

## Twitter Thread by [Trung Phan](#) ■■



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**Our intuitions often leads us astray. A good reminder: study counterintuitive math and economic results.**

**Here are 9 of them ■**

The Birthday Paradox

In a room of 23 people, there's a >50% chance that 2 people share the same birthday.

This type of probabilistic thinking does \*not\* come naturally to many people.

**BUT** the probability of **23** people **NOT** having the same birthday is:

$$\frac{364}{365} \times \frac{363}{365} \times \frac{362}{365} \times \dots \times \frac{344}{365} \times \frac{343}{365} \approx 0.49270 = 49.270\%$$



The Coastline Paradox

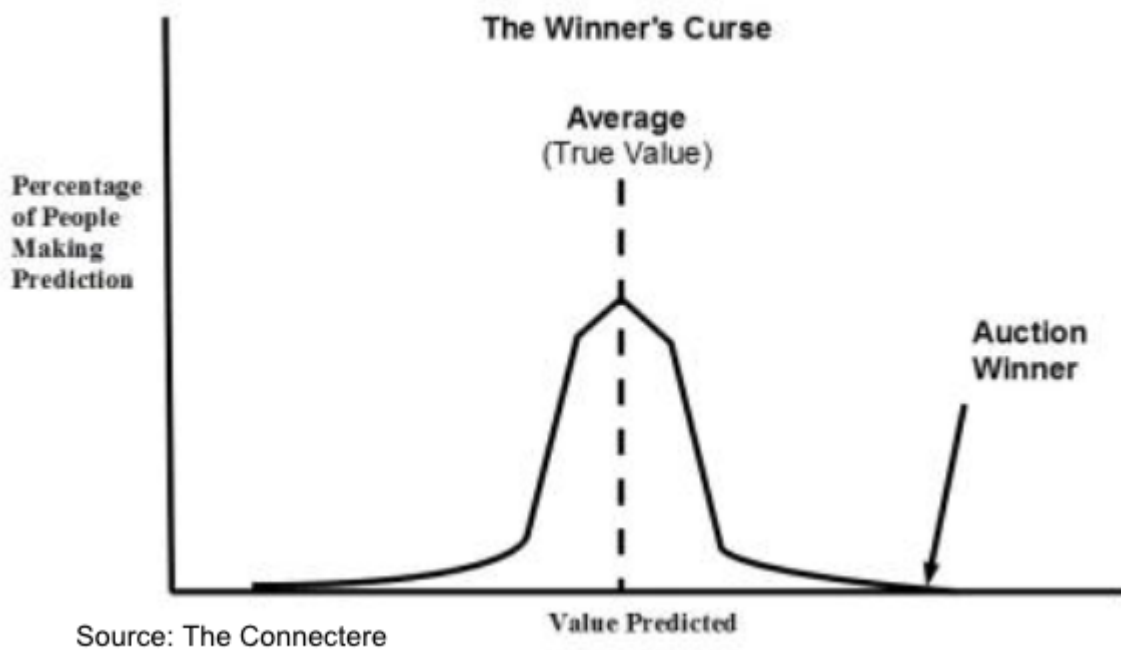
Fractal geometry is also confounding:

The coastline of a landmass does not have a well-defined measurement. As the unit of measurement gets smaller (eg. from KMs to cm), the length increases without limit.



