Example **Prove that** $5^n - 1$ is divisible by 4 (n a positive integer).	**Prove that** $3^{2n} - 1$ is divisible by 8 (n a positive integer).
Step 1 Testing $n = 1$, Expression = $5^1 - 1$ = 4 (which is divisible by 4) $\therefore$ the result is true for $n = 1$.	**Step 1**
Step 2 Assume the result is true for $n = k$, that is, assume $5^k - 1 = 4 \times P$, where P is an integer.	**Step 2**
Step 3 Hence show for $n = k + 1$, that $5^{k+1} - 1 = 4 \times Q$ where Q is an integer. Now $5^{k+1} - 1 = 5^k \times 5^1 - 1$ $= 5 \times (4P + 1) - 1$, from our assumption, $= 20P + 4$ $= 4(5P + 1)$ $= 4 \times Q$ since $5P + 1$ is integral. Hence, if the result is true for $n = k$, then it is true for $n = k + 1$.	**Step 3**
Step 4 Since the result is true for $n = 1$, from Step 3 it is true for $n = 1 + 1 = 2$, and then for $n = 2 + 1 = 3$, and so on for all positive integral values of n.	**Step 4**
Exercise: Prove: If n is even, then $n^2 + 2n$ is divisible by 8.	