Math 322

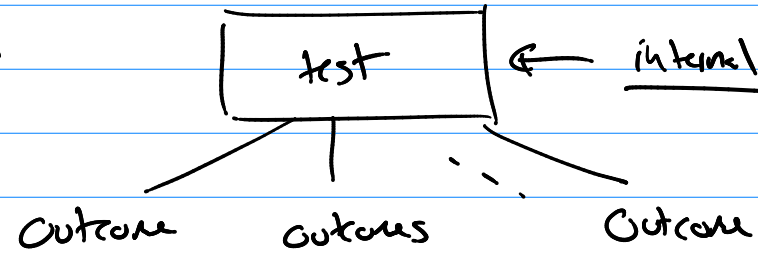
Due Friday:

① construct a decision tree for finding a possible fake coin among 6 coins.
- What is best possible number of weighings to find the possible fake (or state it isn't there)?
- Can you construct such a tree?

10.4(1,2,3)

Trees

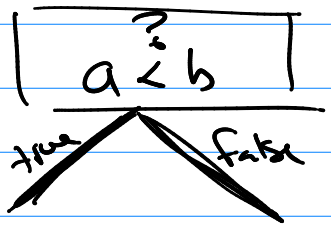
① Decision



leaf: all the possible end results.

(ex) Sort $\{e_1, e_2, e_3\}$ assume distinct

internal vertex test:



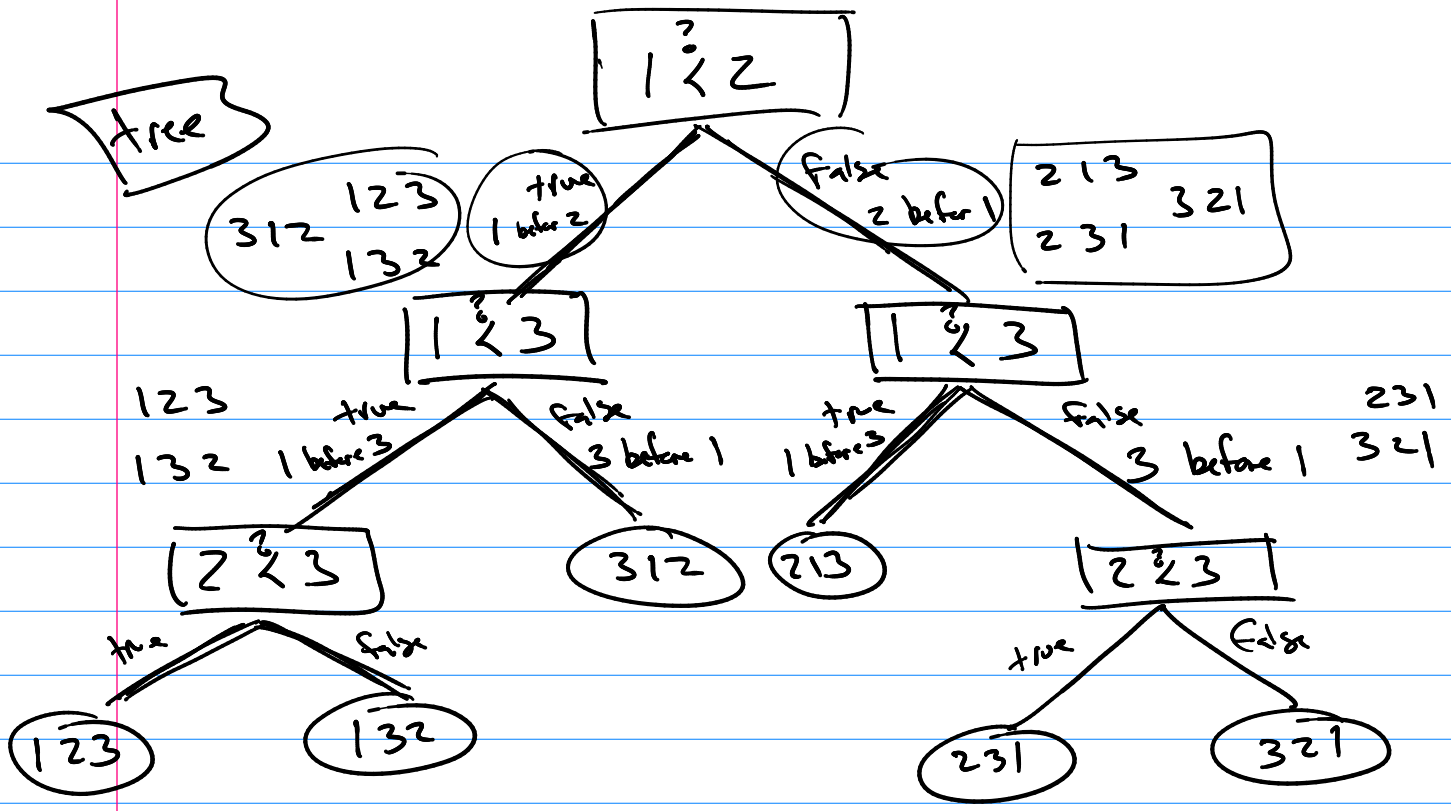
leaf:

