# International Mathematical Talent Search – Round 2

**Problem 1/2**. What is the smallest integer multiple of $9997$, other than $9997$ itself, which contains only odd digits?

**Problem 2/2**. Show that every triangle can be dissected into nine convex nondegenerate pentagons.

**Problem 3/2**. Prove that if $x, y$, and $z$ are pairwise relatively prime positive integers, and if $\frac{1}{x} + \frac{1}{y} = \frac{1}{z}$, then $x + y$, $x - z$, and $y - z$ are perfect squares of integers.

**Problem 4/2**. Let $a$, $b$, $c$, and $d$ be the areas of the triangular faces of a tetrahedron, and let $h_a$, $h_b$, $h_c$, and $h_d$ be the corresponding altitudes of the tetrahedron. If $V$ denotes the volume of the tetrahedron, prove that

$$(a + b + c + d)(h_a + h_b + h_c + h_d) \geq 48V.$$

**Problem 5/2**. Prove that there are infinitely many positive integers $n$ such that the $n \times n \times n$ box can not be filled completely with $2 \times 2 \times 2$ and $3 \times 3 \times 3$ solid cubes.