week3lecture1

- **Stretches**

  1. Place two coins of the same size flat on a table and roll one around the edge of the other, as if they were gears. Suppose you have two coins of the same size flat on a table. Keeping one static and rolling the other around the static coin as if they were gears, how many times will the rolling coin spin completely?
  2. Suppose there are three golden spheres in front of you. Two spheres have radius r. The remaining sphere has radius $2r$. You may either take the two spheres of radius r or the one sphere with $2r$. Which would you rather take?

- **Lecture on See it** Humans are poor at processing a lot of information at once. We saw this as an issue when doing the *Changing 50 cents* problem–imagine if you had to organize a similar amount of information on the job. There are several standard techniques that may help you see information more clearly by organizing it, visualizing it, contextualizing it, or creating a model. This will typically involve making tables, charts, figures, graphs, or using physical objects. For example, in the homework assignment this week, you will most likely be using figures or physical objects. Today we will go over some of these methods and demonstrate them using problems. So lets give example problems that use these techniques.

  – **Tables.**
  Most real world problems come with a ton of information. For example, if you are in charge of scheduling a large event, you will most likely end up using some sort of spreadsheet to make tables. Furthermore, in problem solving, there may not be a clear solution to the problem until a table is used to help reveal a pattern in the information given.
  To help demonstrate this, consider the following problem:

    * *Tables*
      Organize data
      Reveal patterns
      Motivate solutions

  The Green's Party.
  The Greens were having a party and were unsure how many guests they had invited. The night of the party, the first time the doorbell rang, 1 guest entered the house. On the second ring, 3 guests entered. On the third ring, 5 guests entered. As it turned out, on each successive ring the entering group was 2 guests larger than the previous group. How many guests entered on the 15th ring and how many guests in total were in the house after the 15th ring?

  – **Pictures.**
  Sometimes you will be faced with problems that are difficult to visualize in your head. As a result, it is sometimes easier to do a problem by drawing pictures. To relate to the symmetry problem, say you had to find the solution to a pentagon. One way you can do the problem is use a model. Another way you can do the problem is to draw pictures and analyze the problem that way.

    * *Pictures*
      Organize data
      Help visualize visuals
      Can add or delete information as needed

  To demonstrate this, we will consider the following problem.
  Pie in the Face.
  In a TV Game Show Contest, in order to win a prize, a contestant must run to a table, pick up a pie, race toward a partner and give him or her a face full of pie in the quickest time

possible. Mary and Bill decided that since Mary is faster than Bill, she would do the running. They also felt that the shortest distance traveled would yield the quickest time. The table is 13 feet long and is filled with chocolate pies. Mary is standing 5 feet away from the end of the table and perpendicular to it. Similarly, Bill is 8 feet from the opposite end of the table and perpendicular to it. What is the shortest distance Mary must travel to accomplish this feat?
If you were to attempt to solve this problem without drawing a figure, it might be very difficult for you. Furthermore, as I mentioned, when you draw the figure, you are able to add or delete information as you see fit.

– **Models.**
Next we will consider the use of models. By a model I mean a physical model. For example, in the symmetry problem, you might find it useful to cut out a square and determine the symmetries by physically rotating the square.

  * *Models*
    Having a physical model may help inspire a solution.
    Physical models can be used for visualization that's too difficult to do in your head.

To demonstrate how a physical model might help, we will do another problem. However, we will use a picture to solve the problem but we will discuss how using a model may help.
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?
So how might a physical model help? We saw that the trick to this problem was to realize how the rope behaved when the goat walked around the barn. So, perhaps, if you did a physical model, this trick would have become immediately clear.