Problems to know

As the class progresses towards the first exam, the problems you are responsible to understand for the exam will be added here. Note that there will be an additional problem on the exam that you will have not seen before.

1. **Heap of Beans.** There are 16 beans in a pile. Two people playing against each other take turns removing either 1, 2, or 3 beans from the pile on each turn. The person who removes the last bean(s) wins the game. Describe a winning strategy for this game!

2. **Two Bean Heaps.** Make two heaps of beans with 10 beans in each heap. You and a partner alternate moves until all the beans are gone. The winner is who takes the last bean(s). A move consists of removing one bean from one of the piles, or of removing a bean from each pile. What is a winning strategy?

3. **Changing 50 cents.** In how many ways can you change a 50 cent piece?

4. **Tethered Goat** A goat is tied to one of the corners of a rectangular barn on a rope that is 50 feet long. The dimensions of the barn are 40 feet by 30 feet. Assuming that the goat can graze wherever its rope allows it to reach, what is the square footage of the grazing area for the goat?

5. **Symmetries**

6. **Green's Party** By this I mean problems similar to Green's party where you end up having to sequentially sum and find a pattern in some data set.

7. **Handshakes** In a train station waiting room you find yourself waiting for the train along with 15 other travelers. Everyone in the room decides that it is a good idea to become acquainted by shaking hands with everyone else in the room. How many handshakes will take place?