1. **a** No, the argument is invalid in an interpretation in which \( p \) and \( q \) are false but \( r \) is true.

**b** No, the argument is invalid in an interpretation in which \( p, q \) and \( r \) are all true.

2. Let \( P(n) \) denote the predicate \( 2 \mid (n^2 + 5n) \). As a basis, we note that \( P(0) \) corresponds to the fact that \( 2 \mid 0 \). Assume \( P(n) \) for some fixed \( n \geq 0 \).

\[
(n+1)^2 + 5(n+1) = n^2 + 7n + 6 = (n^2 + 5n) + 2(n+3)
\]

By the Induction Hypothesis \( 2 \mid (n^2 + 5n) \), and clearly \( 2 \mid (n+3) \). Thus, \( 2 \mid ((n^2 + 5n) + 2(n+3)) \) which implies \( 2 \mid ((n+1)^2 + 5(n+1)) \). But this is \( P(n+1) \).

Hence \( P(n) \rightarrow P(n+1) \), and the theorem is proved.

3. As a basis, we note that any three lines in general position must meet in three points, and they form a triangle. Fix \( n \geq 3 \) and assume that \( n \) lines form a triangle \( \Delta \). There are two possibilities:

- If the \((n+1)\)st line (call it \( l' \)) does not intersect \( \Delta \), then the theorem holds.
- If line \( l' \) does intersect \( \Delta \), then it intersects exactly two of the lines (call them \( l_1 \) and \( l_2 \)). The points where \( l' \) intersects \( l_1 \) and \( l_2 \), as well as the intersection of \( l_1 \) and \( l_2 \) form a triangle.

In either of these two cases, the \( n+1 \) lines form a triangle.