N is a 2-digit number.
When N divided by 9, the remainder is 1.
When N divided by 10, the remainder is 3.
What is the remainder when N is divided by 11?

We start by making a list of numbers which satisfy the first condition:

$9 \times 1 + 1 = 10$
$9 \times 2 + 1 = 19$
$9 \times 3 + 1 = 28$
$9 \times 4 + 1 = 37$
$9 \times 5 + 1 = 46$
$9 \times 6 + 1 = 55$
$9 \times 7 + 1 = 64$
$9 \times 8 + 1 = 73$
$9 \times 9 + 1 = 82$
$9 \times 10 + 1 = 91$

Then we go through the list and select those which satisfy the second condition:

There is only one possibility, hence $N = 73$
and its remainder when divided by 11 is $\boxed{7}$