had to travel $90 \div 5 = 18$ miles per hour.




"PER" MEANS "FOR EACH" OR "FOR EVERY."

Excellent figurin', little monsters. **Speed** be the ratio of distance to time.

We often express speed as the distance traveled for one unit o' time...

...for example, as the number o' miles traveled per hour.

We can abbreviate "miles per hour" as mph.

$$\begin{aligned} \text{Speed} &= \frac{\text{distance}}{\text{time}} \\ &= \frac{90 \text{ mi}}{5 \text{ hr}} \\ &= \frac{18 \text{ mi}}{1 \text{ hr}} \\ &= 18 \text{ mph} \end{aligned}$$


Other units can be used to measure speed.

Some things happen very slowly.

For example, the horn o' a spiralcac grows just $\frac{3}{4}$ inches per year, starting at birth.

How long be the horn o' a 40-year-old spiralcac?



If the horn grows $\frac{3}{4}$ inches each year, then in 40 years, it will be $\frac{3}{4} \cdot 40 = 30$ inches long.



Aye. In fact, we can find the age of a spiralcac by the length o' its horn.

What be the age o' a spiralcac with a 60-inch horn?

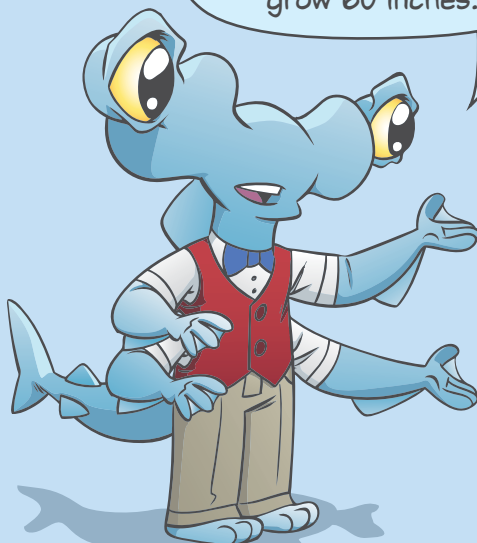
Trying a similar problem without fractions can help us figure out what to compute.

If the horn grows 2 inches per year, it will take $60 \div 2 = 30$ years to grow 60 inches.

So, if the horn grows $\frac{3}{4}$ inches per year, it will take $60 \div \frac{3}{4}$ years to grow 60 inches.

$$60 \div \frac{3}{4} = 60 \cdot \frac{4}{3} = 80 \text{ years.}$$

$$\begin{aligned} 60 \div \frac{3}{4} &= 60 \cdot \frac{4}{3} \\ &= \frac{240}{3} \\ &= 80 \end{aligned}$$



Speed be a special type o' ratio, called a *rate*.

If ye' be usin' the word *per*, then you're probably usin' a rate.

A rate describes how much o' one quantity there be for one unit of another quantity.

Rate

For example, the time I faced a mighty spiralac, me heart be thumpin' 200 beats *per* minute.

Its enormous feet be havin' 5 razor-sharp talons *per* toe!

Its nostrils could spray powerful jets of water like a firehose...
...30 gallons *per* second!

What treasure were you after?

Spiralacs shed their soft, fluffy feathers.

While me crew distracted her, I was able to gather a dozen sacks full o' the downy plumage.

The largest sack o' feathers weighed just $4\frac{1}{2}$ pounds 'n' sold for \$720!

The smallest sack weighed only $2\frac{1}{5}$ pounds 'n' sold for \$330!

Which sack be worth more per pound?

What was the cost per pound of each sack?