

## The Magic of 1089

Here is a neat little trick and, of course, how it works.

- (1) Take any three digit number where the digits are in descending order (highest digit to lowest digit)
- (2) Reverse the digits and subtract this result from your number of step (1)
- (3) Take this answer, and add it to this number with the digits reversed.
- (4) Your result is 1089

Here is an example: Take 841, reversing the digits, I get 148. Now subtract  $841 - 148$  and I get 693. Reverse these digits and I get 396. Now add  $693 + 396$  and you end up with 1 089!!!

### How it Works:

Let's write the original number as  $100H + 10T + 1U$ , where H = hundred's digit, T = ten's digit and U = unit's digit. If I reverse this number, it becomes  $100U + 10T + 1H$ . Subtracting these two results leads us to:

$$(100H + 10T + 1U) - (100U + 10T + 1H) = 100H + 10T + 1U - 100U - 10T - 1H = 99H - 99U = 99(H - U)$$

Thus the result will be a multiple of 99 where you multiply 99 by a number from 2 to 8 since H and U are at least 2 apart. Below are those multiples:

$$99 \times 2 = 198$$

$$99 \times 3 = 297$$

$$99 \times 4 = 396$$

$$99 \times 5 = 495$$

$$99 \times 6 = 594$$

$$99 \times 7 = 693$$

$$99 \times 8 = 792$$

$$99 \times 9 = 891$$

Now if you look at the results above, all of them have the ten's digit = 9 (so  $T = 9$ ), and the hundred's plus the unit's digits add up to 9 (so  $H + U = 9$ , or  $H = 9 - U$ ). So, if we add the number HTU to the digits reversed, UTH, then we get the following:

$(100H + 10T + 1U) + (100U + 10T + 1H) = 101H + 20T + 101U$ . Now substitute it  $T = 9$  and  $H = 9 - U$  and we get:

$$101(9 - U) + 20 \times 9 + 101U = 909 - 101U + 180 + 101U = 909 + 180 = 1\ 089$$

HaHaHa !! Now matter what we start with (as long as the 3 digits are in descending order) we end up with the same answer, the magical number 1 089 !!