

Dimensional analysis (also known as the factor-label method or unit-factor method) is by far the most useful math trick you'll ever learn. Maybe you've learned some algebra, but will you use it? For many people the answer is, "not after the final exam."

For a fraction of the effort needed to learn algebra, you too can learn "dimensional analysis." First off, however, let's get rid of the big words. What this is all about is just conversion--converting one thing to another. This is something you will have occasion to do in real life. This is seriously useful stuff.

This trick is about applied math, not about numbers in the abstract. We're talking about measurable stuff, stuff you can count or measure. Anything you measure will have a number with some sort of "unit of measure" (the dimension) attached. A unit could be miles, gallons, miles per second, peas per pod, or pizza slices per person.

*Example:*

*You're throwing a pizza party for 15 and figure each person might eat 4 slices. How much is the pizza going to cost you? You call up the pizza place and learn that each pizza will cost you $14.78 and will be cut into 12 slices. You tell them you'll call back. Do you have enough money? Here's how you figure it out, step by step.*

1. Ask yourself, "**What do I want to know?**" In this case, how much money is the pizza going to cost you, which in math terms is: cost (in dollars) per party, or just $/party. This is your "answer unit." This is what you are looking for.

2. Ask, "**What do I know?**" Write it all down, everything you know: one pizza will cost you $14.78 (in math terms 1 pizza/$14.78). You also know that for $14.78 you can buy one pizza ($14.78/1 pizza). It can be important to realize that every conversion factor you know can be written two ways. One of these ways may be needed to solve the problem and the other won't, but in the beginning you don't know which, so just write them both ways. Continue writing down other things you know. You know, or hope, that only 15 people will be eating pizza (15 persons/1 party), or for this one party, 15 people will come (1 party/15 persons). You also know there will be 12 slices per pizza (12 slices/1 pizza), or that each pizza has 12 slices (1 pizza/12 slices). The last thing you know is that each person gets 4 slices (1 person/4 slices), or that you are buying 4 slices per person (4 slices/person). Math is a language that is much briefer and clearer than English, so writing every thing you know in math terms, here's what you might have written down:

3. Ask, "From all the things above I know, **what do I actually need to know** to figure out the problem?"

Remember that you want to know $/party, so pick one of the things you know that has either dollars on top, or "party" on the bottom. Let's start with $14.78/pizza as the starting factor. Great, you got dollars on top, but "pizza" on the bottom where you want "party." To get rid of "pizza" pick one of the things you know that has "pizza" on the top. "Pizza" over "pizza" cancels out, so you get rid of the "pizza:"



Okay, you now have dollars per slice, but you want dollars per party, so now what? Easy, just keep picking from the things you know whatever cancels out the units you don't want. The numbers go with the units, but don't worry about numbers, just pay attention to the units. So you pick 4 slices/1 person to get rid of "slices," then 15 persons/1 party to get rid of "person(s):"



Now multiply all the top numbers, and then divide by any bottom numbers to get the right number. Finally add the units that are left over to the number to get the answer you wanted. Using this method, you can hardly go wrong unless you push the wrong button on your calculator.

By the way, how many pizzas should you order? Figuring this out should be as easy as....

