

# ALGEBRA FOR PHYSICS

Unit 1, Dr. John P. Cise, Professor of Physics, Austin

Austin Com. College, 1212 Rio Grande St., Austin Tx. 78701 & New York Times , May 3, 2016 by Natalie Angier

## Math a Piece of Cake

**INTRODUCTION:** Application and purpose here is to practice your algebraic skills.

**QUESTIONS:** If father now ( $f_1$ ) is three times older than me ( $m_1$ ), state this algebraically? (b) Next: but in ten years' time, he(..... $f_2$ ) will be twice as old as me ( $m_2$ ), state this algebraically? (c) Also, ..... $f_2 = f_1 + 10$ ,  $m_2 = m_1 + 10$  (d) Using (a),(b), & (c) find age of me ( $m_1$ ) Now?

**ANSWERS:** (a)  $f_1 = 3 m_1$ , (b)  $f_2 = 2 m_2$ , (c) as above....., (d)  $m_1 = 10$



Eugenia Cheng in her kitchen at work on one of her mathematically inspired desserts.

Dr. Cheng, 39, has a knack for brushing aside conventions and edicts, like so many pie crumbs from a cutting board. She is a theoretical mathematician who works in a rarefied field called category theory, which is so abstract that “even some pure mathematicians think it goes too far,” Dr. Cheng said. At the same time, Dr. Cheng is winning fame as a math popularizer, convinced that the pleasures of math can be conveyed to the legions of numbers-averse humanities majors still recovering from high school algebra. “Math is about taking ingredients, putting them together, seeing what you can make out of them, and then deciding whether it’s tasty or not,” Dr. Cheng says. “The great thing about math is you don’t need much to start exploring it,” Dr. Baez said. “No expensive equipment, just pencil and paper, and you can start fiddling around with patterns and numbers.” The key to thinking logically is to get comfortable with abstraction. The next step up in abstraction is to replace specific numbers by symbols like  $x$  and  $y$ , a powerful maneuver that allows you to apply your argument more broadly, just as a general-purpose recipe for pie can be the vehicle for banana, blueberries, pumpkin, nuts, knots, you name it.

**((( As an example of abstraction at work, “How to Bake  $\pi$ ” presents this little brain teaser: My father is three times as old as I am now, but in 10 years’ time, he will be twice as old as me. How old am I? It then takes the reader through the solution by way of  $x$ - $y$  abstraction. )))**

Dr. Cheng recognizes that people can feel uncomfortable with some of the abstractions required by mathematical thinking, by the need to ignore the particulars of, say, this green round pillow and that square purple pillow in favor of an abstract ideal of a pillow that you’re going to call  $x$ . But it’s just a matter of practice, she said, before the idea starts to feel like a real object that you can manipulate with ease. “You become very good at separating what’s relevant from what isn’t, and that can be very useful in daily life,” she said.