### Winner's Curse

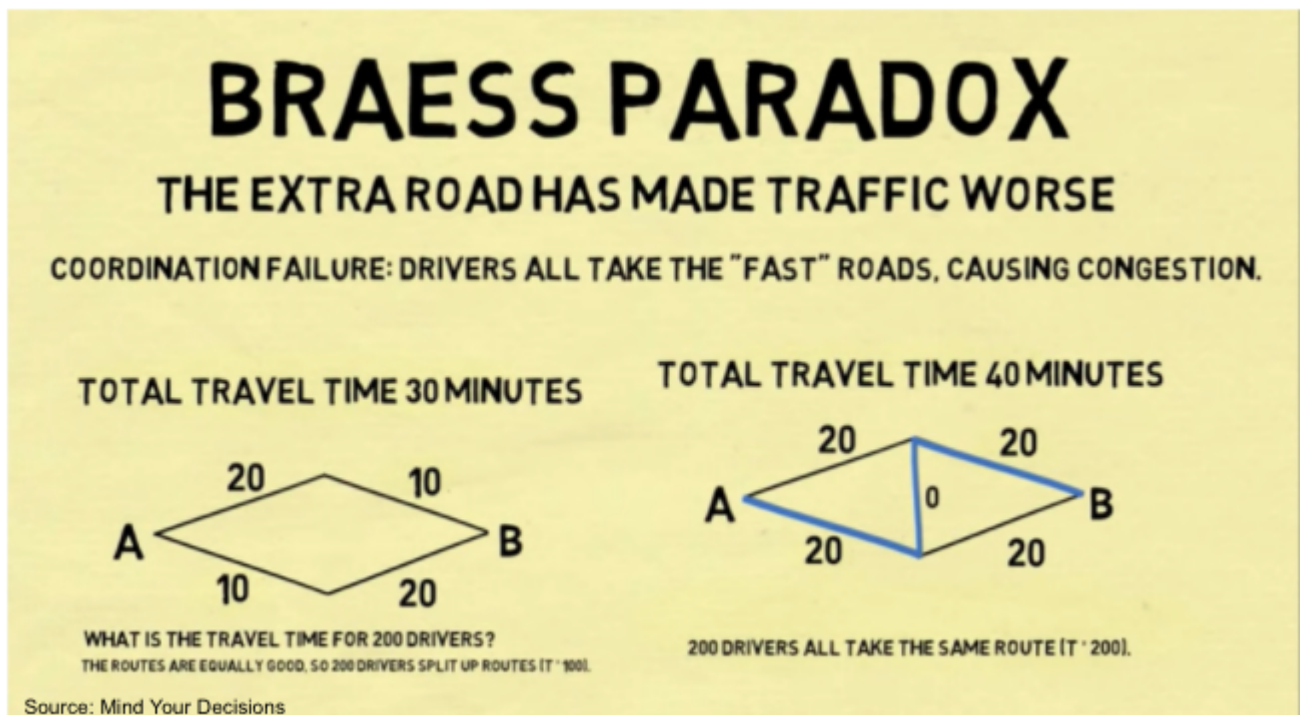
In an auction, the winning bid will usually exceed the intrinsic worth of an item leading to a significant overpay (and negative net profit for the winner).



### Braess's Paradox

Removing an extra road can make everyone's commute time faster.

Why? The existence of a "fast" road leads to congestion because everyone uses it. If you remove the shortcut, traffic flows better.



## Market for Lemons

If a seller has slightly more info than a buyer (eg used cars), it can lead to market failure:

- Buyer will pay price below market (b/c they can't confirm quality)
- High-quality sellers leave market b/c can't get good price
- Only low-quality sellers remain

## Asymmetric information

(not equal)

Buyer thinks value is:

£3,000

Seller knows  
value is:  
£2,000



[www.economicshelp.org](http://www.economicshelp.org)

### The Potato Paradox

If you take 100lbs of potatoes which are 99% water by weight and you let it dry so that they are 98% water, their new weight is 50lbs.



