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Mathematical mind appreciates the paradox

By JASON BROWN
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Watching the ridiculousness of the riots in Toronto surrounding the G20 meeting, I find myself musing about how organized the anarchists are, how they must have leadership.

My mathematical mind just picks up on things like that, drifting toward the comical in everyday life. And I know that people find me humorous because I've heard a number of people say behind my back, "There's something funny about him."

Anyway, one thing that a mathematical outlook gives me is an appreciation for paradoxes, seeming or real contradictions in logic.

There are descriptions of paradoxes dating back to ancient Greece.

Zeno created one where he had a tortoise in a race with Achilles, with the much-faster Achilles giving the tortoise a head start. (It would have to be a slow weekend for Achilles to race a tortoise, but this is the mathematician Zeno's mind experiment, and he probably had all sorts of time on his hands.)

While you know, of course, that at some point Achilles will pass the tortoise, Zeno pointed out that whenever Achilles reached the spot where the tortoise started, the tortoise, being in motion, would be at some point ahead. And when Achilles reached that point, the tortoise would again still be ahead. And so on, forever. It seems that Achilles will never catch the tortoise because whenever he reaches the spot where the tortoise was, the tortoise was still ahead.

Considering this paradox led mathematicians to develop a notion of limit, the basis of calculus. Therefore, only good things come from trying to deal with the incongruities of a paradox.

I don't know if you caught a recent interview of Billy Bob Thornton that Jian Ghomeshi did on the Q radio show on CBC, but if you haven't, I highly recommend you go to the web and watch it for all

its excruciating hilarity. Based on this, I came up with a new paradox, which I have

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dubbed the Billy Bob Paradox, based on an old mathematical chestnut.

Here's how it goes. Suppose I make the rule that I will speak only to those people who don't speak to me and won't speak to anyone who does. Sounds pretty simple, doesn't it? (But you are wondering whether to answer me, aren't you? If you do, I'm not talking to you.)

Here's the kicker, though. Do I talk to myself?

On one hand, if I talk to myself, I shouldn't because I don't talk to people who talk to me. But, on the other hand, if I don't, I do because I talk to anyone who doesn't talk to me.

The paradox is enough to leave me speechless (or not).

Sometimes, a paradox can have a mathematical solution, but the answer is so counterintuitive it can still leave you vacillating from one point of view to another. One of my favourites is called the Monty Hall Paradox, which has at least some Canadian context because the game show host hails from Winnipeg, a city known for, among other things, being the birthplace of my lovely wife.

Hall used to be the host of a show called Let's Make a Deal, where he bartered with contestants who were motivated simply by a desire to win unknown prizes.

The show inevitably led to the following scenario: Hall would show the contestant three closed doors. Behind one of the doors was a grand prize, such as a car or a vacation. Behind the other two were dud prizes, with one usually being a donkey with a lei around its neck.

The contestant chose one of the three doors. Then, to build suspense before opening the contestant's door, Hall opened one of the other two doors, showing a donkey. He then allowed the contestant to switch to the other closed door. The big question was whether the contestant should switch, and many a contestant squirmed under the weight of that choice.

So should the contestant switch? What would you do?

You would think that there is no reason to switch because you know that after you pick a door, Hall can always pick one of the two doors left to show a donkey. So there is really nothing you learn from him doing it. You are left with two doors, one with the big prize behind it, and you have a 50-50 chance of being right. You may even feel that you would kick yourself if you changed doors and lost, having chosen the right door at the start. So that is even a bigger reason not to change.

But look at it from this point of view: You have, from the start, a one-third chance of picking the big prize door from among the three. If you picked the correct door and switch, you lose. But you have a two-thirds chance of picking the wrong door to start, and switching guarantees you win because Hall has opened the other losing door. By switching, you double your chances of winning, plain and simple.

Even though the mathematical reasoning shows the advantages of winning, it's still easy to waver and think that you shouldn't. That's the beauty of the math and the paradox.

So if you happen to get on the revised version of the show, which has started to run again with Wayne Brady as the host, remember to switch. And if you win, be modest about your new-found mathematical outlook, but make sure to tell everyone how modest you are.

Jason I. 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. He is also the author of Our Days Are Numbered: How Mathematics Orders Our Lives. (jbrown@herald.ca)

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