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Math Quiz on the Radio

Abstract

What word, often spelled with an umlaut, is used to identify a point on a two-dimensional graph?

Many of you probably already figured out the answer is "coordinate." But that's because you are sitting comfortably in your dorm room rather than being on a stage with bright lights in front of a few hundred people being recorded for national broadcast on public radio. [*excerpt*]

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Disciplines

Mathematics



Math Quiz on the Radio

DARREN GLASS

What word, often spelled with an *um-laut*, is used to identify a point on a two-dimensional graph?

Many of you probably already figured out the answer is “coordinate.” But that’s because you are sitting comfortably in your dorm room rather than being on a stage with bright lights in front of a few hundred people being recorded for national broadcast on public radio.

That was the situation I found myself in last year, when I was a contestant on the NPR game show *Ask Me Another*. Despite the fact that I am a mathematician who often teaches about coordinates, I was unable to come up with the answer, costing me fame and fortune. Well, it was public radio, so there wasn’t much fame or fortune, but it did cost me bragging rights and the chance to have novelist Owen King give me feedback on some of my writing.

Ask Me Another has been airing on public radio stations since May 2012 and now produces about 30 new episodes per year. With comedian Ophira Eisenberg as host, the show describes itself as part comedy, part musical revue, and part pub trivia night. Most episodes involve 10 or 12 players who compete against each other in pairs, with the winners of all the games facing off in a bonus round at the end of the episode. The games range quite a bit, as they combine word play, pop culture trivia, general knowledge, and mathematics. Yes, mathematics.

For example, one episode featured a game entitled “Hollywood Formulas,” in which players had to combine the names of movies with terms from mathematics. They were asked to identify the 2007 movie directed by Ben Affleck and starring his brother Casey, who plays a Boston detective searching for a closed shape with five sides (*Pentagon Baby Gone*) and also a 1994 sci-fi flick in which Jean-Claude Van Damme

stars as a police officer from the future who makes sure all numbers can be divided only by one and themselves (*Primecop*).

Art Chung is the puzzle editor for the show, and he works with a staff of freelancers to develop the puzzles that make it to the show. (Trivia fact: One of the puzzle writers also works as the museum communicator at the Museum of Mathematics in New York City.)

Chung has been writing trivia questions for most of his life, dating back to a column in his eighth-grade newspaper. He attended law school at New York University, but after several years as an attorney wanted a change, so he got a job as one of the original writers of the television show *Who Wants to Be a Millionaire*. He wrote for several other game shows before coming to NPR to help develop *Ask Me Another*.

He told me that he enjoys working math into games when possible, but that the format of a radio quiz show makes it challenging. “Numbers as trivia questions are not that interesting. Even when you know the answer, there isn’t the same kind of ‘Aha’ moment that makes trivia fun. Either the answer is 45 or it’s 46.”

Jonathan Coulton acts as the ‘One Man House Band’ for *Ask Me Another*, and he told me that despite studying music at Yale, he has “always been interested in the math and science side of the world. Through school, I tolerated history but I *loved* chemistry and calculus.” His sense of humor and smart fan base make him a natural fit for the show, and Chung

In addition to airing on many NPR stations, *Ask Me Another* can be found at npr.org/askmeanother, where you can find all the episodes referred to in this article. We recommend starting with “Solving For X,” which featured Steven Strogatz: n.pr/1CmC3mw.



Josh Rogosin/NPR

Art Chung and Jonathan Coulton backstage at a taping of *Ask Me Another*.

recalls that when they were developing the show someone suggested that they “try to find a Jonathan Coulton type, and we were lucky enough to get the actual Jonathan Coulton.”

Some of the most popular games on the show use Coulton’s talents to sing new lyrics to a wide range of popular songs. For example, one episode featured a game called “Algebraic Music” in which Coulton performed songs that normally have numbers in the lyrics but replaced them with algebraic equations, leaving the listener to solve for x . In other words, if Prince were to sing that “tonight I’m going to party like it’s x plus 59” or the Proclaimers would sing that “I would walk x times 10 miles and I would walk x times 10 more just to be the man who walks 1,000 miles to fall down at your door,” then what is the value of x ?

They were worried that the game might be too complicated, but it has received some of the most positive feedback in the history of the show. When I asked Coulton about this game, he said that “it was a ton of fun. People seem to really enjoy a ridiculous man with a beard and an acoustic guitar singing about math. It’s something you don’t see every day.”

