Number Magic

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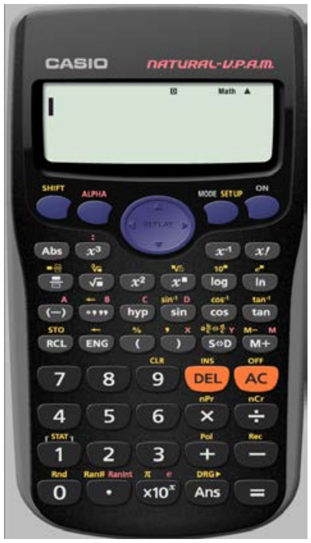
37 037



The number 37 037 possesses some magic. Multiplied by any number, the number 37 037 creates a number of different patterns. By learning these patterns on your Casio calculator, you can pass your calculator to any person in your class and show them how you can quickly multiply the number 37 037 by any other number. For example, any multiple of the number three (up to 27), multiply by 37 037 to get a six-digit series of the same number.

For example, 37 037 × 3 = 111 111, to find the rest, put the numbers into your calculator and watch the magic!

1089

The number 1 089 also has some interesting properties…

1 089 × 9 = 9 801 [1 089 reversed]

If a, b, c, …, x, y, z stood for a digit 0 ≤ a~z ≤ 9 then is there a 1 digit number or 2-digit, or 3- or … where the result reverses?

For example,

10 a89 or 10a b89

× 9   × 9

98 a01   98b a01 etc.,

There is a pattern, and the totals of these numbers formed which do this are the Fibonacci numbers: < 0, 1, 1, 2, 3, 5, 8, 13, …. >. What is the pattern?

Complete the following table:

Nº digits	Y/N/total count	Nº digits	Y/N/ total count
1-digit	N	11-digits	
2-digits	N	12-digits	
3-digits	N	13-digits	
4-digits	1 - 1089	14-digits	
5-digits	1 -	15-digits	
6-digits	1 -	16-digits	
7-digits	1 -	17-digits	
8-digits	2 -	18-digits	
9-digits	2 -	19-digits	
10-digits	3 -	20-digits	

Square numbers ending in '5'

5^2 = 5 × 5 = 25
15^2 = 15 × 15 = 2 25
25^2 = 25 × 25 = 6 25
35^2 = 35 × 35 = 12 25
45^2 = 45 × 45 = 20 25
55^2 = 55 × 55 = 30 25
65^2 = 65 × 65 = 42 25
75^2 = 75 × 75 = 56 25
85^2 = 85 × 85 = 72 25
95^2 = 95 × 95 = 90 25

What do you notice?

Will this pattern work for $ab5^2 = (100a + 10b + 5)^2$ 0r for $abc5^2 = (1\,000a + 100b + 10c + 5)^2$?

Some answers:

N	N × 37 037	N	N × 37 037	N	N × 37 037
1	37 037	10	370 370	19	703 703
2	74 074	11	407 407	20	740 740
3	111 111	12	444 444	21	777 777
4	148 148	13	481 481	22	814 814
5	185 185	14	518 518	23	851 851
6	222 222	15	555 555	24	888 888
7	259 259	16	592 592	25	925 925
8	296 296	17	629 629	26	962 962
9	333 333	18	666 666	27	999 999

$(n5)^2$ = n5 × n5 [Note: When 'n' represents a 10's digit.]
$= (10n + 5)^2 = 100n^2 + 100n + 25$
$= 100(n^2 + n) + 25$
$= 100n(n + 1) + 25$, when n is a single digit, 0~9.

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