

Junior Balkan MO 2008

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

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

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 .
3. Find all prime numbers p, q, r , such that $\frac{p}{q} - \frac{4}{r+1} = 1$
4. A 4×4 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 .