Why Are Story Problems So Hard?
Math 101, Littlefield

Story problems have a reputation for being much harder than "just math" problems. Why is that?

Well, there's a simple reason: **they <u>are</u> harder!**

As an example, consider the following "just math" problem:

Solve the following equation. $50 * 2 + x * 6 = (50 + x) * 5$

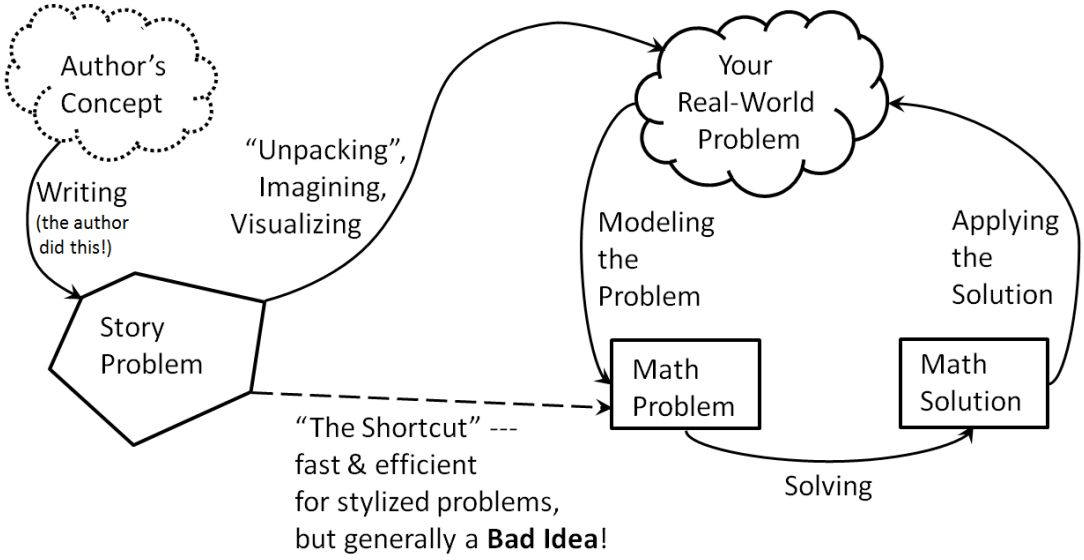
To work this problem, all you have to do is mechanically shove some symbols around.

Or if you're feeling really lazy, just type the original equation into an algebra calculator like http://www.quickmath.com and out pops the answer, no thinking required.

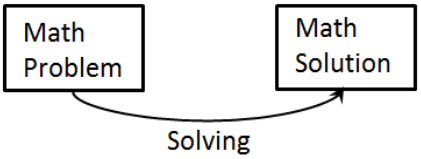
Then on the other hand, there's this story problem: *"Joe Grocer wants to mix 50 pounds of nuts that cost $2 per pound, with some other nuts that cost $6 per pound, to make a mixture that costs $5 per pound. How many pounds of $6 nuts should he use?"*

This looks a lot harder, doesn't it? And in fact it is! But it's not the math that's harder; what's harder is getting to the math in the first place.

Consider the big picture:



When you're dealing with a "just math" problem, you only have to work with this tiny part of the big picture:



To deal with a "real-world problem", you have the additional task of modeling the problem — deciding how to turn your real problem into a math problem — and then the task of applying the math solution back to solving your real problem. Those parts are just plain difficult!

In the case of Joe Grocer, one way of modeling the real problem of mixing nuts ends up producing the "just math" problem that we already talked about: $50 * 2 + x * 6 = (50 + x) * 5$

Once you see this, it's obvious that solving the story problem has to be harder than just solving the equation, because solving the equation is only one part of solving the real world problem.

But with a "story problem", it's even worse than that. You don't even have direct access to a real world problem that you can think about in a variety of ways. All you get to start with is a short sequence of words that represent some problem that was in the mind of the problem's author when he or she wrote the story!

Then it's your job to somehow figure out what problem the author is trying to describe, turn it into your own understanding of a real-world problem, then start attacking it as a math problem.

At least, that's what you ought to be doing. **Make sense of the story, turn it into your <u>own</u> understanding of a real-world problem, and then work on solving that real-world problem.**

There is a great temptation to try taking The Shortcut — using some sort of quick-and-dirty pattern matching to turn the story problem directly into a math problem without ever actually making sense of it. This approach is actively encouraged by some textbooks, which specifically tell you to look for key phrases like "2 more than", "3 times as old", and so on, and turn those into algebraic expressions like "2+x" and "3x".

At its best, The Shortcut approach is an excellent way of dealing with stylized problems that appear as exam questions. But this is just a game — a way of getting a better score on an exam. The rest of the time, The Shortcut is a horrible idea.

The real purpose of story problems is to give you exercise in solving real world problems. The story is just a quick and inexpensive way to create an image of a real-world problem in your head.

Presenting you with **<u>real</u>** real-world problems would be much better, but that takes more time and materials than most math courses have available. So classes generally use story problems as a poor substitute for practical problem solving. This course is no exception.