

Choose any four-digit number and follow this process. I predict your answer will be a multiple of 11...

Process	Example
Take any four-digit number.	5238
Create a second number by moving the first digit to the 'back of the queue' and moving the rest along.	2385
Now add your two numbers.	$\begin{array}{r} 5238 \\ +2385 \\ \hline 7623 \end{array}$

Try it a few times. Is the answer **always** a multiple of 11?  
Can you explain why?

This is what Samira noticed:

"I started with 5 thousands, 2 hundreds, 3 tens and 8 units.  
After I moved the digits along, my new number had 2 thousands, 3 hundreds, 8 tens and 5 units."

This is what Jay noticed:

"I picked 1000 as my first number, so my second number was 0001 and the total was 1001.

I know 1001 is a multiple of 11 because it is 1100-99, and 1100 and 99 are both multiples of 11."

Do these observations help you to explain what's going on?

What if you start with a three-digit number?

Or a five-digit number?

Or a six-digit number?

Or a 38-digit number ... ?

Can you prove your findings?