Hi all

In this tutorial, I'm going to explain a technique called '帰一法混用乗法' (literally means 'Regressing Multiplier to the power of 10 mixed with normal multiplication'). This is a twist of '帰一法乗法' (literally means 'Regressing Multiplier to the power of 10'), also known as 'Multiplication by Complementary Numbers' in Takashi Kojima's book (and totton's page, of course).

帰一法乗法 is useful when multipliers are a little smaller than 100, 1 000, etc., but this 帰一法混用乗法 is useful when the SECOND most significant digit of the multiplier is 9 or near-9 numbers.

It goes like this...
Example: 156x293=45708

First, put the multiplier and multiplicand.

```
ABC   abcdef
293   156000   Modify multiplier: Increment top digit of the multiplier,
               and the rest of the digits are changed to its complement number.
307   156000   Multiply 3 at [A] with 6 at [c], and put the result to [c-d], after clear [c]
307   151800   Multiply 7 at [C] with 6, and subtract from [c-f]
307   151758   Multiply 3 at [A] with 5 at [b], and add the result to [b-c], after clear [b]
307   116758   Multiply 7 at [C] with 5, and subtract from [b-e]
307   116408   Multiply 3 at [A] with 1 at [a], and add the result to [a-b], after clear [a]
307   046408   Multiply 7 at [C] with 1, and subtract from [a-d]
307   045708   done.
```

And this technique could be combined with 'The Elimination of the Initial Digit of a Multiplier Beginning with One' (省一法乗法), and this is called '省一帰一混用乗法'. It is useful when the top digit of the multiplier is 1, and the THIRD digit is 9 or near-9 value. (perhaps you can find how to operate.) :-)

masaaki

==

Hi all,

I am writing the explanation of '過大実乗法' (multiplication with excessive multiplicand), but before that, I would like to explain '省一帰一混用乗法' (The Elimination of the Initial Digit of a Multiplier Beginning with One, combined with Regressing Multiplier to the power of 10 mixed with normal multiplication), which I left the explanation other day.
It is useful when the top digit of the multiplier is 1, and the THIRD, FOURTH, ... digit is 9 or near-9 value.

The method itself is very similar with '帰一法混用乗法' (Regressing Multiplier to the power of 10 mixed with normal multiplication).

Now brief explanation with example 567*1298=735966

```
ABCD   abcdef
1298   567    : First, revise the multiplier.
              : To do so, clear [A], Add 1 to [B], and make the rest of the digits [CD] to
              : the complement number.
0302   567      Remember the value at [c] (7), multiply the value by [B] (3), and add to [cd].
0302   5691     Multiply 7 by [D] (2), and subtract the value from [ef].
0302   569086   Remember the value at [b] (6), multiply the value by [B] (3), and add to [bc].
0302   587086   Multiply 6 by [D] (2), and subtract the value from [de].
0302   586966   Remember the value at [a] (5), multiply the value by [B] (3), and add to [ab].
0302   736966   Multiply 5 by [D] (2), and subtract the value from [cd].
0302   735966   done
```

It could be useful when we calculate principal and interest, or tip ...

Thanks to the people who devised and handed down this technique to the modern world, and Totton Heffelfinger for giving me the opportunities to introduce it.

masaaki