end sort = 123 or 312 or 132 or 321 or 213 or 231

best case tree:

$h \geq \lceil \log_n l \rceil$

$h \geq \lceil \log_2 6 \rceil = 3$



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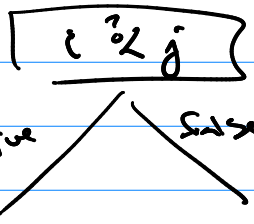
best case of sort 5 distinct elements?



2-ary

So

$|\text{leaves}| = |P_1 P_2 P_3 P_4 P_5|$

$= 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 5!$

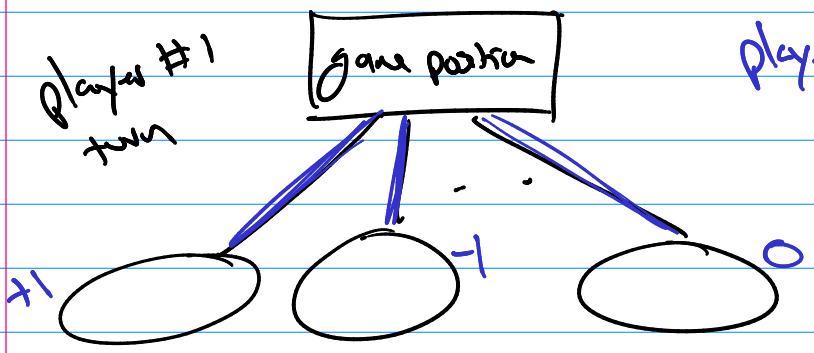
$= 120$

best case $\rightarrow$ $h \geq \lceil \log_2 120 \rceil = 7$

Game tree = decision tree with labels upon a vertex letting us know the value of a vertex for player #1

$\rightarrow$ value of vertex is based on min/max principle

short def of min/max principle is the players aren't stupid.

