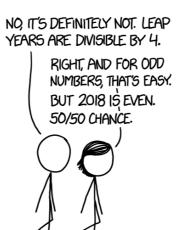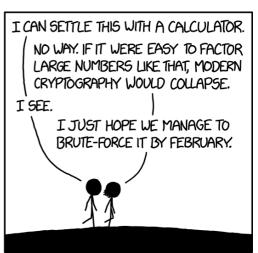Counting Part 2

10, 11 Nov 2019

Sam Y. [myong]

Agenda

- o Counting poker hands
- o Counting in two ways
- o Infinite sets counting

A standard deck consists of 52 cards. Each card is designated by one of the 4 possible suits and one of the 13 possible ranks. A poker hand is a 5-selection from a standard deck. (~10min)

1. **One pair** is a hand that contains two cards of the same rank and three cards of three other ranks. How many distinct **one pairs** are there?

2. **Two pair** is a hand that contains two cards of one rank, two cards of another rank, and one card of a third rank. How many distinct **two pairs** are there?

3. **Three of a kind** is a hand that contains three cards of the same rank and two cards of two other ranks. How many distinct **threes of a kind** are there?

4. **Full house** is a hand that contains three cards of one rank and two cards of another rank. How many distinct **full houses** are there?

(~5min)

5. $n \in \mathbb{N}^+$

$$\sum_{k=0}^{n} \binom{n}{k} = 2^n$$

(~7min)

6. $n \in \mathbb{N}^+$

$$n2^{n-1} = \sum_{k=1}^{n} \binom{n}{k} k$$

Puzzle 1.

Hard

6	2	7	3	5				
		3		6				
	9						1	
	7		9	4	6			
3						7	4	
		8			3	1		
4								8
				1		4		9
							6	

Puzzle 2. Prove $3 < \pi < 4$ visually.

7. Prove $|\mathbb{N}| = |\mathbb{N} \times \mathbb{N}|$

8. Prove $|(0, 1)| = |(0, 1]|$

9. Show that the set of all functions $f: [n] \to \mathbb{N}$ is countable.

10. Show that the set of all functions $f: \mathbb{N} \to \mathbb{N}$ is uncountable.

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incredible!

what?

I just found that jellybean I lost earlier

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