

# Take a mathematician to court to fight a ticket

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There seems to be more traffic these days.

This past January, in the afternoon of a snowstorm, I had just turned left from Connaught Avenue onto Bayers Road outbound. I was in the left lane, stopped, and as I looked at my side mirror, I saw the truck behind me mount the median with two wheels and attempt to pass me on the left. Straight out of Dukes of Hazard.

He sideswiped my car. I jumped out, incensed, and demanded his insurance and driver's licence, to which the driver replied, "I usually don't give out my insurance."

Simple logic dictates that you don't say something like that without a lot of accidents under your belt.

The police statistics for the first quarter of 2012 have just come out, and collisions are up 9.09 per cent from the first quarter of 2011. It's tempting to *extrapolate*, and to forecast that driving is indeed getting worse. It's also natural to *interpolate* the numbers — that is, to think that the number of collisions grew steadily from 2011 to 2012, but more statistics suggest otherwise.

The fourth quarter of 2012 saw the collisions rate go *down* by more than 30 per cent. So whether the statistics are worse now or just seem worse from personal experience remains to be seen.

In any event, catching poor drivers seems to be a focus in Halifax now. As I travelled across the Macdonald bridge today, a sexy face on billboard stared at me, purring: "I like a driver who takes it slow." The ad seems counterproductive to me, as I thought the city, for safety reasons, would want drivers with both hands on the steering wheel.

Speeding is an issue. Do you drive a little too fast and not pay enough attention to the speedometer? If your mind wanders while driving, you can still use some simple math to figure out whether you have a heavy foot.

Suppose your trip to the airport, 40 kilometres away, only took 21 minutes. Your average speed over the trip would be about 114 kilometres an hour, and the famous mean value theorem of calculus would tell you that you must have hit this speed at least once during your trip.

Police have a more sophisticated (yet completely mathematical) method of catching speeders. Their radar guns work by bouncing microwaves off cars to determine their speed, by much the same principle guiding why the sirens of ambulances change their pitch as they approach and recede from you.

Math may catch some traffic infractions, but it can also get alleged offenders off the hook. There is a delightful story I read about a physicist, Dmitri Krioukov, who was caught recently by a cop for going through a stop sign. Facing a fine he felt he didn't deserve, the physicist went to court to fight the ticket, not with a lawyer but with a math paper he wrote.

In the paper (entitled *The Proof of Innocence*) he presented to the judge, he argued that the police officer erred in three ways. First, the officer mistook the car's speed with its *angular* speed — that is, how quickly the policeman's viewing angle is changing. Furthermore, at the stop sign, the officer's view was obstructed by a longer car. Finally, Krioukov stated that while the view was obstructed, he rapidly decelerated (due to a sneeze) and then rapidly accelerated.

With all the ensuing calculus, Krioukov proved that the officer might have interpolated the car's apparent speed before and after the short time of obstruction and thought the car didn't stop. As Krioukov later stated, his paper was awarded a \$400 prize, in that the ticket was thrown out of court.

So the lesson learned is that the next time you want to fight a ticket, it's best to take a mathematician to court, not a lawyer.

*Jason Brown is a professor of mathematics 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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