

# Observations on multiplication of a large number by any 2-digit number and a result with recurring decimal digits of inverse of 109 and other primes

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A table look up method was presented in RMIT-2017 for multiplying any number by 2-digit numbers up to 20 for obtaining the result directly from left to right than the conventional method of multiplication. We have developed a new method for doing multiplication of any number by 2-digit numbers up to 100 which can be used for left to right as well as right to left multiplication. Limitations of the method will also be discussed. The method works when the most significant digit of the result obtained by multiplying an  $n$ -digit number by a 2-digit number, is same as the result obtained by multiplying the first 4 digits (from left) of the  $n$ -digit number by the 2-digit number. It can be extended to multiplication by numbers with more digits also. When this result does not hold good, some edge conditions must be applied. With this table look up method we can obtain the result of multiplication from left to right or from right to left or get any digit of the result of multiplication with much less effort. We have also developed a method for generating 108 significantly different and large numbers, which when multiplied by 109 contains same

pattern which enables us to identify all the 108 numbers easily. This method uses recurring decimal digits of inverse of 109. The technique works for many other primes also. For example, consider the prime 97. Consider the numbers,  $1287322507 * 97 = 124870283179$  and  $1493508074 * 97 = 144870283178$ .