The code takes a positive integer $N_i$ as input and computes the upper bound

$$\mathbb{E}_i(N_i') \leq \min_{J \in \{1,\ldots,N_i\}} \left( J + (N_i - J) \left( 1 - \mathbb{P}_i(\hat{A}_i^J \in C_i^J) \right) \right)$$

for the conditional expectation $\mathbb{E}_i(N_t')$ of the number $N_t'$ of shots in the $i$th round of the outer loop in the Accelerated Quantum Amplitude Estimation (AQAE) algorithm, that is, Algorithm 2 in the paper *Accelerated Quantum Amplitude Estimation without QFT* by Alet Roux and Tomasz Zastawniak. This is used in the paper obtain an upper bound for the expectation $\mathbb{E}(M)$ of the quanti computational complexity $M$ of the AQAE algorithm.

The function `PCi(E_N_i,N)` computes the conditional probability

$$\mathbb{P}_i(\hat{A}_i^J \in C_i^J) = \mathbb{P}_i(E_i^N \leq e(\hat{A}_i^N))$$

for given values of $E_i^N$ and $N$, where $\hat{A}_i^J$, $C_i^J$, and $e(\hat{A}_i^N)$ are defined in the paper.

The function `PCi(E_N_i,N)` uses repeatedly the formula

$$\begin{aligned}\mathbb{P}(X \in [a,b]) &= \mathbb{P}(X \leq b) - \mathbb{P}(X < a) \\ &= \mathbb{P}(X \leq \lfloor b \rfloor) - \mathbb{P}(X \leq \lceil a \rceil - 1) \\ &= F_X(\lfloor b \rfloor) - F_X(\lceil a \rceil - 1),\end{aligned}$$

where $X$ is a random variable with the binomial distribution $B(N,p)$, $N$ is a positive integer, $p \in (0,1)$, $a, b \in [0,N]$, $\lceil a \rceil$ is the ceiling of $a$ (that is, the smallest integer greater than or equal to $a$), $\lfloor b \rfloor$ is the floor of $b$ (that is, the largest integer smaller than or equal to $b$), and $F_X(x) = \mathbb{P}(X \leq x)$ is the cumulative distribution function of $X$.