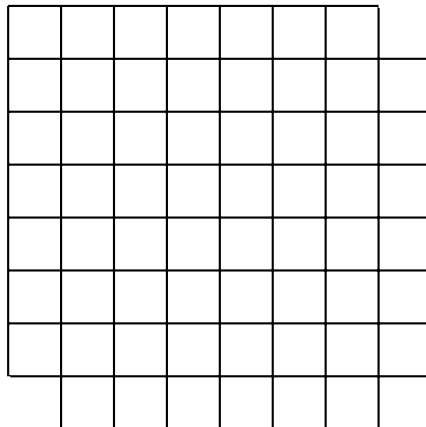


UW Math Circle
October 11, 2012

1. Kolya arranges 5 plastic cups sitting right-side up on a table. He can alter the cups on the table by picking any two of them and flipping them over, so that if a cup was right-side up, it would be flipped to be up-side down; and if a cup is up-side down, it becomes right-side up. Is it possible for Kolya to get all 5 cups upside-down by repeating this process some number of times?
2. Is it possible to fill a 4×4 table with integers so that the sum of the numbers in each row and the product of the numbers in each column is odd.
3. Start with an 8×8 chessboard and remove the upper left corner and the lower right corner. Is it possible to cover the resulting board with non-overlapping 1×2 dominoes?



4. An evil 9-headed monster is terrorizing the country of Uzbekikazakhturkistan. The Brave Knight Cosmo sets out to defeat the monster with his sword. Each time he cuts off one of the monster's heads with a swing of his sword, it grows right back! If he cuts off three heads with a single swing of his sword, 7 heads grow back! However, if he cuts off two heads with a single swing of his sword, they fall off. Unfortunately, if Cosmo swings at the monster and misses, the monster grows two heads. Is it possible for Brave Sir Cosmo to defeat the monster and save his Uzbekikazakhturkistanian brethren?

5. At a conference of 6 tribal chiefs, there are 6 tents. Each chief starts in his/her own tent. Every hour, two of the chiefs leave the tent they are in and move to an adjacent tent. Is it possible that all of the chiefs eventually end up in the same tent?

UW Math Circle

Homework – Week 2

1. Is it possible for a knight to start at square A1 (lower left corner) on a chessboard and move to square H8 (upper right corner) by making standard knight moves in such a way that he visits every square on the board once and only once along the way?

							H8
A1							

2. In the North Cascades National Park, all trails are either uphill or downhill. A group of hikers moves at a pace of 6 km/hour if they are hiking downhill, but only 3 km/hour if they are hiking uphill. They plan a hike from Cascade Pass to Stehekin and back, which is 30km in each direction. How long will the hike take them?
3. There are 21 students at the UW Math Circle this week. During the lesson, they start passing notes to one another. Each student passes a note to either two or four other students. After a while, Kolya and Steve realize what is happening and ask everyone to empty their pockets. When this happens, each student reveals three notes. Kolya immediately realizes that someone must have been lying. How did he know?
4. As a punishment for passing notes, Steve decides to give everyone a very challenging problem. He writes this on the chalkboard:

$$1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7 \quad 8 \quad 9 \quad 10 = 0,$$

and challenges the students to put either a + or – sign between each of the numbers. Is this possible?