1. Find all two-digit integers \( N \) for which the sum of the digits of \( 10^N - N \) is divisible by 170.

2. Circle \( S \) lies inside circle \( T \) and touches it at \( A \). From a point \( P \) (distinct from \( A \)) on \( T \), chords \( PQ \) and \( PR \) of \( T \) are drawn touching \( S \) at \( X \) and \( Y \) respectively. Show that \( \angle QAR = 2 \angle XAY \).

3. A tetromino is a figure made up of four unit squares connected by common edges.
   (i) If we do not distinguish between the possible rotations of a tetromino within its plane, prove that there are seven distinct tetrominoes.
   (ii) Prove or disprove the statement: It is possible to pack all seven distinct tetrominoes into a \( 4 \times 7 \) rectangle without overlapping.

4. Define the sequence \( (a_n) \) by
   \[ a_n = n + \{ \sqrt{n} \}, \]
   where \( n \) is a positive integer and \( \{ x \} \) denotes the nearest integer to \( x \), where halves are rounded up if necessary. Determine the smallest integer \( k \) for which the terms \( a_k, a_{k+1}, \ldots, a_{k+2000} \) form a sequence of 2001 consecutive integers.

5. A triangle has sides of length \( a, b, c \) and its circumcircle has radius \( R \). Prove that the triangle is right-angled if and only if \( a^2 + b^2 + c^2 = 8R^2 \).