UW Math Circle

October 20, 2016

Homework

1. Austin has 101 coins, of which 50 are counterfeit. The counterfeit coins weigh one gram less than the genuine coins. Austin has a balance scale which can determine the different in weight between two different objects. Austin wants to know whether or not one particular coin is counterfeit. Can he determine this in one weighing?

2. How many diagonals are there in a regular n-gon? (A regular n-gon is a polygon with n-sides where all the sides and angles are the same)

3. You have a circle divided into 6 equal pie slices, and there is a token in each sector. You are allowed to shift any two tokens into either of the two sectors bordering the one they are in at the moment. After doing this many times, is it possible that all the tokens are in one sector?

4. A frog starts are the upper left hand corner of an 8×8 chessboard, and is hopping towards the lower right hand corner. Each times he hops, he moves either one square down or one square to the right. How many paths can the frog take?