1 Grade-school multiplication

Suppose we multiply two *n*-digit integers $(x_1x_2...x_n)$ and $(y_1y_2...y_n)$ using the grade-school multiplication algorithm. How many pairs of digits x_i and y_i get multiplied in this algorithm?

 $\begin{array}{c}
 0 & n^3 \\
 0 & 2n-1 \\
 0 & 2
 \end{array}$

\circ n^2

Correct

What is the smallest exponent x such that the number of one-digit operations in grade-school multiplication is always at most $10000 \cdot n^{x}$?



2 Divide-and-conquer multiplication

Suppose that we have a divide-and-conquer algorithm \mathcal{A} that multiplies two *n*-digit integers by recursively calling itself to perform *t* number of $\lceil n/2 \rceil$ -digit integer multiplications; when $n \leq 1$, it performs single-digit multiplication.

If t = 4, what is the smallest exponent x such that the number of one-digit multiplications is always at most $10000 \cdot n^{x}$?



Correct

For what values of t does the algorithm perform fewer one-digit multiplications than the grade-school multiplication algorithm for inputs that have n > 10000 digits?

O For all values of t
O t = 1, 2
O t = 1, 2, 3
O t = 1, 2, 3, 4

Correct

What is the value of t for Karatsuba integer multiplication algorithm?

3

Correct