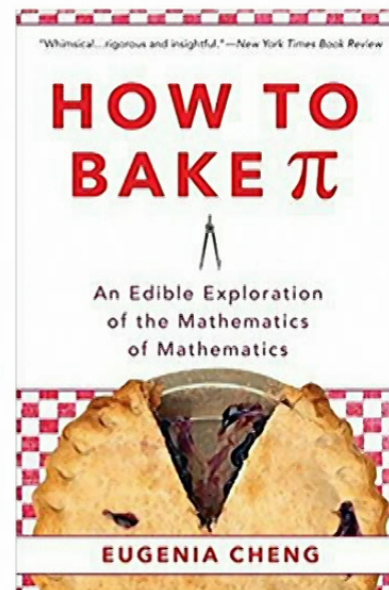
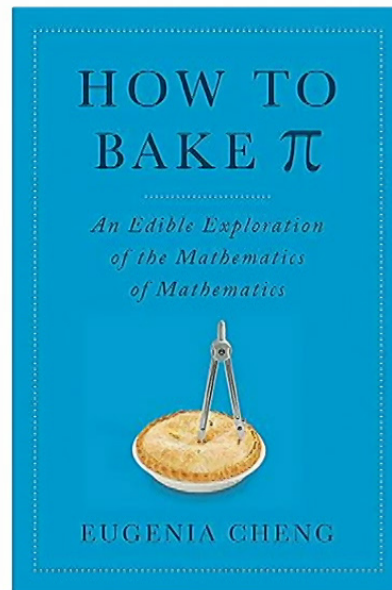


Title: Eugenia Cheng: How to Bake Pi

Date: Apr 05, 2017 07:00 PM

URL: <http://pirsa.org/17040000>

Abstract: <p>Mathematics can be tasty! Itâ€™s a way of thinking, and not just about numbers. Through unexpectedly connected examples from music, juggling, and baking, Dr. Eugenia Cheng will demonstrate that math can be made fun and intriguing for all. Her interactive talk will feature hands-on activities, examples that everyone can relate to, and funny stories. She will present surprisingly high-level mathematics, including some advanced abstract algebra usually only seen by math majors and graduate students. There will be a distinct emphasis on edible examples.</p>



Plan

1. Bach
2. Juggling
3. Hair

Plan

1. Bach
2. Juggling
3. Hair
4. Factors of 30
5. Cake
6. Custard.

2.

What is Mathematics?

Mathematics is the **logical** study of how **logical** things work.

3.

1. Bach

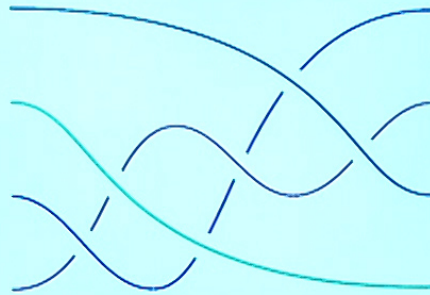
Prelude in G minor: Book 2 of the Well-Tempered Clavier

Praeludium XVI

Largo

The image displays the musical score for Praeludium XVI, a Prelude in G minor from Book 2 of the Well-Tempered Clavier by J.S. Bach. The score is written for piano and consists of two systems of five staves each. The tempo is marked 'Largo'. The key signature is one flat (F major/G minor). The notation includes various musical symbols such as notes, rests, and bar lines.

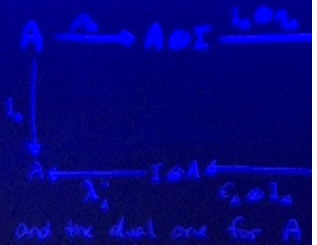
1. Bach



autonomous if it is symmetric
with $(\cdot)^*: C^* \rightarrow C$ such that
 $(B \otimes C)^* \cong C^* \otimes B^*$ exists which is natural
*-autonomous category is
 $\cong (A \otimes B)^*$
category is a *-autonomous
self-dual tensor

$A^* \otimes B^* \cong (A \otimes B)^*$
 $u_i: I \rightarrow I^*$

category is a Sym
each object A a dual
 A^* and a counit
in a way that the



and the dual one for A
 $\eta_A = \epsilon_A^* = \sum_i (x_i, x_i^*)$

For $(\text{FdVect}_K, \otimes)$ we take
of linear functionals on
in $(\text{FdVect}_K, \otimes)$ are

