1.

$$
\begin{aligned}
P &\doteq 1 \leqslant x \leqslant 9 \ \wedge\ \forall_{0 \leqslant k < N}\, 1 \leqslant a[k] \leqslant 9 \ \wedge\ N > 0 \\
Q &\doteq i = N \ \wedge\ \forall_{0 \leqslant k < N}\, a[k] + x \neq 10 \ \vee\ i < N \ \wedge\ \forall_{0 \leqslant k < i}\, a[k] + x \neq 10 \ \wedge\ a[i] + x = 10
\end{aligned}
$$

2.

$$
I \doteq 0 \leqslant i \leqslant N \ \wedge\ \forall_{0 \leqslant k < i}\, a[k] + x \neq 10
$$

3.

Melhor caso: $a[0] + x = 10$

Pior caso: $\forall_{0 \leqslant k < N-1}\, a[k] + x \neq 10$

$T_{mc}(N) = 1$

$T_{pc}(N) = N$

$$
\overline{T}(N) = \sum_{i=1}^{N} \left(\left(\frac{8}{9}\right)^{i-1} \cdot \frac{i}{9} \right) + \left(\frac{8}{9}\right)^{N} \cdot N
$$

4.

Melhor caso: $u[0] + u[1] = 10$

Pior caso: $u[N-2] + u[N-1] = 10 \ \vee\ \forall_{0 < i < N-1}\, (\forall_{i < j < N}\, u[i] + u[j] \neq 10)$

$$
T_{pc}(N) = \begin{cases} 0 & , N < 2 \\ N + T(N-1) & , N \geqslant 2 \end{cases}
$$

$$
T_{pc}(N) = \sum_{i=2}^{N} i = \frac{N^2}{2} + \frac{N}{2} - 1
$$

$T(N) \in O\left(N^2\right)$