

Mathematics and Magic  
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This collection of magic tricks that use mathematical principles comes from my collection of similar tricks. How to do each trick is explained. Your challenge is to figure each of the tricks out. Why do they work? Feel free to email me with solutions or for hints.

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Trick #2

**Faster than a Calculator**

Mathematics Level: Algebra 1 or higher to grasp the why, 4<sup>th</sup> grade or higher to just appreciate the trick.

Materials: A calculator, a chalkboard and chalk, or white board and markers, or pencil and paper.

How: This trick works better if everyone can see what numbers the volunteer is writing (except you). Have a volunteer come to the board and when you turn your back, write down 2 numbers, one on top of the other. Tell the volunteer to pick two small numbers, probably under 10 (or provide a calculator). After the volunteer has done this, tell the volunteer to sum those numbers and put the answer underneath the two numbers. Then tell the volunteer to sum the last two numbers and write their sum under the last number. The volunteer should continue adding the last two numbers in this manner until a total of ten numbers are on the board. Have the students take out their calculators and tell them that you are going to race them. The goal is to get the sum of all ten numbers the fastest. Turn around and within 5 seconds tell them the entire sum.

The Trick: Multiply the 7<sup>th</sup> number by 11 and that is the sum. There is another trick that is helpful here. To do any number times 11 you do it like this:

739 X 11.

Bring down the ones place

9.

Add the ones and tens digit  $3+9$  is 12, so I write down 2 and carry 1

29.

Add the next two digits  $3+7$  so I have  $10 + 1$  (carried from the last step) = 11 so I write 1 and carry 1.

129

Bring down the last digit (plus the 1 carried over) so 8  
8129.

Example

2  
3  
5  
8  
13  
21  
34  
55  
89  
144

The sum is 374 because  $34 * 11$  is 374.

I brought down 4, adding  $3+4$  and got 7 and then brought down 3.

Trick #3

### **Mind Control Clock Trick**

I learned this one from watching David Copperfield do it on national television when I was a young teenager. I have no idea which broadcast it was or how to source it properly yet.

Mathematics level: This is ideal for a Geometry class or a middle school class that is talking about reflections, rotations, and symmetries. However, I would guess that upper elementary students would enjoy the trick and could be taught the why behind it.

Materials: A Clock

How: First, Have the entire class pick a number on the clock and “put a finger” on it in their mind. Second, have them go 6 hours clockwise. Third, Then have them go counterclockwise equal to the number that they first picked. For example, if they had originally put their finger on the number 7, then they would go 7 hours counterclockwise at this point. Fourth, then have them go X number of hours (you pick this) clockwise. You then tell them exactly what number their finger is on now.

Trick: They will all end up at the number 6 after the third step. So if you tell them to go ahead 5 hours then they will all be on the number 11 regardless of what number they started on.

Trick #41:

**A Day for any Date: Lewis Carroll Edition:**

- The Century Item:
  - Take the Century Item and divide by Four
  - Take remainder from three
  - Multiply this difference by two
- The Year Item:
  - Add together the number of dozens, the remainder, and the number of fours in the remainder
- The Month Item:
  - If it begins or ends with a vowel, subtract the number denoting its place in the year, from 10.
  - This, plus its number of days, gives the item for the following month
- The Month Item:
  - If it begins or ends with a vowel, subtract the number denoting its place in the year, from 10.
  - This, plus its number of days, gives the item for the following month.
  - Had a flaw in the Month Number System:
  - Table has since been developed
- The Day Item:
  - Use the day of the Month
- Get the final answer
  - Sum the results of each part together
  - Divide the answer by seven.
  - Use the remainder to determine your day.
  - The remainder gives the day of the week: Sunday is a 0, Monday a 1, ... Saturday a 6.

January	0	July	6
February	3	August	2
March	3	September	5
April	6	October	0
May	8	November	3
June	4	December	12

**Example: Today is December 8, 2008. It's a Monday.**

**Century Item:  $20/4$  is 5 r 0.  $3-0 = 3$   $2 \times 3 = 6$ .**

**Year Item:  $08/12 = 0$  r 8.  $8/4$  is 2 r 0.  $0+8+2 = 10$ .**

**Month Item: 12**

**Day Item: 8**

**Total  $6 + 10 + 12 + 8 = 36$ .  $36/7$  is 5 r 1. 1 is a Monday! So it worked.**

Trick #5

### **Name of the Card Trick**

Mathematics level: Algebra 1 at least to understand the why behind the trick, but upper elementary and higher to appreciate the trick and some could learn it.

