Solving a recurrence by expansion

Example: $T(n) = T(n-3) + 2$ for $n \geq 0$; $T(0) = T(1) = T(2) = 5$.

Step 1: Calculate the first few values to get some insight and understanding

n	$T(n)$
0	5
1	5
2	5
3	7
4	7
5	7
6	9
7	9
8	9
9	11

Step 2: Expand the definition and look for a pattern

$$T(n) = T(n-3) + 2$$
$$= T(n-6) + 2 + 2$$
$$= T(n-9) + 2 + 2 + 2$$
$$\vdots$$

Here we assumed n is a multiple of 3, for simplicity

$$= T(0) + \underbrace{2 + 2 + 2 + \cdots + 2 + 2}_{n/3 \text{ copies of } 2}$$
$$= 5 + 2 \cdot \frac{n}{3}$$

So we conclude $T(n) = 5 + \frac{2n}{3}$, when n is a multiple of 3.

Step 3: check agreement with step 1. Also use an online tool like Wolfram Alpha to check the answer. (but it may not help!!)