

Putnam practice - Basic stuff and registration

The Putnam exam will be held on Decemeber 6 (Saturday) at the Engineering Technology Center room Q105 from 10:00 am to 1:00 pm and 3:00 pm to 6:00 pm.

You can register for it at the following link:

<https://putnam.edvistas.com/datamate/testRegister.aspx?id=f884e7e8-8ef0-4cb3-bb14-3a39a00132b3>

1. A castle is surrounded by an octagonal wall with a tower at each vertex. A guard defend each of the eight tower every night. Normally, each guard moves to the next tower in clockwise direction every hour. However, one evening, they are tired and confused. They still move every hour, but in randome directions, to adjacent towers. After some time, all eight guards are gathered in the same tower. What is the minimum number of hours for this to happen?

2. Let n be an even positive integer. Write the numbers $1, 2, \dots, n^2$ in the squares of an $n \times n$ grid so that the k^{th} row, from left to right, is

$$(k-1)n+1, (k-1)n+2, \dots, (k-1)n+n.$$

Color the squares of the grid so that half of the squares in each row and in each column are red and the other half are black. Prove that for each coloring, the sum of the numbers on the red squares is equal to the sum of the numbers of the black squares.