1. Let ABC be an acute-angled triangle with circumcentre O. Let P on BC be the foot of the altitude from A.
   Suppose that $<BCS \leq \angle ABC + 30^{O}$.
   Prove that $<CAB+ \leq cop\angle 90^{o}$.

2. Prove that
   $\frac{a}{\sqrt{a^2+8bc}} + \frac{b}{\sqrt{b^2+8ca}} + \frac{c}{\sqrt{c^2+8ab}} \geq 1$
   for all positive real numbers a,b and c

3. Twenty-one girls and twenty-one boys took part in a mathematical contest.
   Each contestant solved at most six problems.
   For each girl and each boy, at least one problem was solved by both of them.
   Prove that there was a problem that was solved by at least three girls and at least three boys.

4. Let n be an odd integer greater then 1, and let $k_1, k_2 \ldots, k_n$ be given integers.
   For each of the n! permutations
   $a = (a_1, a_2 \ldots, a_n)$ of 1,2,...,n, let
   $S(a) = \sum_{i=1}^{n} k_i a_i$.
   Prove that there are two permutations b and c, $b \neq$, such that n! is a divisor of $S(b) - S(c)$.

5. In a triangle ABC, let AP bisect $\angle BAC$, with P on BC, and let BQ bisect $\angle ABC$, with Q on CA.
   It is known that $\angle BAC = 60^{o}$ and that $AB + BP = AQ + QB$.
   What are the possible angles of triangle ABC?

6. Let a, b, c, d be integers with $a < b < c < d < 0$. Suppose that
   $ac + bd = (b + d + a - c)(b + d - a + c)$.
   Prove that $ab + cd$ is not prime.