

Notations

$n = 2^m \times q$, $m \geq 0$ and q odd.

$S(n, k)$ denotes the k -th entry in row n of triangle A237048,

$T(n, k)$ denotes the k -th entry in row n of triangle A249223,

each row having $r = \text{row}(n) = \left\lfloor \frac{\sqrt{(8n+1)} - 1}{2} \right\rfloor$ entries.

$S(n, k) = 1$ if k is odd and $k|n$ or if k is even and $k|(n - \frac{k}{2})$, 0 otherwise.

Theorem

$T(n, k) = |\{d : d|n \ \& \ \frac{k}{2} < d \leq k\}|$, $1 \leq k \leq \text{row}(n)$.

Proof

$k|(n - \frac{k}{2}) \Leftrightarrow (2^m \times q = \frac{k}{2} \times (2 \times s + 1), \text{ for suitable } s) \Leftrightarrow k = 2^{m+1} \times d \text{ with } d|q$.

$T(n, k)$

$$= \sum_{i=1}^r (-1)^{i+1} S(n, k)$$

$$= \sum_{d|q \ \& \ d \leq k} 1 - \sum_{d|q \ \& \ (2^{m+1} \times d) \leq k} 1 \quad (*)$$

$$= |\{d : d|q, d \leq k\}| - |\{2^{m+1} \times d : d|q, 2^{m+1} \times d \leq k\}|$$

$$= |\{d : d|q, d \leq k\} \cup \{2^j \times d : 1 \leq j \leq m, d|q, 2^j \times d \leq k\}| -$$

$$|\{2^{m+1} \times d : d|q, 2^{m+1} \times d \leq k\} \cup \{2^j \times d : 1 \leq j \leq m, d|q, 2^j \times d \leq k\}|$$

$$= |\{2^j \times d : 0 \leq j \leq m, d|q, 2^j \times d \leq k\}| - |\{2^j \times d : 1 \leq j \leq m+1, d|q, 2^j \times d \leq k\}|$$

$$= |\{2^j \times d : 0 \leq j \leq m, d|q, 2^j \times d \leq k\}| - |\{2^j \times d : 0 \leq j \leq m, d|q, 2^j \times d \leq \frac{k}{2}\}|$$

$$= |\{2^j \times d : 0 \leq j \leq m, d|q, \frac{k}{2} < 2^j \times d \leq k\}|$$

$$= |\{d : d|n, \frac{k}{2} < d \leq k\}|$$

Corollary

The width of the symmetric representation of sigma of n at the diagonal, $T(n, \text{row}(n))$, equals the number of divisors of n in the half-open interval $(\frac{\text{row}(n)}{2}, \text{row}(n)]$.

Proof

Line (*) says that the number of odd divisors of n less than or equal to $\text{row}(n)$ minus the number of odd divisors of n greater than $\text{row}(n)$ equals $T(n, \text{row}(n))$, the width of the symmetric representation of sigma of n at the diagonal.