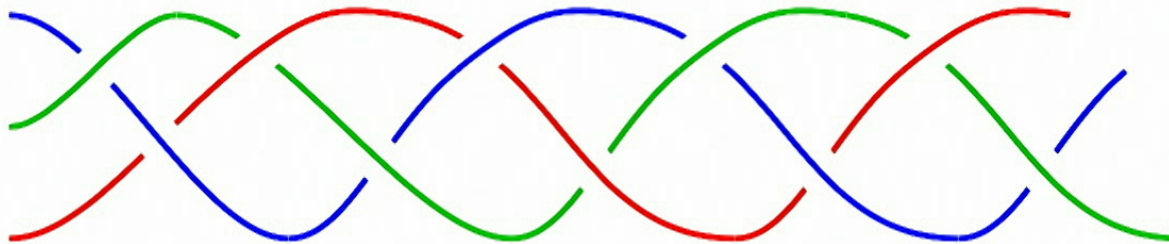
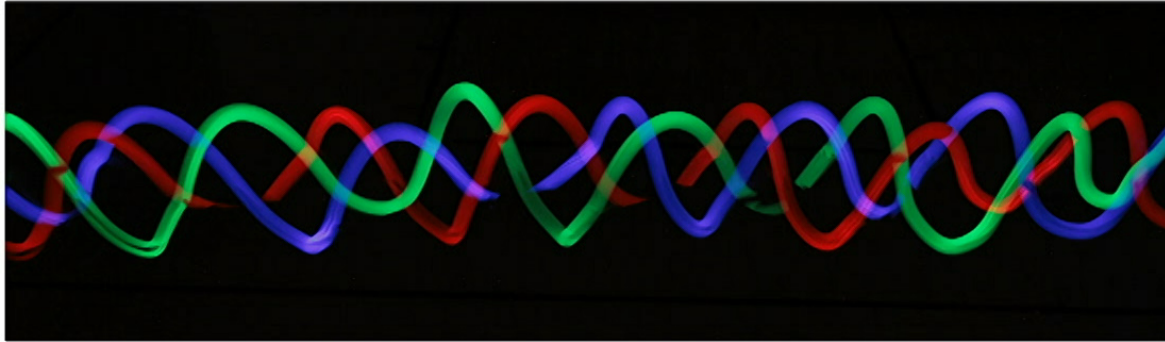
$\eta_V: K \rightarrow V^* \otimes V \rightarrow 1 \mapsto \sum_{i=1}^n e_i \otimes e_i^*$

$\epsilon_V: V \otimes V^* \rightarrow K: e_i \otimes e_i^* \mapsto 1$

n is the dimension of V ,
 e_i is the linear functional

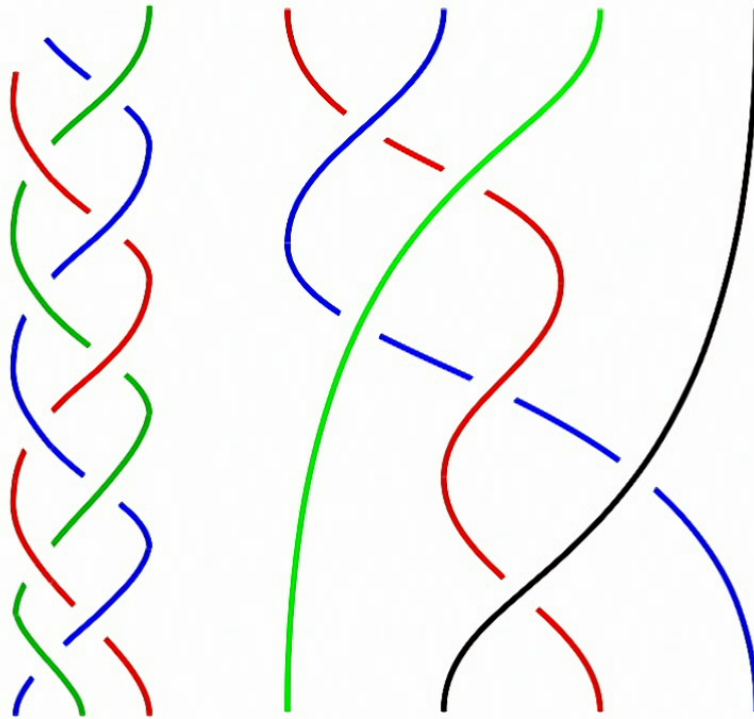
determined by $e_i(e_j) = \delta_{ij}$

2. Juggling



6.

3. Hair



7.