Such games are typical for *Ask Me Another*, as they require contestants to know a little bit of trivia and also to solve a puzzle with the trivia. Math often shows up in these types of games—another question along this line from a recent episode asked players to calculate “the year of Stanley Kubrick’s space odyssey, divided by the number of amigos in a 1986 Steve Martin comedy.” Listening to that episode, it is clear that the

contestants quickly figure out the two movie references but struggle to do the arithmetic, which Chung lamented: “It’s just division by three! You shouldn’t need a calculator to do that.”

On the other hand, Coulton says that this is one of his favorite moments on the show: “I suppose it’s a character flaw that I like to watch people squirm, but it’s a known fact that when you are up on stage you immediately become 60 percent dumber than you actually are, so watching people try to do math in that state . . . well, it’s a lot of fun.”

Each episode also features a celebrity guest, who is interviewed by Eisenberg and then subjected to a custom personalized quiz. Past guests include comedian John Hodgman; actor Andy Serkis; and Bobby and Kristen Lopez, who wrote the songs for the movie *Frozen*. One episode last year featured mathematician Steven Strogatz as the Very Important Puzzler and gave Chung a chance to develop a puzzle he had been thinking about for a while, related to Erdős-Bacon numbers.

Quick Aside: Mathematicians often discuss their “Erdős number,” which is the number of degrees of separation they have from Paul Erdős—people who collaborated with Erdős have Erdős number equal to one, people who collaborated with one of those people (but not with Erdős) have Erdős number two, and so on.

Similarly people refer to the “Bacon number” of an actor, where people who have been in a film with Kevin Bacon have a Bacon number one, and so on.

The sum of a person’s Bacon number and their Erdős number is their “Erdős-Bacon number.” For example,

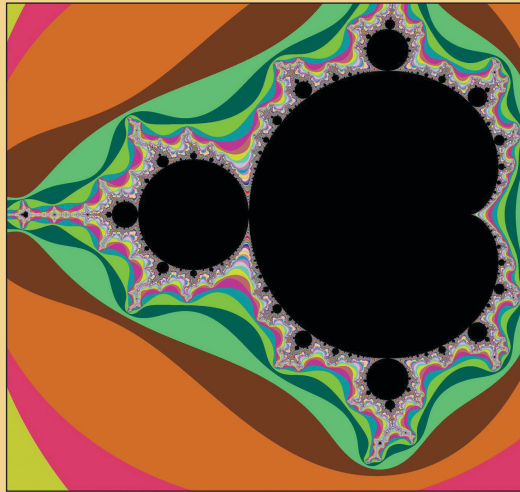
The following questions were part of a game called “Replacement Math” in which contestants were asked to perform the following numerical calculations:

- Jay-Z’s problems plus Three Dog Night’s loneliest number.
- Ways to leave your lover minus the rules for dating my teenager daughter.
- Roger Maris’s record home runs in a season plus Michael Jordan’s retired Bulls uniform number.
- The number of apostles raised to the power of Eddie Money’s Tickets to Paradise.
- The Dalmatians plus the Luftballons divided by Ali Baba’s Thieves.

The answers appear on the next page.

Coulton's Ode to Benoit Mandelbrot

In addition to being the house musician for *Ask Me Another*, Jonathan Coulton has released more than 10 albums of his own music. Although many of his songs show off his geeky side, none do



The Mandelbrot set.

so more than his ode to Benoit Mandelbrot. He told me that he originally conceived of it as a joke song treating the history of mathematics as if it were an emotionally important epic battle between good and evil. However, as he was writing, he realized that he was not joking and that the mathematics really did resonate with him in an emotional way. "I still get a little misty when I sing it." Here is an excerpt.

*His disdain for pure mathematics
and his unique geometrical insights
Left him well equipped to face those demons down
He saw that infinite complexity could be described by simple rules
Used his giant brain and he turned the game around
And he looked below the storm, saw a vision in his head
A bulbous pointy form, picked his pencil up
and he wrote his secret down:
Just take a point called z in the complex plane
Let z_1 be z squared plus c
And z_2 is z_1 squared plus c
And z_3 is z_2 squared plus c , and so on
If the series of z s will always stay close to z and never trend away
That point is in the Mandelbrot set*

(And yes, he knows that his mathematics isn't quite right. He says that every time he plays the song live, someone points it out to him; you don't have to.)

