

The Magic of Statistics...



Revealed!



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"Out of this World"

- One of the top ten tricks
 - Rated by magicians from around the world
- Created in 1942
- Uses a regular deck of cards
- Single prediction modification created by Larry Smith

It's MAGIC!!!

- Spend 10 minutes entertaining your students while teaching or reviewing concepts including:
 - Probability and Independence
 - The Binomial distribution
 - The Normal approximation to the binomial
 - Hypothesis testing

Semantics

- Remove all ACEs from the deck
- Place one red ACE and one black ACE face up
- Ask each student, in order, to guess the color of a card which they cannot see
- Place card onto appropriate colored ACE stack
- After 10 (or so) guesses, place opposite color ACE on each stack
- Repeat second step above
- Reveal to students their hidden psychic ability!

Probability

- Define "success" as guessing right
- What is the probability of "success"?
 - Bayesian?
 - Frequentist?
- What is the probability of getting all n right?

Independence

- What is the probability of getting all n right?
- Does the guess of one student affect the next student?
 - Series of reds often forces the next guess to be black
 - Does the probability of "success" change?

Binomial Distribution

- Recall requirements of
 - Dichotomous event
 - Independence
 - N trials
 - Constant probability of success (50%)
- What is the probability of getting all n right?
- What is the probability of getting n-1 out of n right (modification)?

Hypothesis Testing

- p-value: If the true probability of “success” is 50%, what is the chance you get all n right?
 - Binomial calculation
 - Normal approximation to the binomial
 - Only need $n=10$ until np and $n(1-p) \geq 5$
- In the end, students don't need to understand how the trick works, just that their guesses were likely not random
 - This is how hypothesis testing often works

Calculated Probabilities

N	Basic Trick	Single Error (p-value)	Single Prediction
1	1 in 2	1	1 in 48
2	1 in 4	3 in 4	1 in 64
15	1 in 32,768	1 in 2,048	1 in 98,304
20	1 in 1 million	1 in 49,932	1 in 2.4 million
25	1 in 34 million	1 in 1.3 million	1 in 62 million
30	1 in 1.1 billion	1 in 35 million	1 in 1.7 billion

The REAL Magic!

- It makes students enjoy statistics class!
 - Many mention that “he does cool magic tricks” on course evaluations
 - (Although it's the only one I know!)
 - Students love engagement with activities