

Corrections on Counterfeit Coins Paper

1. Page 1. You have as total possibilities
 $nCh * (n - h)CI$
 - 1) I think you mean $(n - h) * CL$.
 - 2) This is more commonly written as $\binom{n}{h} \binom{n-h}{L}$
2. You should include the lower bound of
 $\lceil \log_3 \binom{n}{h} \binom{n-h}{L} \rceil$
3. Page 1. You should say that we view the problem as a GAME with two players: Seeker and Spoiler.
4. Page 1. (I am not sure I told you this.) The case of ONE counterfeit coin has been completely solved by humans without AI.
http://en.wikipedia.org/wiki/Balance_puzzle
or just look up 'balance puzzles' on Wikipedia
You should prob read the entire entry for background.
You should include what is known about ONE counterfeit coin since that is well known.
You should point on that 1-H 1-L has not been studied.
5. Page 2. Your table has two columns that I don't know they are. The table should have labels at the top of each column..
The first row: What is 56? I suspect its the number of possibilities..
Let see

$$\binom{8}{1} \binom{7}{1} = 56$$

YES, that is what it is. Great. You need to tell us that.
This means that the best you can do is

$$\lceil \log_3 56 \rceil = \lceil 3.66 \dots \rceil = 4.$$

The last two columns are

4 weightings

4

I suspect that one of those is the lower bound and one is the number of weightings you achieved.

Can't tell which is which since they are both 4.

I would have thought that since one col says *4 weightings* that would be what you CAN do, but that can't be right since in the third row that col is smaller.

SO lets look at the third row

12 coins, 1 H, 1 L.

$$\binom{12}{1} \binom{11}{1} = 132$$

$$\lceil \log_3(132) \rceil = \lceil 4.445 \dots \rceil = 5$$

So it seems you have the lower bound in the 4th col and the number of weightings needed in the 5th col.

6. Did your program PROVE that you can always do (say) 12 coins, 1H, 1L with 6 weightings?
7. Is it an open question to determine if (say) the 12 coins, 1H, 1L case REQUIRES 6. I think it is open.
8. For all of the cases where the upper and lower bounds do not match do you think the upper bound is the truth, or the lower bound is the truth? Page 4 indicates that you do thing so and has a "proof" for one of the cases. Can you make this rigorous? Can you determine WHEN n , 1H, 1L needs one more weighting than the lower bound?
9. Based on your data a good conjecture is that n coins 1H, 1L uses

$$\leq \left\lceil \log_3 \binom{n}{1} \binom{n-1}{1} \right\rceil + 1 = \lceil \log_3 n(n-1) \rceil + 1$$

weightings. For large n thats $\leq 2 \log_3 n$.