Recurrence relations

Recurrence relations are generally functions defined recursively:

1. $g(1) = 3$ and $g(n) = 3 + g(n-1)$ for $n \geq 2$
2. $f(1) = f(2) = 1$ and $f(n) = f(n-1) + f(n-2)$ for $n \geq 3$.
3. $h(1) = 1, h(2) = 2$ and $h(n) = h(1) + h(2) + \ldots + h(n-1)$ if $n \geq 3$

Note that

- $g(n)$ only depends on $g(n-1)$
- $f(n)$ depends on $f(n-1)$ and $f(n-2)$, and
- $h(n)$ depends on $h(1), h(2), \ldots, h(n-1)$

Hence you *must* use strong induction for anything you want to prove about $f(n)$ or $h(n)$ but you *could* have used weak induction for $g(n)$.

Strong induction is always valid, so practice using it.