

# Largest Palindrome Product

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A number  $n$ , with  $d$  digits,  $a_0, a_1, \dots, a_{d-1}$  is a palindrome if:

$$n = \sum_{i=0}^{d-1} a_i \cdot 10^i$$

and:

$$a_i = a_{d-1-i} \text{ for all } i = 0, 1, \dots, \left\lfloor \frac{d-1}{2} \right\rfloor$$

To find the largest palindrome that is the product of two 3-digit numbers, all products of 3-digit numbers are generated. The largest of the generated products that are found to be palindromes is taken as the result.

## Complexity Analysis

Both generating all possible products, and checking if the products are palindromes can be done in constant space giving an overall space complexity of:

$$O(1) \text{ space}$$

Generating all possible products is done in polynomial time, and checking if any given number is a palindrome is done in logarithmic time. Let  $n$  be the largest number we are using to generate the products, gives an overall time complexity of:

$$O(n^2 \log(n)) \text{ time}$$