Problem 1
Given three distinct unit circles, each of which is tangent to the other two, find the radii of the circles which are tangent to all three circles.

Problem 2
Let $a_1, a_2, \ldots, a_n$ be non-negative real numbers. Define $M$ to be the sum of all products of pairs $a_i a_j$ ($i < j$), i.e.,

$$M = a_1(a_2 + a_3 + \cdots + a_n) + a_2(a_3 + a_4 + \cdots + a_n) + \cdots + a_{n-1}a_n.$$ 

Prove that the square of at least one of the numbers $a_1, a_2, \ldots, a_n$ does not exceed $2M/n(n - 1)$.

Problem 3
a) Prove that 10201 is composite in any base greater than 2.
b) Prove that 10101 is composite in any base.

Problem 4
Describe a construction of a quadrilateral $ABCD$ given:
(i) the lengths of all four sides;
(ii) that $AB$ and $CD$ are parallel;
(iii) that $BC$ and $DA$ do not intersect.

Problem 5
Prove that the equation $x^3 + 11^3 = y^3$ has no solution in positive integers $x$ and $y$.

Problem 6
Let $a$ and $b$ be distinct real numbers. Prove that there exist integers $m$ and $n$ such that $am + bn < 0$, $bm + an > 0$.

Problem 7
a) Prove that the values of $x$ for which $x = (x^2 + 1)/198$ lie between $1/198$ and $197.99494949\ldots$.
b) Use the result of a) to prove that $\sqrt{2} < 1.41421356$.
c) Is it true that $\sqrt{2} < 1.41421356$?

Problem 8
During a certain election campaign, $p$ different kinds of promises are made by the various political parties ($p > 0$). While several parties may make the same promise, any two parties have at least one promise in common; no two parties have exactly the same set of promises. Prove that there are no more than $2^{p-1}$ parties.
Problem 9

Four distinct lines $L_1$, $L_2$, $L_3$, $L_4$ are given in the plane: $L_1$ and $L_2$ are respectively parallel to $L_3$ and $L_4$. Find the locus of a point moving so that the sum of its perpendicular distances from the four lines is constant.

Problem 10

What is the maximum number of terms in a geometric progression with common ratio greater than 1 whose entries all come from the set of integers between 100 and 1000 inclusive?