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## A TRAILER, A SHOTGUN, AND A THEOREM OF PYTHAGORAS

William H. Kazez<sup>1</sup>  
University of Georgia

Counselor: Please tell the Court your name.

Expert Witness: My name is Will Kazez

Counselor: No, no, no! Your name is...

This is not a good start. I am not naturally a nervous person. I have survived teaching calculus to a large class that included the entire freshman football team of the University of Pennsylvania, but I've never been an Expert Witness. Even though I'm confident of the mathematics, I'm not sure I like the idea of being cross-examined. But still, I'm just rehearsing my testimony with the lawyer, and even if I've got my own name a little wrong, what's the worry? At any rate, lawyers do not like being interrupted.

Counselor: No, no, no! Your name is DOCTOR William H. Kazez.

Expert Witness: O.K. My name is DOCTOR William H. Kazez.

Counselor: And how are you currently employed, Dr.~Kazez?

Expert Witness: I am a Lecturer in the Department of Mathematics at Cornell University.

Counselor: And tell the Court, Dr. Kazez, are you familiar with the theorem of Pythagoras?

Expert Witness: Well your Honor, I don't mean to brag, but yes, I am familiar with the theorem of Pythagoras.

Now this is good! I have rehearsed the last line in my mind many times, and I say bring it on. I'm ready for any cross-examination by any lawyer or judge. Let them take their best shot. But first, maybe I should tell you about the case?

My next-door neighbor at the time was Barry Strom, Director of Cornell's Legal Services. He had a client come to him for help with a problem in elementary geometry. The client was living in a trailer that he kept parked next to one of the boundary lines of his property. One night, his neighbor approached him, with shotgun in hand, and told him to move the trailer, because, in the neighbor's humble opinion, it was parked over the boundary line. We mathematicians like to

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pride ourselves on our ability to craft concise, persuasive arguments, but compared to the guy holding the shotgun, we are amateurs.

As a first step in resolving the conflict, Barry obtained a copy of his client's deed. The deed described the property as a triangle. No problem. It gave the lengths of the sides of the triangle as 90', 110', and 180', so it was a long skinny triangle, but that's alright. Finally, the shape of the land was described as a right triangle! Now this is a problem. Even if you aren't sure how to spell Pythagoras, you know someone really messed up this deed. It was at this point that Barry decided it would strengthen his case to have me explain, in court, the problem with the deed.

You are probably thinking that this has to be the easiest bit of expert testimony ever given. What could go wrong? Why would anyone be nervous? Let me ask you a few questions. First, what if the land the trailer was on wasn't level? On the one hand it was located near Ithaca, N.Y. so it probably wasn't, on the other hand, who parks a trailer on ground that isn't level? No stalling now, this is a cross-examination. If the distances of 90', 110', and 180' are measured between points of different heights, could it be that the triangle they span is a right triangle? Well, no. Pythagoras' theorem still would rule it out.

I'll ask you another question, but first we'll take a time out for a quick experiment. Take a straight piece of wire and fold it in half to form an acute angle. Walk over to the nearest corner in your room, and hold the wire so that the vertex touches the corner, and half of the wire lies on each of the walls forming the corner of your room. Look at the floor, and you'll see that the acute angle of the wire projects to a right angle. Unfold the wire a bit to form an obtuse angle, repeat the experiment, and you'll see that any angle can be projected to a right angle.

What is the meaning of the lengths of edges of a piece of property as described in a deed? Are these lengths the actual distances in 3-space, or do they refer to distances between projections of the corners of the property onto a horizontal plane? How would I know? Do I look like a surveyor? No I don't, but still the question presents itself: Is it possible that the property really is a right triangle that merely projects to a horizontal skinny triangle? Worrying about such things kept me up late the night before our day in court.

Unfortunately, they do not let Expert Witnesses into the courtroom before they testify, but since you are probably wondering what sort of special room they keep us in while we wait, I'll describe that instead. Maybe you think it looks like one of those First Class Medallion Level waiting lounges at airports you've never been in? Well it doesn't. It is a fairly ordinary looking room located right outside the courtroom. There were only two other Expert Witnesses present. One was dressed in an expensive looking suit, and he was huddled close to the other, who was dressed in an orange jumpsuit with numbers on it. After two hours of waiting in a silent room, any action seems like high drama, but it was dramatic when the courtroom doors burst open.

A whole roomful of people piled out with Barry in the lead yelling, "It's over!" Say what? Perhaps my reputation had preceded itself? Just the threat of a mathematician on the witness stand was enough for the opposing legal team to crumble? No, Barry explained, the judge threw the case out, saying that what was needed was a surveyor, not a mathematician.