# Arithmetic

Given:   two n-bit integers

- **Addition and subtraction**:     linear time     $O(n)$

- **Multiplication**:  naively  $O(n^2)$.     Karatsuba (1960):   $O(n^{1.585})$

    Basic idea:     $(2^b x_2 + x_1) \times (2^b y_2 + y_1)$   with  3 mults.

    Best (asymptotic) algorithm:     about   $O(n \cdot \log n)$.

- **Division with remainder**:   $O(n^2)$.

$\log_2 3$