

2020 Junior Balkan Team Selection Tests-Serbia

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by VicKmath7

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- # Given is triangle ABC with arbitrary point D on AB and central of inscribed circle I . The perpendicular bisector of AB intersects AI and BI at P and Q , respectively. The circle (ADP) intersects CA at E , and the circle (BDQ) intersects BC at F and (ADP) intersects (BDQ) at K . Prove that E, F, K, I lie on one circle.
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- # Solve in positive integers $x^{100} - y^{100} = 100!$
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- # Given are real numbers a_1, a_2, \dots, a_{101} from the interval $[-2, 10]$ such that their sum is 0. Prove that the sum of their squares is smaller than 2020.
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- # One hundred tennis players took part in a tournament where they played with each other exactly one game, with no draws. At the end of the tournament a table (ranking) is formed depending on the number of victories. It is known that one tennis player finished the tournament on k -th place and is the only one with that number of victories, and he has beaten every tennis player who is placed above him in the table and lost to anyone ranked weaker than him on the table. Find the smallest value of k .
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