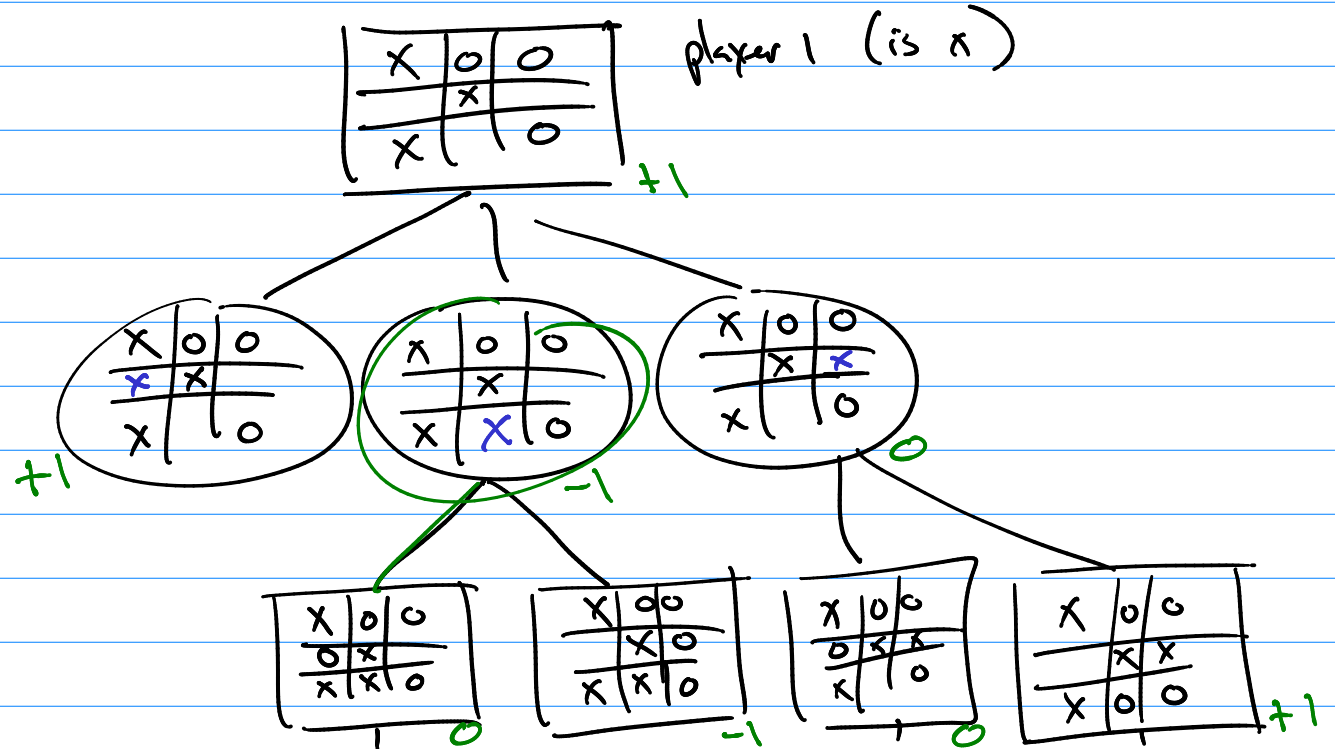


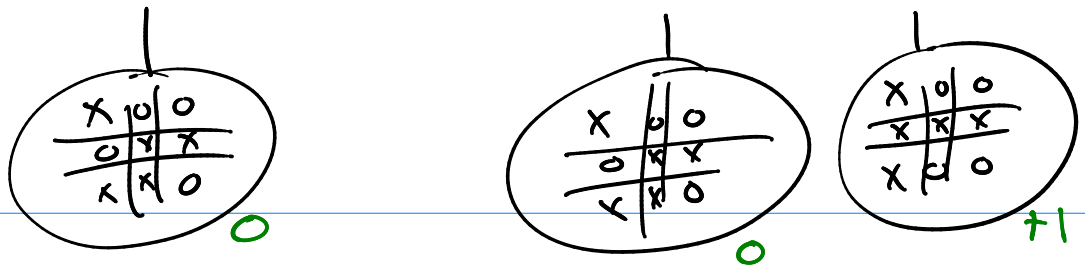
player #1 picks max child

player #2 picks min child

(ex) tic-tac-toe

(note: = player 1 turn
= player 2 turn)

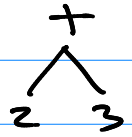




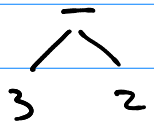
Expression trees (10.4)

Math operations

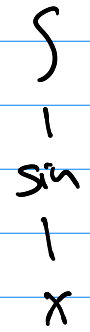
- add 2 to 3



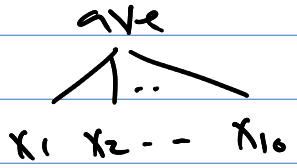
- subtract 2 from 3



- Integrate $\sin(x)$

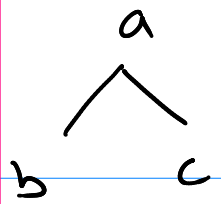


- average x_1 to x_{10}



How to get it out of a tree?

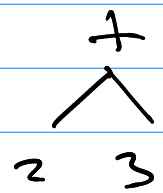
→ tree traversal ⇉ in-order, pre-order, post-order



pre order: a, b, c

in-order: b, a, c

post-order: b, c, a



pre-fix: +, 2, 3

post-fix: 2, 3, +

in fix: 2, +, 3