



# 33rd Austrian Mathematical Olympiad

## Beginner's Competition

June 13, 2002

1. We calculate the sum of 7 consecutive even natural numbers (e.g.,  $2 + 4 + 6 + 8 + 10 + 12 + 14$ ) and call it  $A$ , then the sum of the following 7 even numbers (here  $16 + 18 + \dots$ ) and call it  $B$  and finally again the sum of the following 7 even numbers and call it  $C$ .

Can their product be  $ABC = 2002^3$ ?

2. Show that no positive real number  $x$  exists such that

$$x^{\lfloor x \rfloor} = \frac{9}{2}.$$

3. Determine all real numbers  $x$  that satisfy the following inequality.

$$|x^2 - 4x + 1| > |x^2 - 4x + 5|.$$

4. In a trapezoid  $ABCD$  with base  $AB$  let  $E$  be the midpoint of the side  $AD$ . Further assume that  $2\overline{CD} = \overline{EC} = \overline{BC} = b$ . Let the angle  $ECB$  be  $120^\circ$ .

Construct the trapezoid and determine its area as a function of  $b$ .