

February 12th

A simple test to see if a number is divisible by 9 is to show the sum of the digits is divisible by 9.

For example, 945 is divisible by 9, since $9+4+5=18$ and 18 is divisible by 9.

Show algebraically why this divisibility test works.

If the 3 digit number is "ABC"

then the number is, algebraically:

$$100A + 10B + C = 99A + 9B + A + B + C$$

$$=9(11A + B) + (A + B + C)$$

The sum of the digits is

$$A + B + C$$

Hence if this is divisible by 9, the number itself must also be.

(Incidentally, this trick works for any power of 3!)