**How I Used Math to Beat a Speed Camera Ticket**

Posted by [Alex Berezow](http://www.realclearscience.com/blog/author/alex-berezow/2013/03/) at Thu, 21 Mar 2013

Seattle is a city in [serious need of cash](http://www.seattle.gov/financedepartment/documents/April_2012_Budget_Update.pdf). To make up for its budget shortfall, it has increased street parking rates so incredibly high that drivers feel as if they are the victims of a highway robbery. But the most controversial measure, by far, has been the implementation of red-light and speed cameras. City governments justify the use of traffic cameras because they claim it increases public safety. However, for both [red-light](http://blogs.wsj.com/numbersguy/seeing-red-1208/) and [speed cameras](http://www.telegraph.co.uk/motoring/news/8719263/Speed-cameras-fail-to-cut-accidents.html), the data on this is mixed. Of course, regardless of whether or not the cameras actually serve a greater purpose, cities are quite pleased by the substantial bump in revenue they receive from them.

Recently, I found myself on the wrong side of the law. The citation said I was traveling 30 mph in a 20 mph zone, and for that, I received a whopping $189 fine. But there was a big problem with the photos they provided as "evidence": They didn't really prove their case. The first thing I noticed were the timestamps. The first photo was marked 04:14:19.7 PM, and the second photo 04:14:20.2 PM. That means it took 0.5 seconds for the camera to take two successive pictures of my car. In order for me to verify if the speed camera was accurate, I needed to know the distance my car traveled in that time period. But, that information wasn't provided in the citation.

The second thing I noticed was the poor quality of the photos. The angle and the lighting make it very difficult to determine how far my car traveled. Based on a landmark (a parked car), it appears as if I traveled about one car-length in 0.5 seconds. The type of car I drive is typically about 15 feet long, so that means, based solely on the crude photographic evidence, that I was traveling 30 feet per second. Crunching the numbers, that converts to 20 mph. In other words, the photographic evidence didn't support their case that I was speeding.

Obviously, the burden of proof is on the city. I didn't need to prove that I wasn't speeding; all I needed to show was that the city couldn't prove that I was. Therefore, I subpoenaed the officer who issued the citation, and armed with an ability to do basic math, I headed to court. Much to my surprise, the officer actually showed up. The city attorney's office examined him first, and he verified that the camera calculates speed based upon distance divided by time. (I'm glad to know that Seattle uses that standard, since I don't think there's any other way to calculate speed.) Then I got my opportunity to cross-examine him:

"You said the device calculates speed by dividing distance by time. Do you know how far my car traveled?"
"No," he responded.
"Do you know the margin of error for the device?"
"No."

0 for 2. That's good for me. The city attorney then submitted documentation showing that the speed camera was certified to work accurately. The judge noted, however, that the documentation didn't actually provide much detail, and she also wasn't familiar with the certification process described. I made sure to hammer that point home: "While it's nice that the camera has been shown to work, the relevant point of how far my car traveled and the margin of error of the device hasn't been provided."

I felt the tide turning my way. Then came the *coup de grace*. The city attorney, presumably not intentionally trying to undermine her own case, asked if the officer was certified to use the device that took a photo of my car.  "No." Ouch! She probably should have asked that one before the trial.

After I gave my closing remarks, I nervously awaited the judge's ruling. She voiced her concern that the cameras haven't been rigorously verified to work properly. Then, I heard the most glorious words that will forever echo in my heart: "Infraction not committed." I was a free man. (Well, at least not $189 poorer.) I don't know if my mini-physics lesson actually persuaded the judge, but I still like to think that Sir Isaac Newton was my guardian angel that morning in the courtroom. And just in case you're wondering: I probably was speeding.

**Questions**:

1. How does this speed camera device work?
2. Does this device claim to measure average or instantaneous speed?
3. What are some benefits of speeding cameras claimed by their supporters?
4. What are some negatives of speeding cameras claimed by their critics?
5. Do you think Pennsylvania should install speeding cameras?
6. Is it a good idea to publicly admit your guilt like Alex B did in this article?