

MATHEMAGIC

- X-RAY -



Materials:

- 3 regular dice
- 1 cylinder
- 1 writing slate

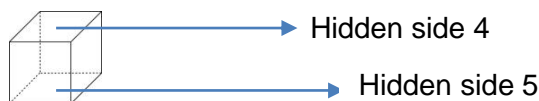
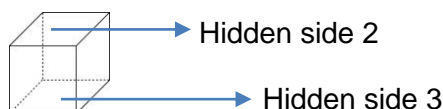
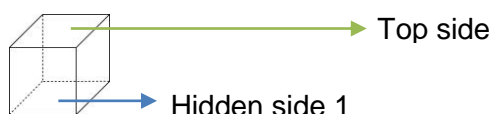
How to do the Magic Trick

Goal:

For this trick, the magician's goal is to find the sum of all the sides hidden underneath the top side of the tower.

Trick :

1. The magician invites a spectator to throw 3 dice, and to then pile them on top of each other to create a tower. Meanwhile, the magician turns around so that he cannot see anything. Once the spectator has piled up the dice as a tower, he places the cylinder around it so that the only visible side is the top of the tower.



2. The magician turns around and examines the tower with his "X-Ray" eyes. He announces the sum of the addition of the 5 sides that are hidden underneath the top side.

(To do this, the magician subtracts 21 from the value of the top side.)

3. The spectator verifies if the number announced by the magician is in fact the sum of the amounts of the 5 hidden sides. To do so, he removes the cylinder, reveals the hidden sides of the dice, and adds them up.



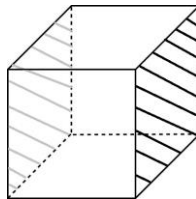
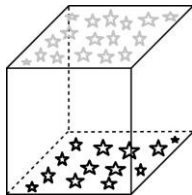
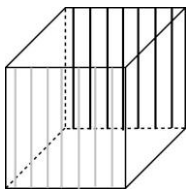
MATHEMATICAL EXPLANATION



Why this trick works

On a 6-sided die, the sum of opposite sides (that never touch each other) always gives 7.

Ex.: $1 + 6 = 7$, $2 + 5 = 7$ and $4 + 3 = 7$.



With 3 dice, the sum of the 3 pairs of opposite sides gives 21, because $3 \times 7 = 21$.

To find the sum of the 5 hidden sides under the top side, we must know that the total of the 3 dice gives 21.

When the magician turns around, all he has to do is subtract the top side of the tower from 21 to obtain the sum of the hidden sides.

For example, let's take a tower built with 3 dice and with a top side showing 4.

The magician must subtract 4 from 21 in order to know the total sum of the hidden sides.

He then does 21 (because there are 3 dice, so 3 pairs of opposite sides that have a sum of 21) $- 4$ (because it is the number that is on the top side).

Ex.: $21 - 4 = 17$.

The magician announces that the sum is 17.