Answer Key

1. a. What is the hypothesis p?
    $n\%3 = 1$

    b. What is the conclusion q?
    $n\%9 \neq 5$

    c. Using $\neg(p \to q) \equiv p \wedge \neg q$, write out the negation of this implication in English.
    $n\%3 = 1$ and $n\%9 = 5$

2. **Step 1:**
   Hypothesis p: n^2 is odd
   Conclusion q: n is odd

   Step 2: p: n^2 is odd AND $\neg q$: n is even

   Step 3:
   (p) $n^2 = 2k + 1$
   $(\neg q)$ $n = 2j$

   Step 4: $2k + 1 = (2j)^2$

   Step 5: $2k + 1 = 4j^2$
   $\Rightarrow$ $1 = 4j^2 - 2k$
   $\Rightarrow$ $\frac{1}{2} = 2j^2 - k$

   Step 6:

   Result: The result is a fraction, not an integer, therefore no counter-example exists.

3. $5k + 3 = 5j + 1$

   $3 - 1 = 5j - 5k$
   $\Rightarrow$ $2 = 5(j - k)$
   $\Rightarrow$ $\frac{2}{5} = j - k$