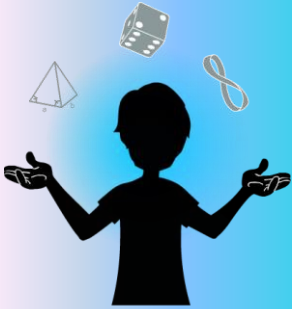


Math Magic

-Vice Versa-



AMAZINGMATHS

Materials:

- Video of the trick
- 12 tokens with two distinctly different faces (heads and tails of coins can be used)

How to perform the trick

1. The magician places 12 tokens that have two distinctly different faces on the table. For example, one side is red and the other yellow. 6 tokens will have the red face showing, and the other 6 will have the yellow face up.
2. The magician turns around, and tells the spectator to mix up the tokens as much as the spectator wants, but without flipping them over. When the spectator is done, the magician asks the spectator to take 6 tokens of any colour, flip them over, and then hide them under their hand.
3. Once the tokens are hidden, the magician turns around and guesses the number of tokens of each colour under the spectator's hand.

How the magician guesses the tokens correctly: When the magician turns back to the table, the magician subtly looks at the tokens that are left on the table. These tokens are the same as the tokens under the spectator's hand. For example, if the magician sees 2 yellow tokens and 4 red tokens, then the spectator also has 2 yellow tokens and 4 red tokens.



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SCIENCES ET MATHÉMATIQUES EN ACTION



Mathematical Explanation



Why the trick works

To begin there are a total of 12 tokens on the table, 6 of each colour. Once the spectator chooses 6 tokens, there remains the complement of the tokens taken. For example, if the spectator takes 2 red tokens and 4 yellow tokens, then 4 red tokens and 2 yellow tokens are left, because there were originally 6 of each colour ($6 - 2 = 4$ and $6 - 4 = 2$).

In addition, the colours are complements of each other. For example, if the spectator takes 2 red tokens, then 4 yellow tokens were also taken because the spectator took 6 tokens in total.

With these two observations, the magician knows that the number of red tokens taken is equal to the number of yellow tokens left on the table, and vice versa. For example, if 2 red tokens are left on the table, then 4 red tokens were taken, which means 2 yellow tokens were taken.

The magician then asks the spectator to flip all the taken tokens. This means all the red tokens become yellow and vice versa. This means that the spectator has the exact same amount of red and yellow tokens under their hand as is on the table.