**Initial state:** 1 lbs solid, 99 lbs water.

**Total weight:** 100 lbs.

**Proportion of total weight that's water:**  $99/100 = 0.99$

**Final state:** 1 lbs solid, 49 lbs water.

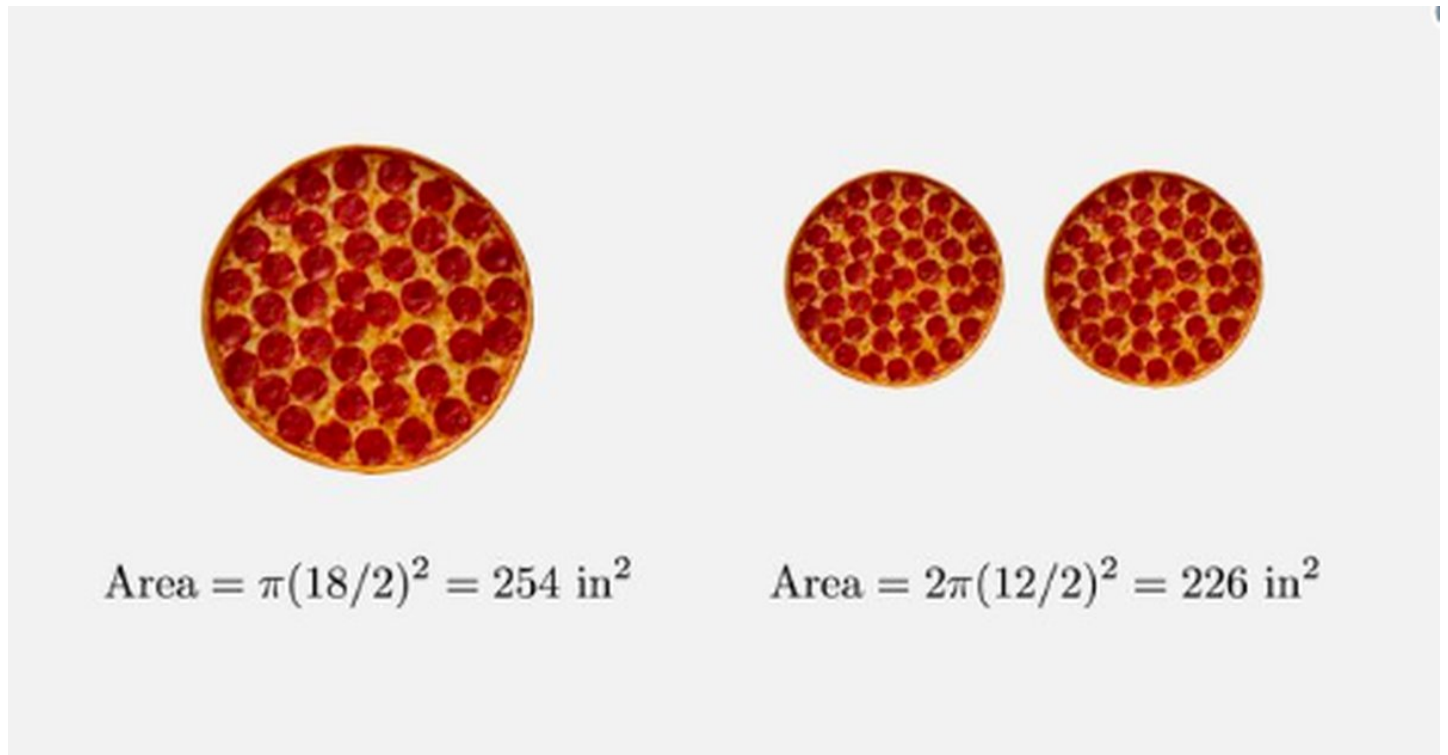
**Total weight:** 50 lbs.

**Proportion of total weight that's water:**  $49/50 = 0.98$



## The Pizza Paradox

One 18-inch pizza has more "pizza" than two 12-inch pizzas (still trying to process this fact).



## Littlewood's Law of Miracles

An example of the law of large numbers: A person can expect to experience events with odds of one in a million at the rate of about once per month.

(Similarly: in a world with ~8B people, a one-in-billion event will happen 8x a month)



