Lighting Addition

A Fibonacci Sequence Effect.

Select 2 students and give them a paper and pencil. Be sure you are not standing close to them as you start the trick so it is clear you cannot see the paper. Pick one student to perform the calculations and ask the other to watch and check to be sure the math is correct at each step.

Ask the student to write down any number form 1 to 9 on the top of the paper. Ask the student to write that same number directly below the first number. Ask the student to add the two numbers together and put that total directly underneath the last number. They will now have 3 numbers listed vertically. Ask the student to add the last two numbers in the list together and put that total directly underneath the last number. They will now have 4 numbers listed vertically. Ask the student to add the last two numbers in the list together and put that total directly underneath the last number. Tell them to continue this process until they have **10 numbers** on the list.

Tell the students that you will race them to add up all 10 numbers. Tell them they can start adding the numbers. Turn around look at the numbers , write the total on a piece of paper and set it down. When they have added up the numbers have them write that total down and announce it to the class. Have them pick up your paper and read the total. You will have found the total much faster then they did.

How it is done.

When you turn around, note the 7th number form the top of the list. Multiply that number by 11 to get the total.

This effect can repeated with different starting numbers. Any starting number can be used but finding the total for larger starting numbers may be too difficult. If you and the student both get to use a calculator then any starting number will work and you will be much faster the larger the starting number is.

How to multiply by 11.

To multiply a 2-digit number by 11, add the two digits and that place the sum in between the 2 original digits.

$$\underline{a}\,\underline{b} \bullet 11 = \underline{a}\ \underline{a+b}\ \underline{b}$$

Example 1

$25 \bullet 11 = \underline{2}\ \underline{2+5}\ \underline{5} = 275$

Example 2

$54 \bullet 11 = \underline{5}\ \underline{5+4}\ \underline{4} = 594$

Example 3

$63 \bullet 11 = \underline{6}\ \underline{6+3}\ \underline{3} = 693$

If the total of the digits is a 2 digit number then cary the 1 to the third digit.

Example 4

$75 \bullet 11 =$
$\underline{7}\ \underline{7+5}\ \underline{5}$
$\underline{7}\ \underline{12}\ \underline{5}$
$= 825$

Example 5

$96 \bullet 11 =$
$\underline{9}\ \underline{9+6}\ \underline{6}$
$\underline{9}\ \underline{15}\ \underline{6}$
$= 1056$

Example 6

$66 \bullet 11 =$
$\underline{7}\ \underline{7+7}\ \underline{7}$
$\underline{7}\ \underline{14}\ \underline{7}$
$= 847$

What about a 3-digit number?

Example 1

$253 \bullet 11 =$
$\underline{2}\ \underline{2+5}\ \underline{5+3}\ \underline{3}$
$\underline{2}\ \underline{7}\ \underline{8}\ \underline{3}$
$= 2783$

Example 2

$621 \bullet 11 =$
$\underline{6}\ \underline{6+2}\ \underline{2+1}\ \underline{1}$
$\underline{6}\ \underline{8}\ \underline{3}\ \underline{1}$
$= 6831$

Example 3

$454 \bullet 11 =$
$\underline{4}\ \underline{4+5}\ \underline{5+4}\ \underline{4}$
$\underline{4}\ \underline{9}\ \underline{9}\ \underline{4}$
$= 4994$

If the total of the digits is a 2 digit number then cary the 1 to the next digit.

Example 4

$653 \bullet 11 =$
$\underline{6}\ \underline{6+5}\ \underline{5+3}\ \underline{3}$
$\underline{6}\ \underline{11}\ \underline{8}\ \underline{3}$
$= 7183$

Example 5

$259 \bullet 11 =$
$\underline{2}\ \underline{2+5}\ \underline{5+9}\ \underline{9}$
$\underline{2}\ \underline{7}\ \underline{14}\ \underline{9}$
$= 2849$

Example 6

$478 \bullet 11 =$
$\underline{4}\ \underline{4+7}\ \underline{7+8}\ \underline{8}$
$\underline{4}\ \underline{11}\ \underline{15}\ \underline{8}$
$= 5258$

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A Fibonacci like adding effect.

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A proof that the sum of the first 10 numbers is 11 times the 7th number.

Let the first number be x and the second number be y. The 10 numbers in the sequence are as follows.

1. x
2. y
3. $x + y$
4. $x + 2y$
5. $2x + 3y$
6. $3x + 5y$
7. $5x + 8y$ ..... The seventh number
8. $8x + 13y$
9. $13x + 21y$
10. $21x + 34y$

The seventh number in the sequence is 5x + 8y and the total of the 10 number is 55x + 88y

$$\text{Total} = 55x + 88y$$
$$\text{Total} = 11(5x + 8y)$$
$$\text{Total} = 11 \bullet \text{the seventh number}$$