Another example of mathematical induction

In view of the fact that I am discouraging you from writing out full mathematical induction problems on your 5"×3" cue cards (so you don't just copy answers onto your test), here is an example that you **can** copy if you like, since I won't ask it on the test (actually, because it's too simple, although it does illustrate the key features of induction).

Show that $2 + 4 + 6 + \cdots + 2n = n(n + 1)$ by mathematical induction.

First verify case $n = 1$: $2 = 1(1 + 1)$ is clearly true.

Next: Assume case n:

$$2 + 4 + 6 + \cdots + 2n = n(n + 1)$$

and **prove** case $n + 1$:

$$2 + 4 + 6 + \cdots + 2(n + 1) \stackrel{?}{=} (n + 1)(n + 2)$$

This follows from the following calculation:

$$\begin{aligned}
&2 + 4 + 6 + \cdots + 2(n + 1) \\
&\quad = (2 + 4 + 6 + \cdots + 2n) + 2(n + 1) && \textit{(notice the previous case is part of the current one)} \\
&\quad = n(n + 1) + 2(n + 1) && \textit{(use the assumed formula)} \\
&\quad = (n + 1)(n + 2) && \textit{(take out the common factor)}
\end{aligned}$$

QED