MATHEMAGIC

- AMAZING ROLL OF THE DIE -

AMAZINGMATHS

Materials:

- Video of the trick
- 3 dice
- Sheet of paper
- Pencil

How to do the Magic Trick

Goal:

Find the values of the spectator's 3 dice.

Trick:

1. While the magician is turned around, the spectator rolls the 3 dice to get three values.

2. Still turned around, the magician gives a list of mathematical operations the spectator will have to do on the sheet:

   I.   Take the value of your first die and multiply it by 2.

   II.   Add 5 to your last result.

   III. Multiply your last result by 5.

   IV.   Add the value of your second die to your result.

   V.   Multiply your last result by 10.

   VI.   Add the value of your third die.

3. The magician asks for the result of the spectator.

4. The magician is then able to reveal, in order, the value of the first die, of the second die and of the third die.

   To do so, the magician subtract 250 to the result and he gets the value of the first die in the hundreds position, the value of the second die in the tens position and the value of the last die in the units position.

MATHEMATICAL EXPLANATION

Why this trick works.

It is possible to solve this magic trick by proceeding algebraically.

Let's write the following variables:

x := the value of the first die;

y := the value of the second die;

z := the value of the third die.

Let's dissect each of the mathematical operations the spectator does:

I.   Take the value of your first die and multiply it by 2.

$$2x.$$

II. Add 5 to your last result.

$$2x + 5.$$

III. Multiply your last result by 5.

$$(2x + 5) \times 5$$
$$= 10x + 25.$$

IV. Add the value of your second die to your result.

$$10x + 25 + y.$$

V.   Multiply your last result by 10.

$$(10x + 25 + y) \times 10 = 100x + 250 + 10y.$$

VI. Add the value of your third die.

$$100x + 250 + 10y + z.$$

We notice that if we subtract 250 to the expression above, we get the expression:

$$100x + 250 + 10y + z - 250$$
$$= 100x + 10y + z$$

So, we find that the final number obtained has x times the number 100, y times the number 10 and z times the number 1, meaning that the final number has x hundreds, y tens and z units.

We conclude that the values of the dice are the digits that form the final number we obtained.