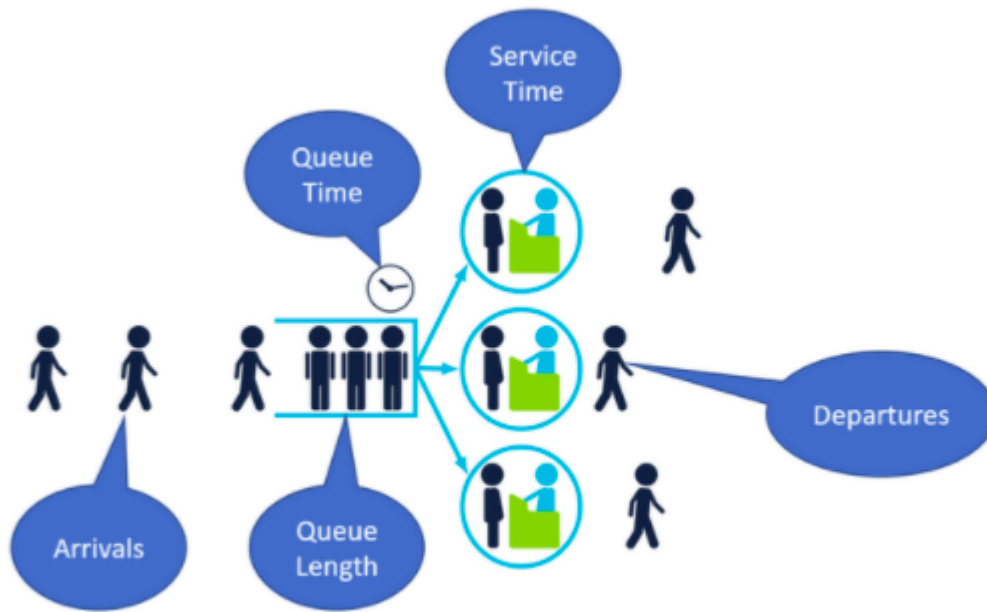
## Queuing Paradox

If bank customers take on average 10 minutes to serve and they arrive randomly at a rate of 5.8 per hour...then the waiting time for

■ one teller is \*5 hours\*

■■two tellers is \*3 minutes\*

Waiting time is reduced by 93x by adding a second teller.



Source: Alteryx

PS. I write interesting threads like this 1-2x a week. Follow [@TrungTPhan](#) to catch them in your feed.

Also check out my weekly Saturday newsletter:<https://t.co/jGZs8brnVR>

Sources

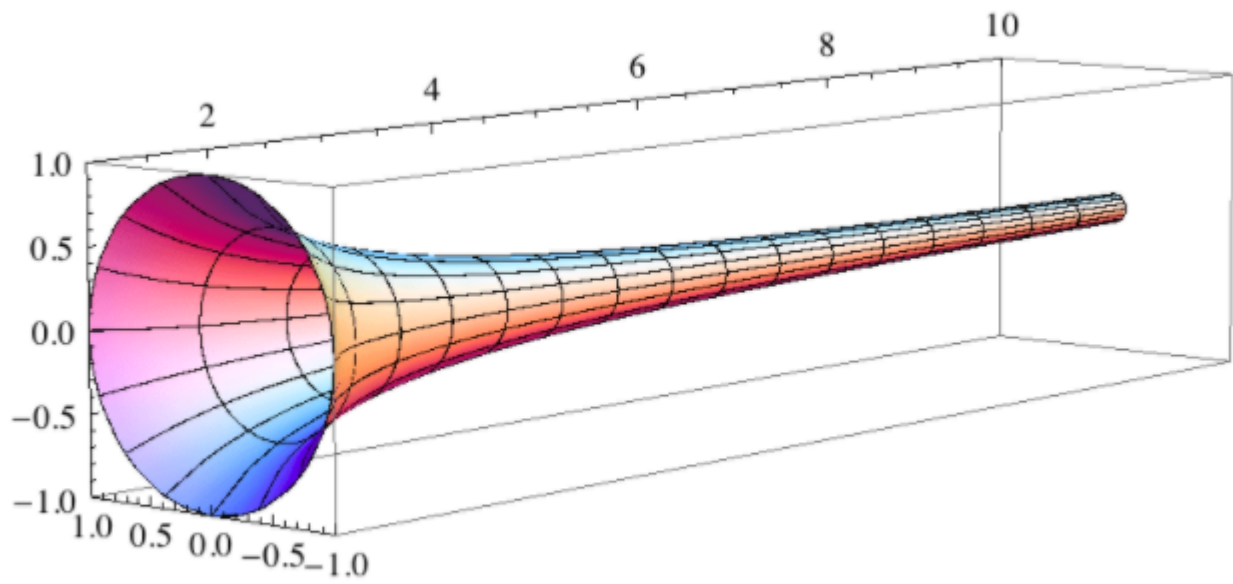
Here's the breakdown of the queueing theory: <https://t.co/2vunn5mMTz>

Check this awesome article for dozens more counterintuitive math, science + physics facts: <https://t.co/8seijm6AkH>

VERY counterintuitive fact: Gabriel's Horn is a geometric figure with:

■■ \*infinite\* surface area

■■ \*finite\* volume



Deep dive on the Birthday Paradox <https://t.co/3AAXUUVGP9>

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Get a cup of coffee.

Let's talk about the Birthday Paradox.

This is a simple exercise in probability.

But from it, we can learn so much about life.

About strategic problem solving.

About non-linear thinking -- convexity, concavity, S curves, etc.

So let's dive in!

— 10-K Diver (@10kdiver) [January 9, 2021](#)