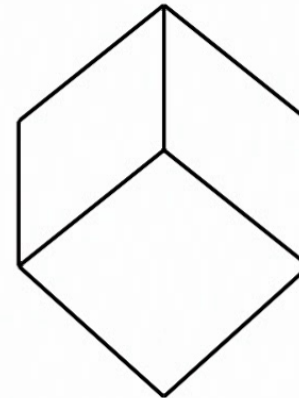
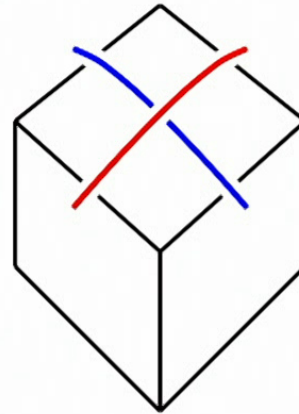
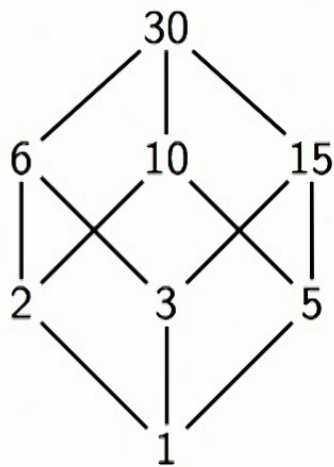
4. Factors of 30

1, 2, 3, 5, 6, 10, 15, 30

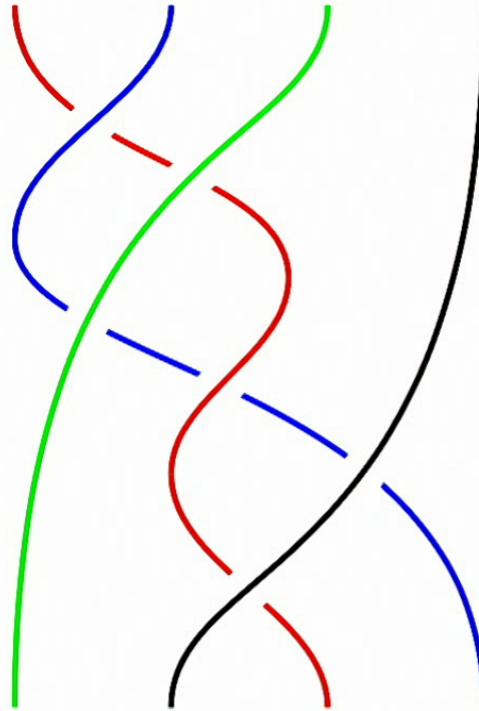
8.

4. Factors of 30

1, 2, 3, 5, 6, 10, 15, 30



4. Factors of 30



9.

5. Cake

Battenberg cake



10.

5. Cake

Battenberg cake



×	1	-1
1	1	-1
-1	-1	1

+	even	odd
even	even	odd
odd	odd	even

×	real	imaginary
real		
imaginary		

10.

5. Cake

Bed flipping

	0	rot	flip	flop
0	A	B	C	D
rot				
flip				
flop				

5. Cake

Bed flipping

	0	rot	flip	flop
0	A	B	C	D
rot	B	A	D	C
flip	C	D	A	B
flop	D	C	B	A

5. Cake

Bed flipping

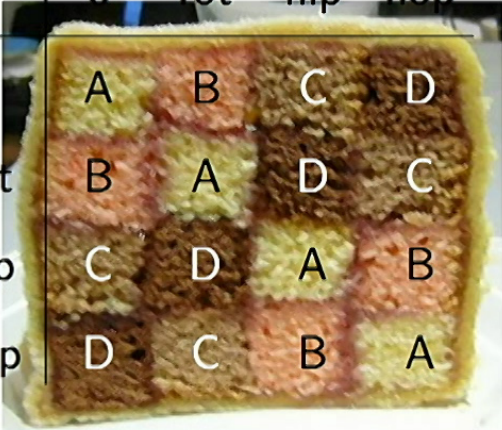
	0	rot	flip	flop
0	A	B	C	D
rot	B	A	D	C
flip	C	D	A	B
flop	D	C	B	A

