

**Junior Balkan MO 2008**

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- 1 Find all real numbers  $a, b, c, d$  such that

$$\begin{cases} a + b + c + d = 20, \\ ab + ac + ad + bc + bd + cd = 150. \end{cases}$$

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- 2 The vertices  $A$  and  $B$  of an equilateral triangle  $ABC$  lie on a circle  $k$  of radius 1, and the vertex  $C$  is in the interior of the circle  $k$ . A point  $D$ , different from  $B$ , lies on  $k$  so that  $AD = AB$ . The line  $DC$  intersects  $k$  for the second time at point  $E$ . Find the length of the line segment  $CE$ .
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- 3 Find all prime numbers  $p, q, r$ , such that  $\frac{p}{q} - \frac{4}{r+1} = 1$
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- 4 A  $4 \times 4$  table is divided into 16 white unit square cells. Two cells are called neighbors if they share a common side. A *move* consists in choosing a cell and the colors of neighbors from white to black or from black to white. After exactly  $n$  moves all the 16 cells were black. Find all possible values of  $n$ .
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