1. Let E be the expression $n - i$. With each iteration of the loop `i` increases by 1. Therefore $n - i$ decreases by 1 with each pass. Eventually E will equal -1, and the loop will terminate. In particular, when $n - i \leq -1$.

We prove the following statement by induction on the variable `i`.

STATEMENT $S(m)$: If we reach the loop test $i \leq n$ with the variable `i` having the value m, then the value of the variable `sum` is $\sum_{m=1}^{n} m = n(n+1)/2$.

BASIS. The basis is $m = 1$. When we first enter the loop we reach the test with `i` having value 1 and `sum` having 0.