

# Contract Law 101.111...

William H. Kazez

January 6, 2005

Maybe I had been overly influenced by *The Godfather*, but when the Director of Legal Services at Cornell University told me that he had a client who had a problem, and that he wanted to ask a favor, I started to wish I wasn't his next-door neighbor. I didn't have room for another corpse in the freezer, and I was not willing to testify that a red light looks green due to phase shifts occurring while driving through an intersection. But he explained that his client was between a rock and a hard place—actually the state of New York and his landlord—and he needed the services of a mathematician to work out a fair solution.

The problem was that his client was receiving \$1000/month from the state of New York. Simple enough, but the figure of \$1000/month was arrived at based on a formula that included 30% of the amount he was paying in rent. No sweat! I can work out percentages like this in my head, but there's more. This guy was living in subsidized housing and was paying \$300/month in rent. The unusual aspect of his contract with his landlord was that his rent depended on his income. His rental contract was set up so that if his income increased, his rent would increase by 20% of his raise.

And now the trouble starts. One day he receives the good news that his stipend from the government was being increased by \$100/month. How would you react to such news? Well it doesn't matter how you would react does it? The point is that *he* promptly went off and told his landlord. As you can imagine, his landlord reacted immediately to the good news and raised his rent by 20% of \$100. Thus his reward for honesty was a \$20 rent hike. You have to make the best of a bad situation, so he returned to the state office with documentation of his new rent in hand. With all the speed that government agencies are noted for, the state of New York agreed to raise his monthly stipend by 30% of \$20.

Now we've got a problem. The poor sap was facing an infinite cycle of rent and pay increases, and it was on his second trip back to his landlord with the good news that his stipend had been raised from \$1000 to \$1100 to \$1106 that he stopped off at the office of Barry Strom, Director of Cornell's Legal Services.

I had better explain something about Barry. He is a lawyer right to the bone, and he has an exhaustive approach to problem solving. I remember when he told me, with glee, that collecting judgments from a financially viable debtor was simply not a problem. For just a few dollars a letter, he could send a letter to every bank in the state of New York,

thereby freezing all assets until the debtor was in the mood to pay both the original debt and the collection costs. This may be an effective legal manoeuvre, but faced with an infinite series, Barry figured it was time to seek the counsel of a mathematician.

Alright. We can see that as the stipend is changed from 1000 to  $1000 + 100$ , the rent will go from 300 to  $300 + (.2)100$ , which will push the stipend to  $1000 + 100 + (.06)100$ . A very persistent client seeking the ultimate in fair resolution of the two contracts could end up requesting an infinite number of progressively smaller paycheck and rent adjustments. At the end of a very, very long day, the client is going to end up with a stipend of

$$1000 + 100 + (.06)100 + (.06)^2 100 + \dots$$

and his rent will be raised to

$$300 + (.2)100 + (.2)(.06)100 + .2(.06)^2 100 + \dots$$

Faster than you can say “Those are geometric series, and I know how to sum them,” I had an epiphany: Don’t lawyers charge for their services? I mean, something like a transaction fee. I’m not greedy, it doesn’t have to be much, but surely if time is money, then saving this guy the nuisance of one round trip between the offices of New York bureaucrats and his landlord is worth a nickel? That’s a lot of nickels.

Barry explained to me that there is a Latin term used in legal circles for my transaction fee. The term is “*pro bono*”, and used in this context it means, “I don’t care if you have a Ph.D. in mathematics, you aren’t getting a cent.” That is a lot of addition for not much money, and at this rate of remuneration, I wasn’t in the mood to share the formula for summing a geometric series with a lawyer. But maybe the dispute can be solved by mediation?

Let’s agree that the stipend of the client will end up being  $1100 + x$ , and that his rent will be raised to  $300 + y$ . Can we agree on values of  $x$  and  $y$  that won’t violate either contract? The landlord would insist that  $y = .2(100 + x)$ , but at the same time, the client would be entitled to a pay bump of  $x = .3y$ . Now we’re in business, since

$$y = .2(100 + x) = .2(100 + .3y) = 20 + .06y.$$

But then  $.94y = 20$ , and the landlord will have to do with  $y = 2000/94 \cong 21.28$ . Similarly

$$x = .3y = .3(.2(100 + x)) = 6 + .06x.$$

so  $.94x = 6$ , or  $x = 600/94 \cong 6.38$ .

The client ended up with a stipend from New York for \$1106.38, and his rent was raised to \$321.28. Barry billed his time to the Legal Aid Clinic, and I impressed Barry enough that when he ran into a case involving a trailer, a shotgun, and a theorem of Pythagoras, he turned to me for expert testimony. But that’s another story for another day.