

Correlation Street

The mathematical soap opera that is my classroom...

Luke's Law

The master bridge player Eli Cuthbertson was once called upon in a court case. A husband and wife bridge pair had fallen out over a four spades contract that the poor woman had failed to make, whereupon her husband had shot her. "I was able to offer in mitigation," said Cuthbertson gravely, "That on that hand, four spades was, in fact, possible."

For certain mistakes, the weary teacher may sometimes feel like clubbing a student to a slow and painful death. Are there any howlers that count as so grievous that the teacher would walk away a free man from a subsequent murder trial?

Andrew, a bright but sloppy student a year and half into his A Level course, offered me this the other day;

$$\frac{x^3 + x + 4}{x^2 + x + 7} = \frac{x^3 + 4}{x^2 + 7} = \frac{x + 4}{7}$$

"I've cancelled the xs," was his hurt explanation, as he tried to fathom why I was weeping in a heap beneath the whiteboard. Should not Andrew be put on trial for this? Such a mistake, I humbly submit, your Honour, deserves life, and in this case life should mean life.

Yet there are other times when a teacher's desire to brandish a red biro like St George's lance can be a little hasty. The other day, I was marking Luke's work on elastic impact. I came across this;

This is because $e = (\text{angle of rebound})/(\text{angle of incidence})$

I'd never seen anything like this before, and it brought me up short. "This can't be true!" I murmured, and indeed, it gave completely the wrong answer. I wrote a harsh comment – "You are busking this, Luke!" – awarded no marks, and ploughed on. But there was something in his bravura that niggled. I decided to bring it up in the lesson.

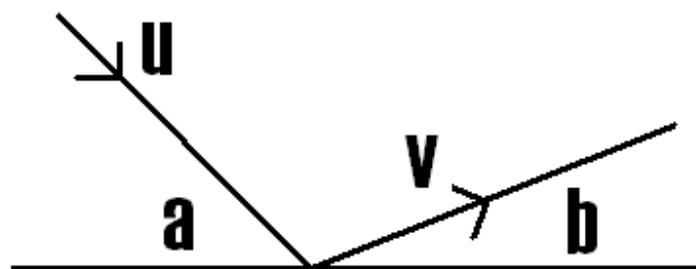
“I wonder if we could examine Luke’s Law for a minute.”

Ears perked up around the room. There is nothing students love more than the idea that one of their number might have come up with a new law, something that might just feature in future textbooks for millennia to come, bringing its author a slice of immortality along the way.

“Luke, how did you discover this?”

“To be honest, Jonny, I was making stuff up,” said Luke, surprising me with his frankness. “But it just felt right.”

And a little exploration revealed his intuition to be (almost) spot-on.



$$e = \frac{v \sin b}{u \sin a}, \quad u \cos a = v \cos b, \quad \text{so dividing, } e = (\tan b)/(\tan a).$$

So by inserting two little tans, we turned what Luke had written into something true, something that could happily bear the name Luke’s Law without any grandiosity. And we’d learnt a bit about elastic impact in the process.

Later that lesson, I once again rushed to dismiss something. We were working on finding the thrusts and tensions in light frameworks.

“Can you use Pythagoras there?” asked Peter.

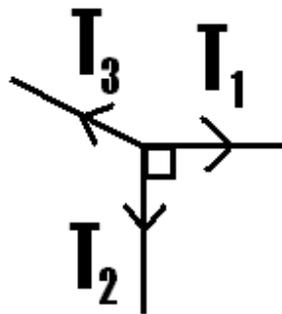
I had my four spades moment; my initial reaction was to reach for the handgun.

“How could Pythagoras possibly help us here?” I snapped.

“All right, Jonny,” said Will, the unofficial class shop steward. “Peter was only making a suggestion.”

“You’re right, Will,” I said. “Peter, I apologise. Now what’s the best interpretation we can find of what Peter has just said? How could Pythagoras help us here? There isn’t a right angle in sight.”

“What if there is?” asked Will. I nodded and drew a diagram on the board.



“If we know T_1 and T_2 , and we have equilibrium, we can find T_3 using Pythagoras,” said Peter calmly. “Could we call that Peter’s Law?”

The lesson for me from all this? My students will not always make four spades when four spades is possible; their technique may let them down. But sometimes they will wing it, enjoy the chance to be intuitive and make three spades in the attempt – which is something to celebrate.

Correlation Street is a mixture of what happens, what I would like to happen, and what I am glad does not happen in my classroom (or thereabouts).

Jonny Griffiths teaches mathematics at Paston College, Norfolk.

www.jonny-griffiths.net