**Kettering University Mathematics Olympiad For High School Students**

www.artofproblemsolving.com/community/c3168268

by parmenides51

– **p1.** Prove that if $a, b, c, d$ are real numbers, then

$$\max\{a+c, b+d\} \le \max\{a, b\} + \max\{c, d\}$$

**p2.** Find the smallest positive integer whose digits are all ones which is divisible by $3333333$.

**p3.** Find all integer solutions of the equation $\sqrt{x}+\sqrt{y}=\sqrt{2560}$.

**p4.** Find the irrational number:

$$A=\sqrt{\frac{1}{2}+\frac{1}{2}\sqrt{\frac{1}{2}+\frac{1}{2}\sqrt{\frac{1}{2}+...+\frac{1}{2}\sqrt{\frac{1}{2}}}}}$$

($n$ square roots).

**p5.** The Math country has the shape of a regular polygon with $N$ vertexes. $N$ airports are located on the vertexes of that polygon, one airport on each vertex. The Math Airlines company decided to build $K$ additional new airports inside the polygon. However the company has the following policies:
(i) it does not allow three airports to lie on a straight line,
(ii) any new airport with any two old airports should form an isosceles triangle.
How many airports can be added to the original $N$?

**p6.** The area of the union of the $n$ circles is greater than $9$ m$^2$(some circles may have non-empty intersections). Is it possible to choose from these $n$ circles some number of non-intersecting circles with total area greater than $1$ m$^2$?

PS. You should use hide for answers.