Problem of the Week

Problem E

It's the Ones that We Want

The sum of the first n positive integers is $1 + 2 + 3 + \cdots + n$.
We define a_n to be the ones digit of the sum of the first n positive integers.

For example,

$$\begin{aligned} 1 &= 1 \quad \text{and} \quad a_1 = 1, \\ 1 + 2 &= 3 \quad \text{and} \quad a_2 = 3, \\ 1 + 2 + 3 &= 6 \quad \text{and} \quad a_3 = 6, \\ 1 + 2 + 3 + 4 &= 10 \quad \text{and} \quad a_4 = 0, \\ 1 + 2 + 3 + 4 + 5 &= 15 \quad \text{and} \quad a_5 = 5. \end{aligned}$$

Thus, $a_1 + a_2 + a_3 + a_4 + a_5 = 1 + 3 + 6 + 0 + 5 = 15$.

Determine the smallest value of n such that $a_1 + a_2 + a_3 + \cdots + a_n \geq 2024$.