

Azerbaijan National Olympiad 2015www.artofproblemsolving.com/community/c166174

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Junior Level

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- 1 Let a, b and c be positive reals such that $abc = \frac{1}{8}$. Then prove that

$$a^2 + b^2 + c^2 + a^2b^2 + a^2c^2 + b^2c^2 \geq \frac{15}{16}$$

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- 2 Let a, b and c be the length of sides of a triangle. Then prove that $S \leq \frac{a^2+b^2+c^2}{6}$ where S is the area of triangle.

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- 3 Find all polynomials $P(x)$ with real coefficients such that

$$P(P(x)) = (x^2 + x + 1) \cdot P(x)$$

where $x \in \mathbb{R}$

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- 4 Natural number M has 6 divisors, such that sum of them are equal to 3500. Find the all values of M .

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- 5 In the convex quadrilateral $ABCD$ angle $\angle BAD = 90, \angle BAC = 2 \cdot \angle BDC$ and $\angle DBA + \angle DCB = 180$. Then find the angle $\angle DBA$
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