Theory of Computer Games

Homework #3

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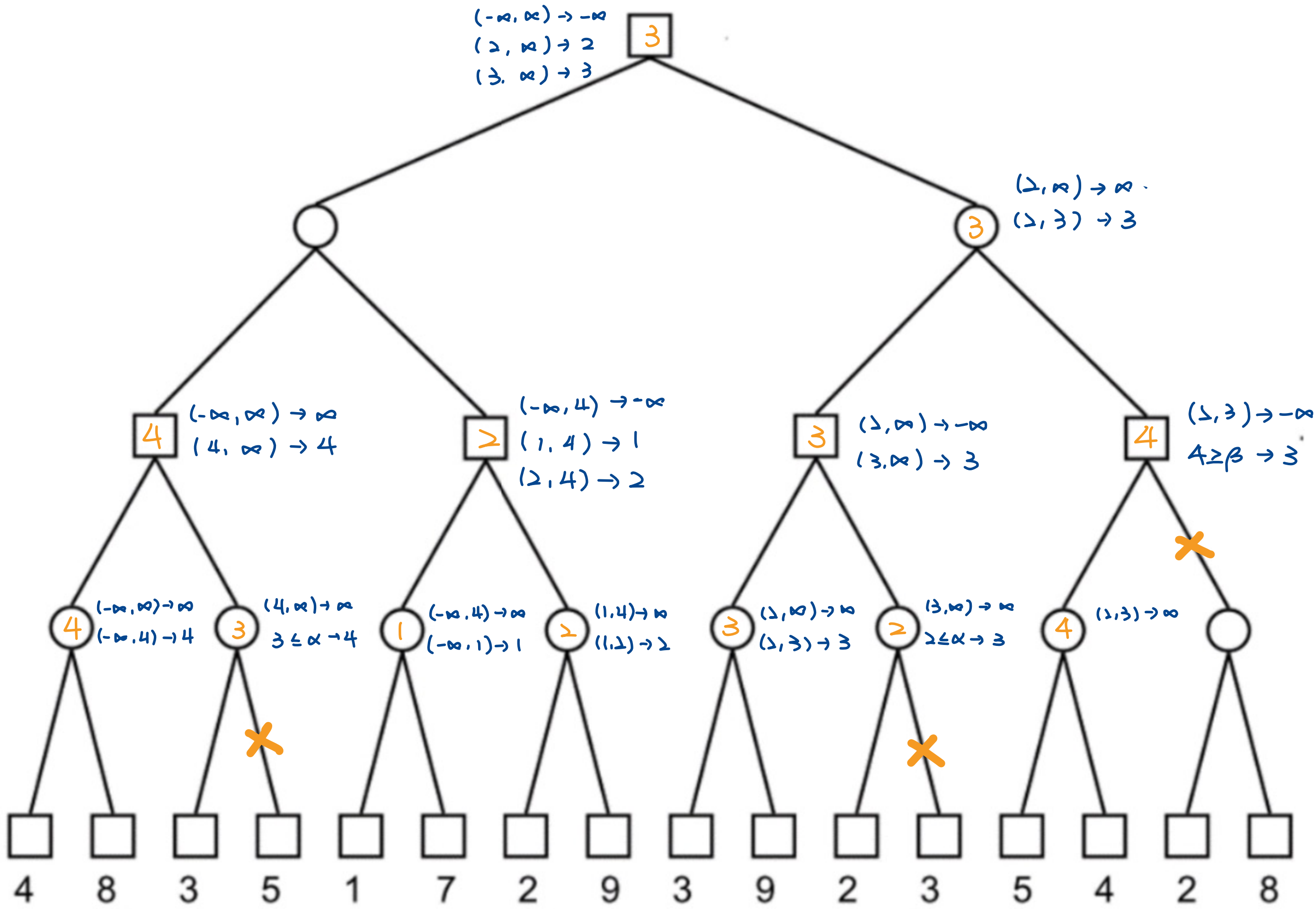
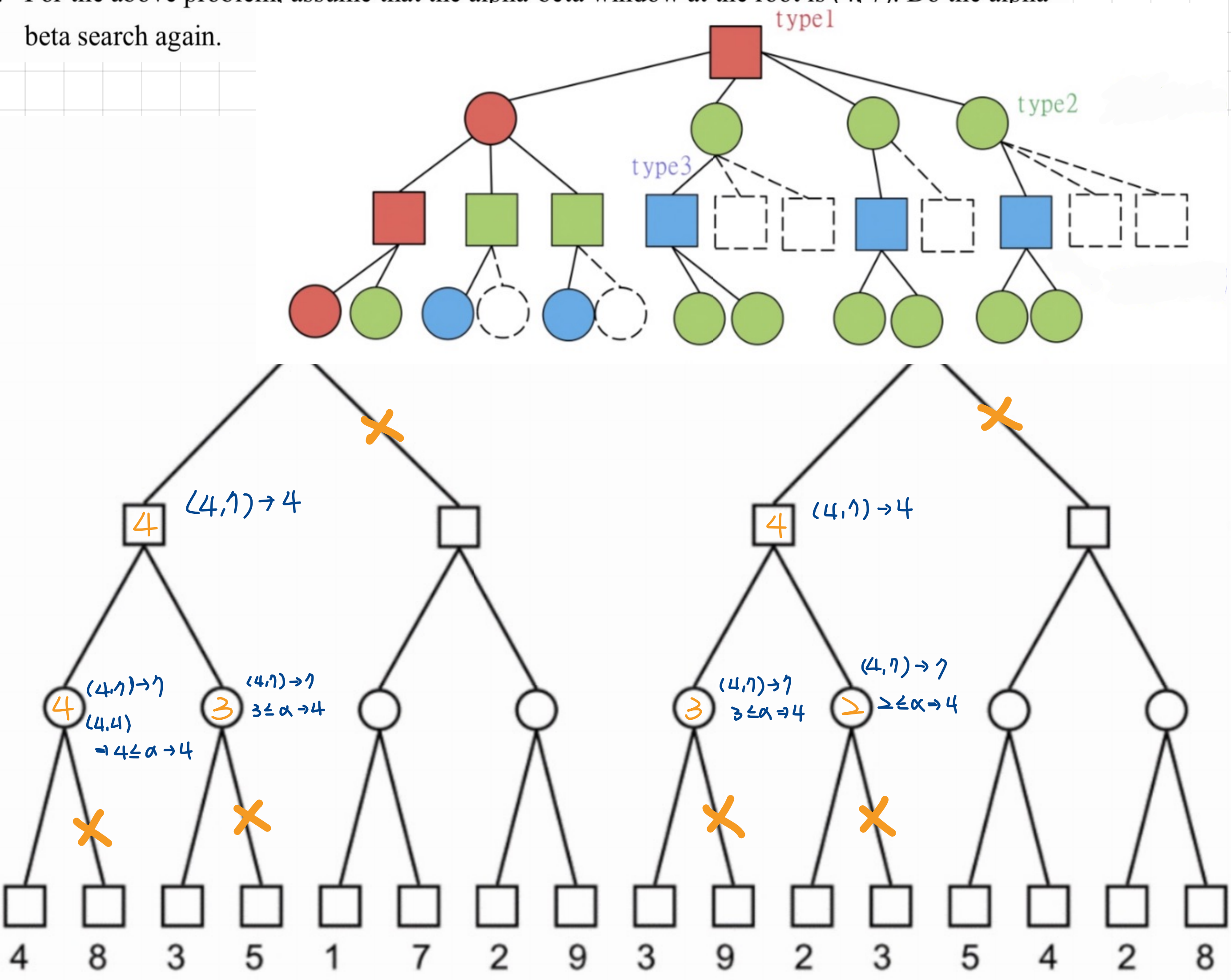
1. Do the alpha-beta search to find the minimax value of the following search tree. You must mark windows at each node and indicate the pruned nodes.