A live version of this song can be found on his latest release, available at jocolive.com.

Danica McKellar has an Erdős number of four (due to her paper "Percolation and Gibbs states multiplicity for ferromagnetic Ashkin-Teller models on \mathbb{Z}^2 ") and a Bacon number of two (as she and Kevin Bacon have each costarred in a film with Christian Slater), earning her an Erdős-Bacon number of six.

Given that Strogatz is not only a mathematician, but has written about networks like those whose structure lead to this type of analysis, his appearance on *Ask Me Another* gave a perfect chance for a quiz on the topic, leading to questions about people like Natalie Portman, Colin Firth, and Hank Aaron, all of whom have low Erdős-Bacon numbers.

I asked Strogatz about his experience on the show, and he wrote me that "it was tremendous fun being on the show, and I have to admit, I was very relieved when they revealed onstage what they'd be quizzing me about. . . . Until that moment I'd been worried about embarrassing myself."

Even when a quiz isn't explicitly about mathematics, Chung and his writers like to work vocabulary terms from mathematics into quizzes whenever possible. As Chung told me, "My idea with all trivia questions is either 'These are things you *should* know' or 'These are things that would be interesting to know,' and I think a basic understanding of the language of mathematics is part of that picture." This is how the word *coördinate* showed up in a quiz filled with questions about terms with umlauts where the other answers included Mötley Crüe and Noël Coward.

Chung and I discussed how *Ask Me Another* is one in a long line of quiz shows that include math in their game. While some game shows include questions that are

Answers to quiz on page 27:

5 '441 '401 '27 '001



Greg Kessler/World Science Festival

Steven Strogatz from Cornell University gets quizzed by host Ophira Eisenberg on *Ask Me Another*.

explicitly about mathematics, others build mathematical thinking directly into the structure of the show: *The Price Is Right* often asks contestants to think mathematically while doing pricing games, the wagering in the final round of *Jeopardy!* is a problem in game theory, and the Monty Hall Problem in probability that is inspired by *Let's Make a Deal* is probably more well known at this point than Hall himself.

As another example, Chung described *Deal or No*

Deal as both “the high point and low point of math on game shows, where people were asked to apply probability calculations and often either couldn’t do them or willfully ignored it.” In all these situations, game shows provide a great chance for mathematics to appear in popular culture and, in my experience, can lead to great conversations—and research questions—for students and faculty.

At the end of our conversation, Chung put it best when he said that although their primary purpose is to entertain audiences, “game shows build a cultural curriculum, and that should include math.” ■

Darren Glass is an associate professor of mathematics at Gettysburg College who likes to think about algebraic geometry and cryptography when he’s not listening to NPR. He also got a question wrong about the recipe for s’mores, which he is even more embarrassed about.

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<http://dx.doi.org/10.4169/mathhorizons.22.4.26>

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In Leibniz’s case, imagine returning from researching a genealogical lead in some remote corner of the Empire to find that all the library’s books had been crated and stored in an attic. What would you do? Various math greats have second-guessed Leibniz and suggested that he should have moved on at different junctures. Yet, I am impressed with his steadfastness and his ability to be creative and productive until the end in a place and position that many of his contemporaries and present fans considered a dead end.

Lesson: Be flexible in the vicissitudes of life while ever remaining true to who you are.

We close with the Leibniz quote: “Providence puts right the mistakes of human beings, so that often things which are thrown badly fall well” [2, p. 65]. ■

Further Reading

[1] The American Mathematical Society and the Mathematics Department of North Dakota State University, *Mathematics Genealogy Project*, 2013, available at genealogy.ams.org.

[2] M. R. Antognazza, *Leibniz: An Intellectual Biography*. Cambridge Univ. Press, Cambridge, 2009.

[3] M. du Sautoy, *The Story of Math*, a DVD produced by the Open University, Acorn Press, 2005.

[4] G. F. Simmons, *Calculus Gems: Brief Lives and Memorable Mathematics*. Mathematics Association of America, Washington, DC, 2007. Sketch A-19 focuses on Leibniz.

Andy Simoson teaches math in the hills of east Tennessee. One afternoon, he explored the AMS’s website on mathematical genealogies [1], tracing his ancestry from student to mentor, and discovered that he was the meta grand student of Leibniz, 16 student-mentors back in time. He offers these reflections as a celebration of this amazing hero of mathematics.

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<http://dx.doi.org/10.4169/mathhorizons.22.4.5>