Idea comes from [http://www.easymaths.com/Curious\\_Maths\\_magic.htm](http://www.easymaths.com/Curious_Maths_magic.htm)

Materials: A deck of playing cards, calculator, paper and pencil and Put the 10 of Hearts in the eighteenth position down from the top of the deck before the class or show starts

### **The Secret**

Announce that you are going to predict which card will be chosen from the deck. On a piece of paper, write: "THE NAME OF THE CARD IS". Fold the paper so that your friend doesn't see what you've written and put it aside until later. Ask your friend to:

1. Enter a 3-digit number into the calculator. (The first digit must be larger than the last digit.)

Example: 845

2. Reverse this number and subtract it from the first number. -548

3. Add the digits in the answer.  $2+9+7=18$  The digits will always add up to 18!

Tell him to count down that many cards in the deck. It will be the 10 of Hearts.

Finally, ask him to open the piece of paper and read your prediction.

He'll read, "THE NAME OF THE CARD IS". Say that you were in such a hurry that you forgot to finish your prediction. Then make these adjustments and his card will mysteriously appear!

-cross off the H in THE

-cross off the AME in NAME

-cross off the T in THE

-cross off the CD in CARD

-change the I in IS to a T by crossing the top

leaving **THE TEN OF HEARTS**

Trick #7

### **Synchronized Minds Trick:**

Mathematics level: Pre-Algebra and above to understand the reasons.

Materials: None

How: Tell Everyone in the class to think of a number between one and ten. Tell them to double their number. Tell them to add X (your choice) to this. Tell them to divide this number in half. Tell them to subtract their original number from this number. (i.e. if they originally

thought of 4 then they take away 4 right now). The mathematician then announces the answer that they ALL have.

Trick: When you tell them to add X. Pick an even number (small one preferably like under 20). Then the number in their head at this point will always be half of X as the final answer.

Trick #8

### **Colored Animal Trick**

Mathematics Level: The mathematics is 4<sup>th</sup> grade and higher, but possibly this trick would only work with high school students (you need an audience that has a basic knowledge of world geography).

From [http://motivate.maths.org/conferences/conf31/c31\\_orange\\_kangaroo.shtml](http://motivate.maths.org/conferences/conf31/c31_orange_kangaroo.shtml)

Materials: None

How: This is a simple mind reading trick. Ask the audience to think of a number between one and nine. Multiply this by nine, add the digits and subtract five. Take the resulting number and assign it a letter (A=1, B=2, C=3 etc). Take a non island country which starts with this letter, take the last letter of this country and find a land animal starting with this letter. Finally think of a color starting with the last letter of the animal.

With high probability, the audience chooses an "Orange Kangaroo from Denmark".

Trick #12

### **Counting Cards (Kings) (My name for the trick)**

Mathematical Level: Algebra II or higher to understand it, middle school to appreciate it.

My personal favorite. This one involves some upper secondary algebraic concepts

## **Solving Systems of Equations**

### **A Card Trick**

by James Currie

University of Winnipeg

Your students may know, or may quite possibly have seen, the following card trick. Understanding how the trick works gives us a chance to model a real life situation by several equations, and to solve the equations to find a chosen card.

### **The Trick**

31316. Take a deck of 52 playing cards. You must have a full deck!

31317. Deal the top card face up. Name the card. Now deal another card face up on it, naming the next higher card. Continue until you say "King". For example, if the top card was the 4♣, you would say "Four, five, six, seven, eight, nine, ten, jack, queen, king". After saying this, you would have a pile of 10 face-up cards, with the face-up 4♣ on the bottom. If you started with the Q♠, you would say "Queen, king", and have 2 cards.

31318. Flip the pile face-down. (This means that the 4♣ is on top of a pile of 10 face-down cards.)

31319. Form several other piles in the same way. If at the end there are not enough cards to complete a pile, place the remaining cards in a discard pile.

31320. A volunteer chooses 3 piles. Pick up the remaining piles, and gather them into the discard pile.

31321. The volunteer openly turns up the top cards of two of her piles. She peeks at the card on the third pile, but doesn't show anyone else.

7. Count the discard pile. Suppose it contains  $N$  cards. Suppose that the volunteer has turned up cards of values  $x$  and  $y$ . (Here jack = 11, queen = 12, king = 13). You can now name the value of the peeked card. It is  $N - 10 - x - y$ .