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Math isn't about getting right answer, but learning from problem

By JASON BROWN
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Imagine there are two large glasses in front of you, a wine glass containing exactly one cup of wine, and a water glass with one cup of water.

You take a tablespoon of wine from the glass of wine and pour it into the water glass, mixing up the contents thoroughly.

You then take a tablespoon of the water-wine mixture from the water glass and pour it into the wine glass.

Here is the question: Is there more wine in the water glass or more water in the wine glass?

It seems pretty clear that there should be more wine in the water glass. After all, you put a tablespoon of pure wine into the water, but then transfer back a mixture of water and wine back into the wine glass. I'll leave it to you to mull it over for awhile.

The problem I've just raised is typical of many workplace problems in that it is atypical, a unique problem that you've probably never thought of before.

Advances in technology depend crucially on problem solving. The high-end skills required of industry-leading jobs are undoubtedly math related.

The Wall Street Journal reported in 2009 a study to ascertain the best and worst jobs, based on five criteria: environment, income, employment outlook, physical demands and stress. And do you know what career ranked first? Mathematician. And second and third place went to actuaries and statisticians, both variants of the same mathematical mindset. (Oh, and the worst job — lumberjack.)

With the importance that mathematics plays in getting and keeping the best jobs, it was disheartening for me to attend a course-selection meeting for parents of high school students.

There were a lot of questions, but I would say about 75 per cent of them were about how their kids might get through the mathematics curriculum. I don't know who was more afraid of math — the students or the parents!

Nova Scotian students haven't done well in math, with only 45 per cent of Grade 12 students passing the provincial math exam in 2010, down six points from the previous year.

So what is there to do? I think we need to recognize the fear that's there, and face it as a challenge, rather than avoiding it. We need to sit down with our children when it comes to math and show them that it requires perspiration, just like athletics.

Getting the right answer is not the goal of math; the aim is to learn from every problem, and there can be fun, even in the struggle.

Oh, and the solution to the wine and water glass problem? Forget about how many tablespoons there are in a cup, forget about how well the wine and water are mixed. Just think of the two glasses at the end.

As the wine glass starts and ends with a cup of liquid, the amount of water in the wine glass has displaced exactly that amount of wine, which is obviously in the water glass.

So there is exactly the same amount of wine in the water glass as there is water in the wine glass.

The beauty of the argument is that it doesn't matter what size spoon you used to travel back and forth, it doesn't matter whether you mixed the wine and water well or not, whether you repeated the transfer of liquid a few more times, or whether the wine and water cups started off with the same amount of liquid!

All that matters is that after all of the transferring, you end up with the same amount of liquid in each glass as when you started.

Math is more than just numbers — it is a way of thinking. If only you had the wine, you could enjoy that while you savour the solution!

Jason I. Brown is a mathematics professor at Dalhousie University in Halifax. His research that used mathematics to uncover how the Beatles played the opening chord of A Hard Day's Night has garnered worldwide attention.

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