1. Suppose we want to prove the following open proposition over the natural numbers:

   p(n): $8^n - 3^n$ is a multiple of 5.

   Which of the following would constitute the base case for a proof via PMI?
   (3 points)

   A. p(2)=64-9=55
   B. p(1)=5
   ✓ C. p(0)=0
   D. p(3)=512-27=485

2. For the induction hypothesis of the proof of the open proposition

$p(n)$: $8^n - 3^n$ is a multiple of 5,

we assume $p(k)$ is true for an arbitrary natural number. It then follows that $p(k+1)=8^{k+1}-3^{k+1} = 8\times8^k - 3\times3^k$. Which of the following reductions of $p(k+1)$ is needed to complete the proof? *(3 points)*

✓ A. $p(k+1) = 8\times(5j) - 3\times(5m)$, for some integers j and m.

B. $p(k+1) = 8\times(8j) - 3\times(3m)$, for some integers j and m.

C. $p(k+1) = 8^m\times(5j) - 3^j\times(5m)$, for some integers j and m.

D. $p(k+1) = 8 - 3 = 5$, for all $k \geq 0$.

3. Given the proof of the following open proposition over the natural numbers (using PMI)

$p(n)$: $8^n - 3^n$ is a multiple of 5,

which of the following open propositions can also be shown to be a tautology over the natural numbers?

(3 points)

A. $q(n) = 7^n - 3^n$ is a multiple of 5.

B. $r(n) = 6^n - 2^n$ is a multiple of 5.

C. $s(n) = 9^n - 5^n$ is a multiple of 5.

✓ D. $t(n) = 9^n - 4^n$ is a multiple of 5.