Math, *you can do it!*

Ratio & Proportion

by Bill Hanlon

Ratio is a comparison between two numbers.

We use ratios every day. Examples would include one candy cost $ .50. The ratio is 1 to $.50. Another example might be there are 70 children and two buses. That ratio would be 70 to 2 or 35 to 1.

You can describe a ratio in three ways:

1 to 5 1 : 5 $\frac{1}{5}$

If one candy bar costs $.50, you might realize that two candy bars would cost $1.00. That seems simple enough, right? Well, what you just discovered is a proportion.

Proportion is a statement of equality between two ratios.

Example
In reading a map, the legend might indicate that one inch represent 25 miles. If the distance you had to travel on the map was 6 inches, how many miles would that be?

The ratio described in the problem is $\frac{\text{inches}}{\text{miles}}$

Knowing that one inch represents 25 miles, we can set up a proportion to determine how many miles six inches represents.

Setting up the proportion we have:

$$\frac{1}{25} = \frac{6}{n}$$

By cross multiplying, we have 1n = 6x25, or n = 150 miles

It is very important that the ratio on the right is described in the same way as the ratio on the left side of the equation.

In other words, if I describe the ratio as inches to miles on the left, I must describe the ratio on the right as inches to miles.

I could have, however, described the ratio as miles to inches on the left. If I did I would have had to describe the ratio on the right as miles to inches. That's very, very important.

That problem was simple enough because a ratio was given in the problem and more information was then given in terms of the ratio. That does not always happen.

Example
In gymnastics class there are five boys for every seven girls. If there are 48 kids in the class, how many boys are there.

The ratio is boys to girls, writing that we have

$$\frac{5}{7} = \frac{\text{boys}}{\text{girls}}$$

Here we realize we don't have additional information in terms of the ratio, boys to girls, to fill in the right side as we did in the previous example.

Knowing that the numbers in a ratio do not describe the actual number of boys or girls, only a comparison. I will use a little algebra to work this problem out. It's easy, stay with me.

Since the ratio is 5 to 7, that means there are 5x boys in class and 7x girls. The information in the problem indicated there were 48 students in the class. That means boys + girls is 48.

Writing that, we have

$$\begin{aligned} 5x + 7x &= 48 \\ 12x &= 48 \\ x &= 4 \end{aligned}$$

Since x = 4, we have 5x4 or 20 boys and 7x4 or 28 girls.

The point being, if you are given a problem being described by a ratio, then additional information is given to you NOT using the descriptors in the ratio, you should set up the problem algebraically as I did in the second example.

Otherwise, if a ratio is given to you and more information is given to you in terms of the ratio, as in the first example, then you merely set up the proportion and cross multiply.