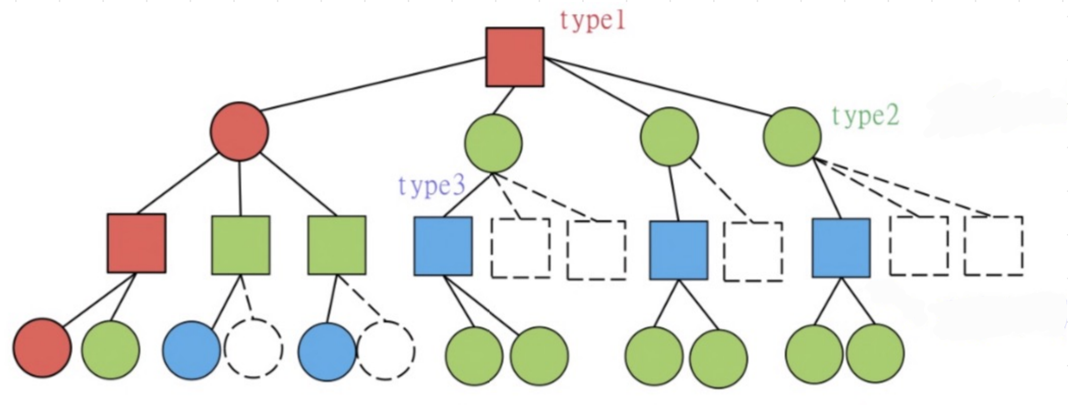


alpha-beta procedure examines exactly $b^{\lceil d/2 \rceil} + b^{\lfloor d/2 \rfloor} - 1$ positions on level d, where d is even.”

2. For the above problem, assume that the alpha-beta window at the root is (4, 7). Do the alpha-beta search again.

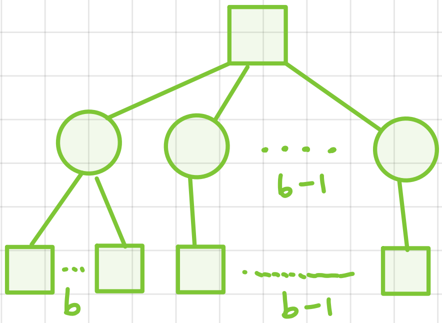


3. Please prove why Corollary 1 is correct. Note that Corollary 1 says: “In the best case, the alpha-beta procedure examines exactly $b^{\lceil d/2\rceil}+b^{\lfloor d/2\rfloor}-1$ positions on level d, where d is even.”



when d is even, $b^{\lceil \frac{d}{2}\rceil}+b^{\lfloor \frac{d}{2}\rfloor}-1 = 2b^{\frac{d}{2}}-1$

If $d=2$

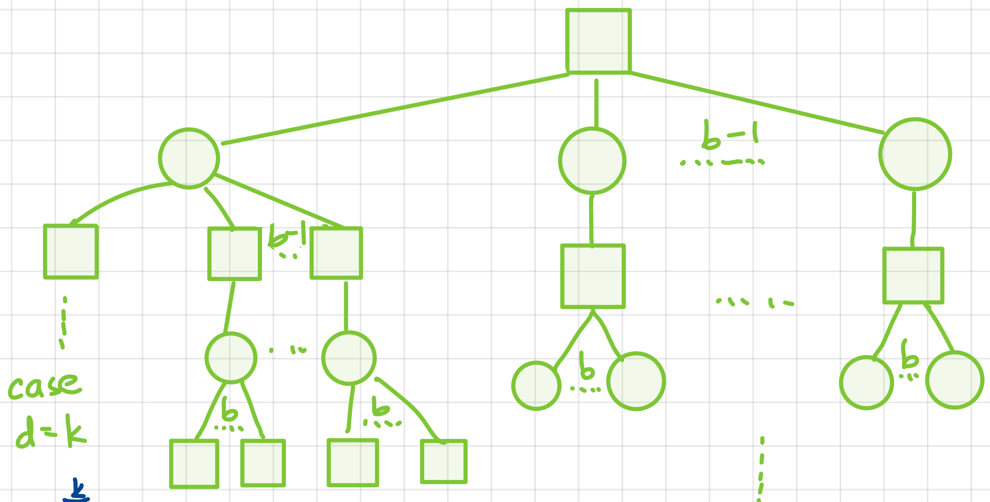


for this case

there will be $b+b-1 = 2b^{\frac{2}{2}}-1$ examines #

If $d=k$, we assume that there will be $2b^{\frac{k}{2}}-1$ positions on level d #

If $d=k+2$



$\Rightarrow 2\cdot b^{\frac{k}{2}}-1$

$\Rightarrow (b-1)\cdot b^{\frac{k}{2}}$

$\Rightarrow (b-1)\cdot b^{\frac{k}{2}}$

$\rightarrow$ total

$= 2\cdot b^{\frac{k}{2}}-1+2\cdot(b-1)\cdot b^{\frac{k}{2}}$

$= 2\cdot b^{\frac{k}{2}+1}-1$

$= 2\cdot b^{\frac{k+2}{2}}-1$

$\Rightarrow$ by induction, done for d is even #