

“Math Doesn’t Suck” Supplemental PDF

Ratios are Independent of the Units You Use!

...continued from “WHAT’S THE DEAL?” in Ch.16, p.199

You may have noticed that in the solution to the “phone hours to study hours” ratio on page 196, what we really found was the ratio of “phone minutes to study minutes.” After all, we converted the times into *minutes*—20 and 60—and then reduced.

Knowing this, you might be thinking, *Why did we say ‘study hours to phone hours’ in the answer, instead of ‘study minutes to phone minutes?’*

As it turns out, for ratios, they’re really saying the same thing!

Think about it: If for every 1 minute you spend on the phone, you spend three minutes studying, then for every 1 hour you spend talking on the phone, you’re spending three hours studying, too. Does that make sense? The only thing that matters in ratios is the relationship *between* the two numbers—not the numbers themselves.

But to illustrate how they are equivalent, we also could have done this problem by converting everything to *hours*, and then simplifying *that* ratio instead. We should get the same final answer, right?

Let's test it out. We have 1 study hour and 20 phone minutes to compare in a ratio.

Since an hour is 60 minutes, we know that 20 minutes = $\frac{1}{3}$ of an hour.

So our ratio of "1 to $\frac{1}{3}$ " would look like: $\frac{1}{\frac{1}{3}}$

Well, that's a little messy, but if you remember how to deal with complex fractions (see Chapter 9 in the book), you can convert it to a simple fraction by first rewriting 1 as $\frac{1}{1}$, and then doing the "means and extremes" on the tall and skinny fraction:

Write 1 as $\frac{1}{1}$ and do the "means and the extremes" (see p. 97 for a review)

$$\frac{1}{\frac{1}{3}} = \frac{1 \times 3}{1 \times 1} = \frac{3}{1}$$

So this means that on a night before a test, my ratio of "study hours to phone hours" was:

$$3 \text{ to } 1 \quad \text{or} \quad 3 : 1 \quad \text{or} \quad \frac{3}{1}$$

Phew! Done! And yep, we got the same answer here as we did above, when we converted to minutes.