

Problem set 1, assigned on 9/18/22

1. Prove that in any 3×3 magic square the sum of the numbers in the corner cells is equal to the sum of the numbers in the side cells. (In the picture, the side cells are marked by circles, and the corner cells by Xs.)

X	O	X
O		O
X	O	X

2. Can a 3×3 magic square be constructed from the first 9 prime numbers? Either present such a square or explain why such a square is impossible.
3. Ten daughters of King Dodon wanted to learn new skills. They enrolled in the "Perfect Princess" Academy where they signed up for three classes - cooking, poetry, and martial arts. Each princess either passed or failed each of these classes. Prove that at least two princesses learned the same set of skills.
4. Knights of the Round Table were eating pies with raisins. Merlin, the Magician, made sure that each knight ate either twice as many raisins or 10 raisins less than his right neighbor. Prove that the knights could not have eaten exactly 1,001 raisins.
5. The 4×4 magic square was filled with the numbers from 1 to 16. Some of these numbers were erased. Restore the square.

4	15		5
		8	
7			