



Problem of the Week

Problem B

Digital Reflections

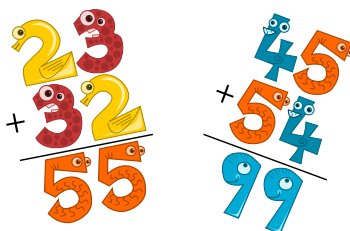
Problem

A *prime number* is a whole number greater than 1 that has only two factors, itself and 1. For example, 13 is a prime number since the only factors of 13 are 13 and 1.

M and N are two different single digit numbers from the set 2, 3, 4, 5, 6, 7, 8, 9, so that

- One of M or N is a prime number, and the other is not a prime number,
- One of M or N is an even number, and the other is an odd number, and
- If you add the two digit numbers MN and NM , their sum is KK , where K is another prime number.

- Which of the single digit numbers 2, 3, 4, 5, 6, 7, 8, 9 are prime, and which are not prime?
- Find all solutions for M and N ?



Solution

- The single digit numbers 2, 3, 5, and 7 are prime, while 4, 6, 8, and 9 are not prime.
- Since M and N must be different, one prime and one not prime, one even and one odd, the only possible combinations of M and N are 2 and 9, 3 and 4, 3 and 6, 3 and 8, 5 and 4, 5 and 6, 5 and 8, 7 and 4, 7 and 6, or 7 and 8.

Of these pairs, three have two-digit sums $MN + NM = KK$, namely

$$34 + 43 = 77, 45 + 54 = 99 \text{ and } 36 + 63 = 99.$$

However, 9 is not a prime number.

Thus the only solutions are $M=3, N=4$, or $M=4, N=3$.

