① b.) $n=3$

weigh 2 of 3 coins

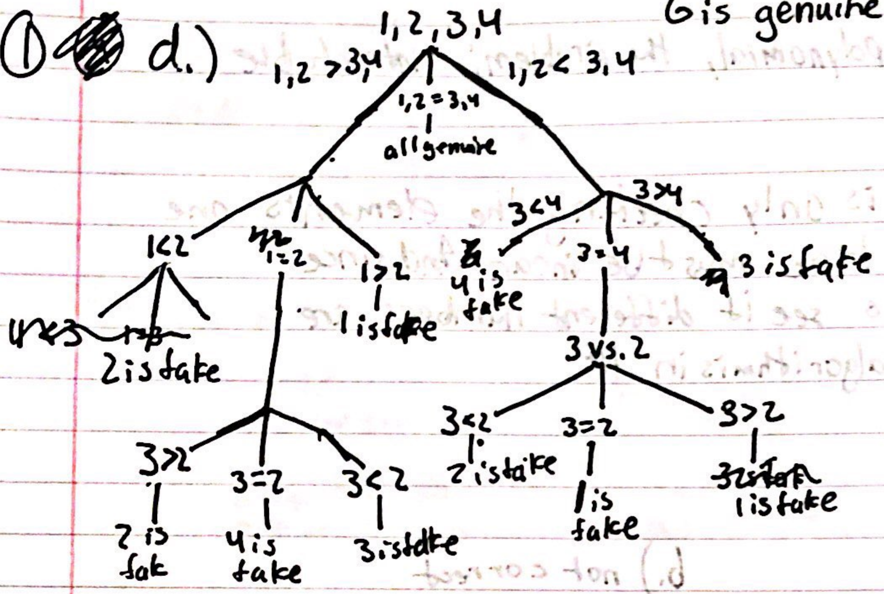
- if same weight
  - swap one coin out for 3rd coin
    - if same weight
      - all coins are genuine
    - if different weights
      - new coin (3rd coin) is not genuine
- if different weights
  - swap one coin out for 3rd coin
    - if same weight
      - Coin that was taken out was not genuine
    - if different weights
      - not possible since at most one coin is not genuine and if all 3 weights are different, then at least 2 coins are not genuine

c.) to prove that all the coins are genuine would only take 2 weighings, ex. weigh 1,2 and 3,4 then weigh 1,3 and 2,4 and if ~~these~~ the weight of 1,2 = weight of 3,4 and the weight of 1,3 = weight 2,4 and we know there can only be 1 fake coin, then all coin weights are equal, therefore they are all genuine.

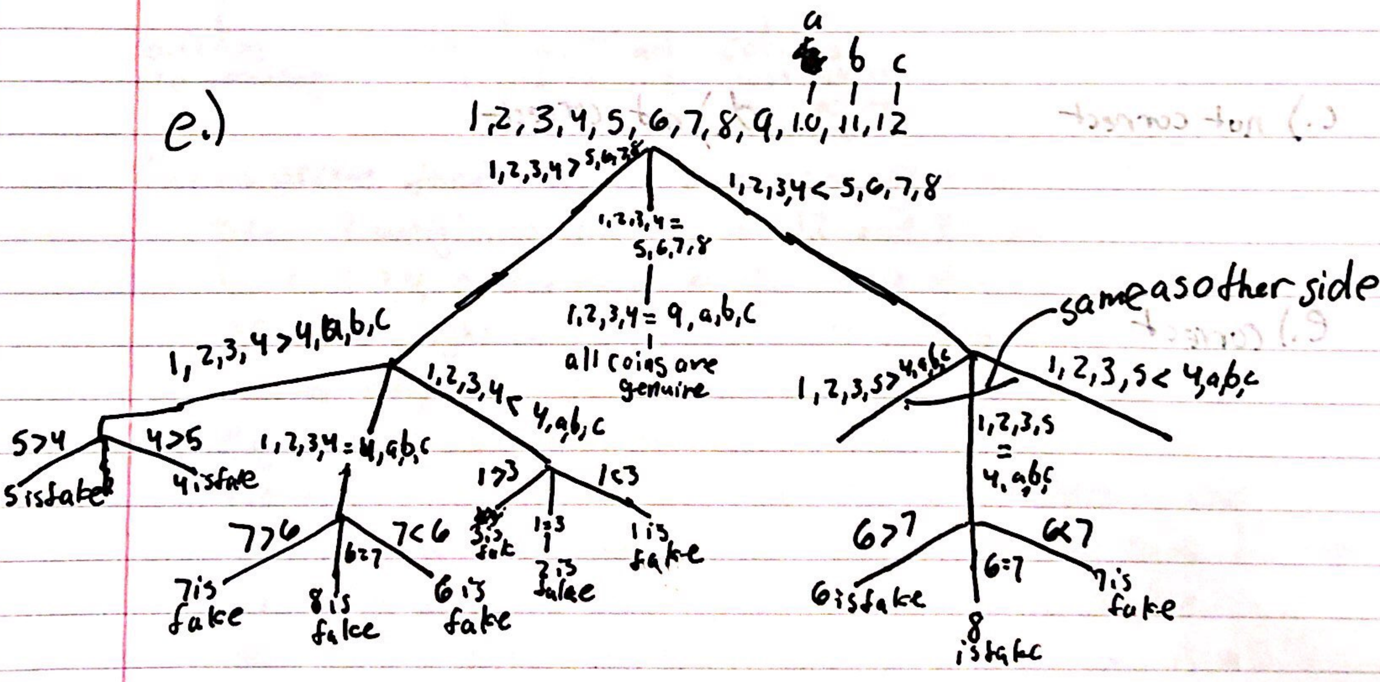
However, to isolate the fake coin if there is one you would need 3 weighings. if you group the coins 1,2 and 3,4 again, the only information you would be able to get from the first weighing is that there is a fake coin. ~~After then, if you changed the groups around to 1,3 and 2,4, the weighing of these two groups~~ to now get new information you need to weigh 1 vs 2 and 3 vs 4 and if two coins being weighed are equal they are both genuine. if a weighing two coins are not equal, one coin needs to be weighed against one of the genuine coins to see if it is genuine or not, therefore, you need 3 weighing

① d.)

6 is genuine coin



e.)



② $2^h \geq (k!)^{n/k}$

$h \geq \log((k!)^{n/k}) = \log(k!)\frac{n}{k}$

$h \geq \frac{n}{k}\log((k/2)^{k/2})$

$h = \frac{n}{k}(\frac{k}{2})\log(\frac{k}{2})$

$h = \frac{n}{2}\log(k) - \frac{n}{2}$

lower bound: $n\log k$

3. since $n^{\log_2 n}$ is not polynomial, the problem is intractable

4. Since the algorithm is only checking the elements one by one, the running time must be linear. And since the algorithm checks to see if different numbers are divisors, then ~~the~~ the algorithm is in NP.

5. a.) not correct

b.) not correct

c.) not correct

d.) not correct

e.) correct