UW Math Circle

October 6th, 2016

1. You're back in the secret hall at Hogwarts, and Snape is standing outside three different doors. He tells you that Harry Potter is behind only one door and Voldemort is behind the other two doors, so choose carefully! He also tells you that the sign on Harry Potter's door is true and at least one of the other two signs is false.

I	II	III
Voldemort is behind door II.	Voldemort is in this room.	Voldemort is in room I.

   Where is Harry Potter?

2. The next time you're in the secret hall, Snape changes the rules on you. He tells you that Harry Potter is behind only one door, Voldemort is behind the other door, and the remaining room is empty. He also tells you that the sign on Harry Potter's door is true and the sign on Voldemort's door is false, while the sign on the empty room can be either true or false.

I	II	III
Room III is empty.	Voldemort is in room I.	This room is empty.

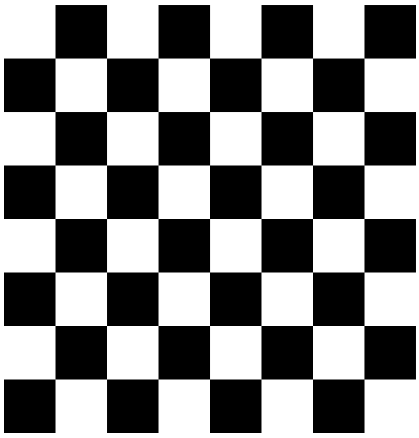
   Who is behind which door?

3. A domino is a 1×2 rectangle where each half of the rectangle contains between 0 and 6 dots. A set of dominoes contains 1 domino for every possible pair of dots, including the doubles. How many dominoes are in a set?

   If instead we have between $0 - 100$ dots on each side, how many dominoes are in a set?

4. All the dominoes in a set are laid out in a row, where the number of spots on ends of touching dominoes matches (these dominoes have between 0 and 6 dots on each square). On one end of the row of dominoes there are five dots. What can you say about the number of dots on the other end?

5. A 8×8 chessboard can be covered with 1×2 dominoes. Can a 8×8 chessboard with the upper right and lower left corners removed still be covered by dominoes?



6. On a chessboard, a knight starts in the upper right hand corner, and returns there after making several moves. What can you say about the number of moves the knight must have made?