



## 40<sup>th</sup> Austrian Mathematical Olympiad

### Beginner's Competition

June 23<sup>rd</sup>, 2009

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1. We assign a positive integer to each side of a square, written in red color. Each vertex is labelled in green color by the product of the two adjacent red numbers. The sum of the green numbers is 40.

Determine all possible values for the sum of the red numbers.

*G. Kirchner, Innsbruck*

2. Let  $x$  and  $y$  be non-negative real numbers.

Prove that

$$(x + y^3)(x^3 + y) \geq 4x^2y^2.$$

When does equality hold?

*Problem Selection Committee*

3. We have an unlimited number of stamps of values 134, 135, ..., 142 and 143 Cent.

Determine the largest integer value (in Cents) which cannot be represented by these stamps.

*G. Woeginger, Eindhoven, The Netherlands*

4. The reflection of the center  $M$  of the square  $ABCD$  with respect to  $C$  is denoted by  $E$ . The intersection of the circumcircle of the triangle  $BDE$  with  $AM$  is denoted by  $S$ .

Show that  $S$  is the midpoint of  $AM$ .

*W. Janous, Innsbruck*