1 Grade-school multiplication

Suppose we multiply two $n$-digit integers $(x_1 x_2 \ldots x_n)$ and $(y_1 y_2 \ldots y_n)$ using the grade-school multiplication algorithm. How many pairs of digits $x_i$ and $y_j$ get multiplied in this algorithm?

- $n^3$
- $2n - 1$
- $n^2$

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

Correct

2 Divide-and-conquer multiplication

Suppose that we have a divide-and-conquer algorithm $A$ 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 $10000 \cdot n^x$?

2

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?

- For all values of $t$
- $t = 1, 2$
- $t = 1, 2, 3$
- $t = 1, 2, 3, 4$

Correct

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

3

Correct