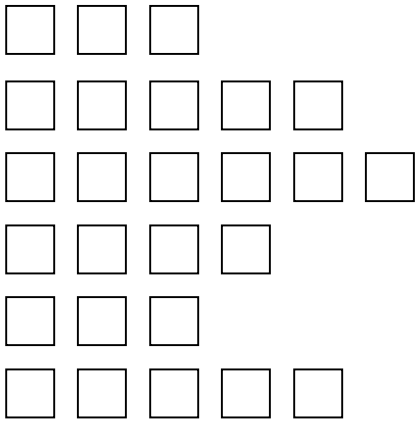
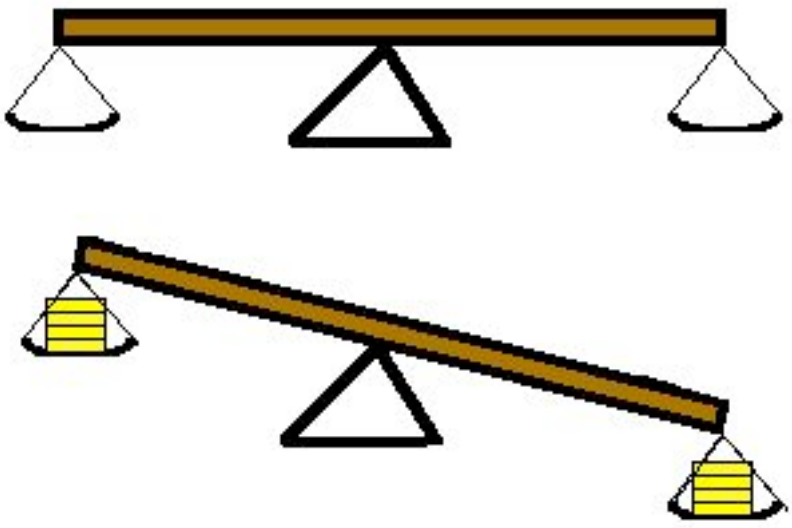
A Game and a puzzle where different base systems may help

The Game of Nim: Below you see some rows of squares. Players alternate moves by taking as many squares as they want from ONE row only. They can take one square, more than one square, all the squares, on each turn, BUT they can only take squares from one row only.
The player who takes the last square wins.



A Balance beam puzzle:

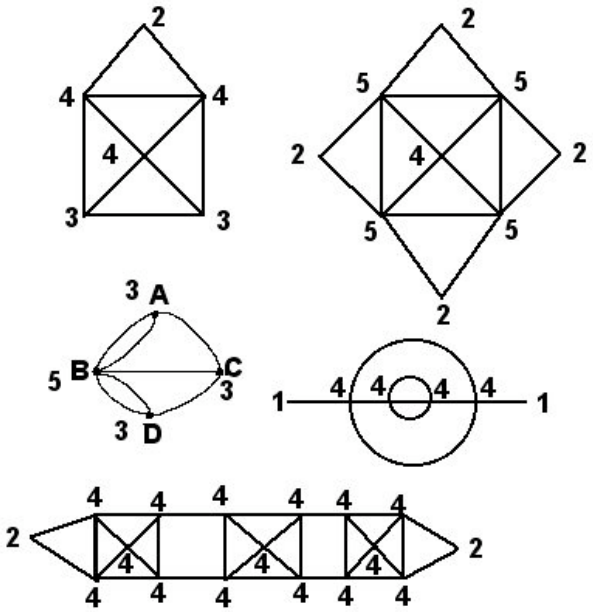
You have 27 coins, one is counterfeit, the other 26 are real. The counterfeit coin looks exactly like the others, duh, it is the same size and shape. However it is a different weight. However, you do not know if it is heavier or lighter than the real coins. You have a balance beam like the one pictured below. In exactly three weighings of the coins, and you can put as many coins on each side as you like, you must find the counterfeit coin. So you can use the balance beam only three times. All it will tell you is if the two sides are equal in weight or not. If they are not equal in weight, as the second picture shows, it may be because the coin is lighter and on the left-hand plate, or it may be the coin is heavier and on the right-hand plate.



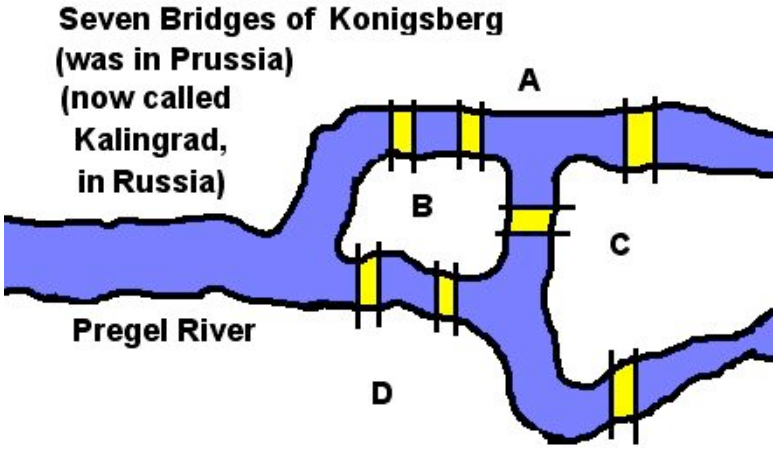
Answers next week. For last sessions answers, March 15, 2009, please see the next page.

Answer to March 15th puzzles.

I have the same pictures below, but I have counted at each vertex, how many lines come into that vertex.



This type of puzzle was first analyzed by Leonard Euler in 1736, and it led to the new branch of Mathematics called topology. It started when citizens of Konigsberg, pictured below, found they could not travel over every bridge exactly once (all the way across), without traveling over one bridge twice. Euler started by sketching the problem as I have in the middle left picture above.



His analysis was as follows:

(1) Count all the lines coming into each vertex. I have done this above.
(2) If there are exactly two odd numbers, it can be done, however you must start at one of them and you will end up at the other one.
(3) If there are no odd numbers, then you can start anywhere, and you will finish where you started.
(4) If there are more than two odd numbers, then the puzzle is impossible, since you have to end up at the other odd number, but you cannot end up in two places at once!!!

So top left and middle right can be done, but you must start at one of the odd numbers. Try doing the shape starting somewhere else. The top right and middle left are impossible since there are more than two odd numbers. The bottom one is possible, and you can start anywhere. Wherever you start is also where you should finish.

The only platonic solid that could be done with one piece of uncut wire? The octagon, all vertices have 4 lines.