5. Cake

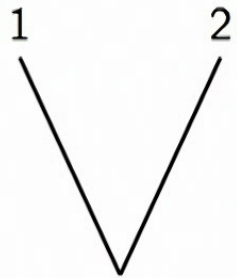
Bed flipping

	0	rot	flip	flop
0	A	B	C	D
rot	B	A	D	C
flip	C	D	A	B
flop	D	C	B	A

	0	rot	flip	flop
0	A	B	C	D
rot	B	A	D	C
flip	C	D	A	B
flop	D	C	B	A



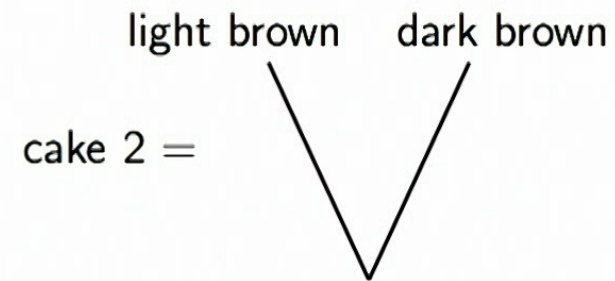
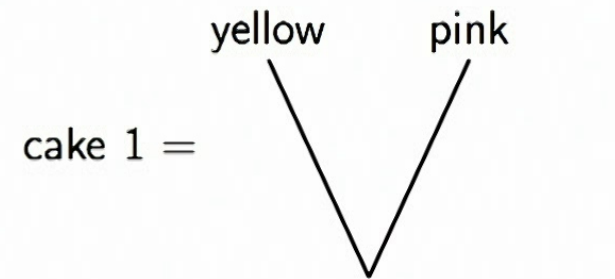
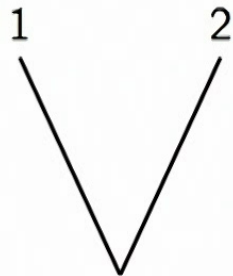
5. Cake



13.

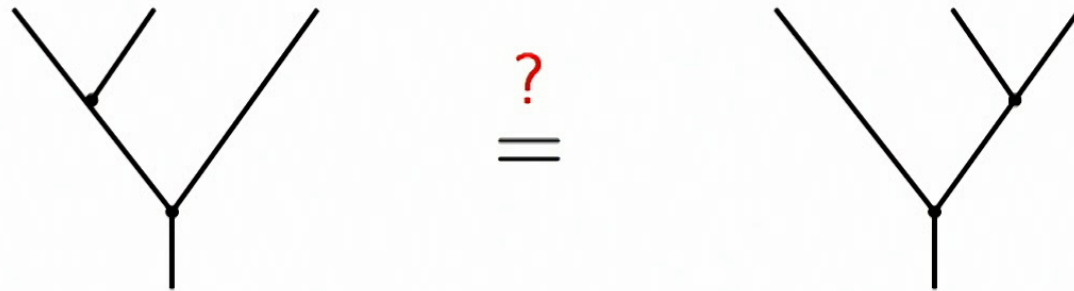
5. Cake

cake 1 cake 2
bunny 1 bunny 2
light brown dark brown
yellow pink



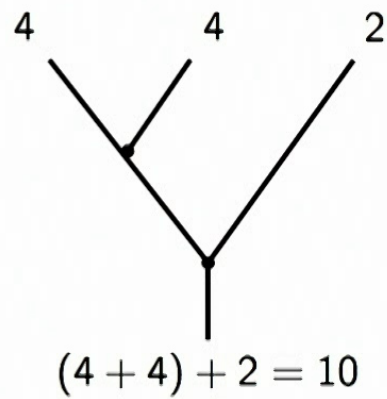
6. Custard

Trees come from sticking things together.

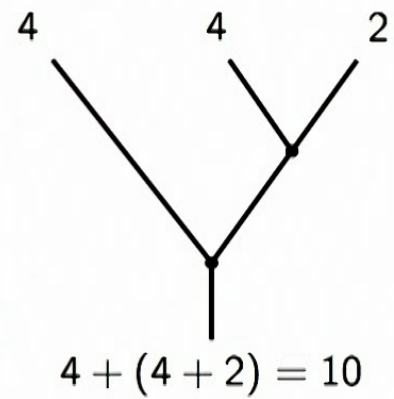


6. Custard

Trees come from sticking things together.

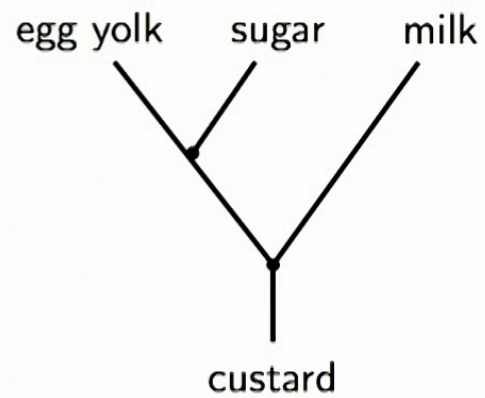


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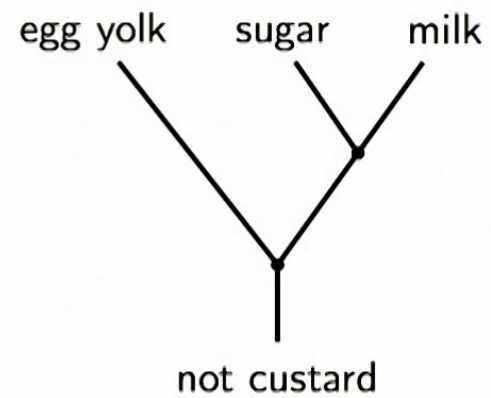
6. Custard

Trees come from sticking things together.



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14.

What is Category Theory?

Mathematics is the **logical** study of how **logical** things work.

Category Theory is the Mathematics of Mathematics.

—the logical study of
the logical study of
how logical things work.