

max-eval (state)

for all $a \in A_{\text{state}}$

next_state \leftarrow Result (state, a) ^{depth}

$V(a) \leftarrow \min\text{-eval}(\text{next_state}, 2)$

return val = $\max_a V(a)$, action: $\arg\max_a V(a)$

min-eval (state, depth)

if depth \geq max-depth

evaluate (state)

if state = Terminal
evaluate (state)

$V \leftarrow +\infty$

for all a in A_{state}

next-state \leftarrow Result (state, a)

$V \leftarrow \min \{ V, \text{max-eval}(\text{next-state}, \text{depth}+1) \}$

return V

max-eval (state, depth)

if depth \geq max-depth

evaluate (state)

if state = Terminal
evaluate (state)

$V \leftarrow -\infty$

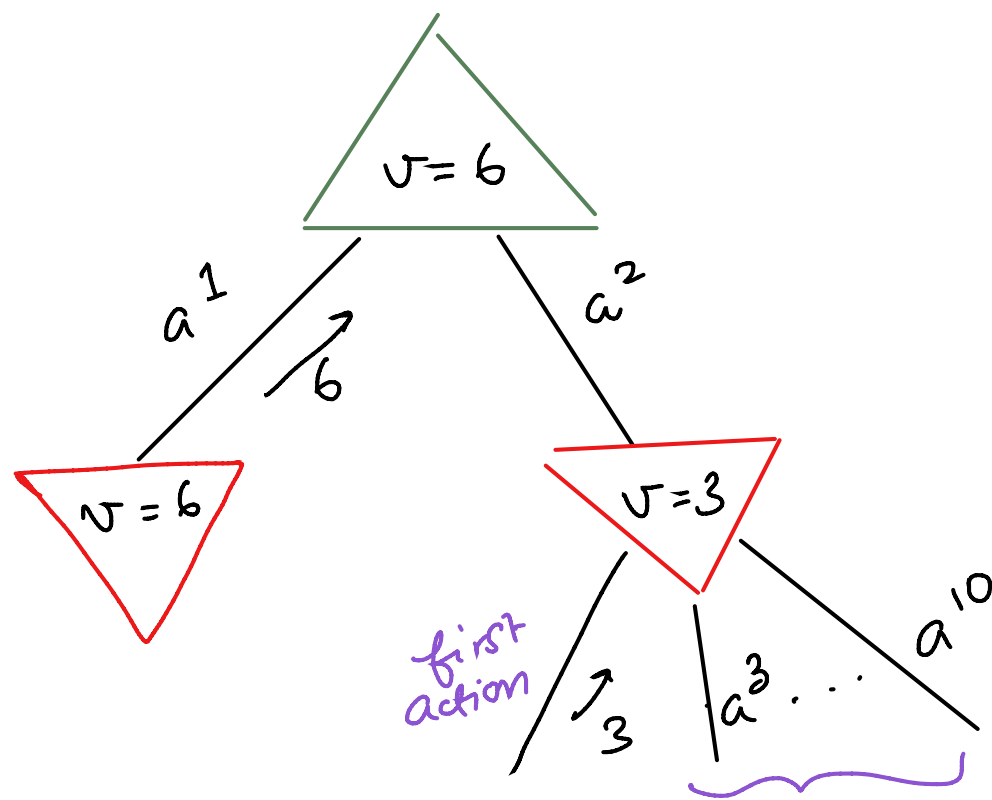
for all a in A_{state}

next-state \leftarrow Result (state, a)

$V \leftarrow \max \{ V, \text{min-eval}(\text{next-state}, \text{depth}+1) \}$

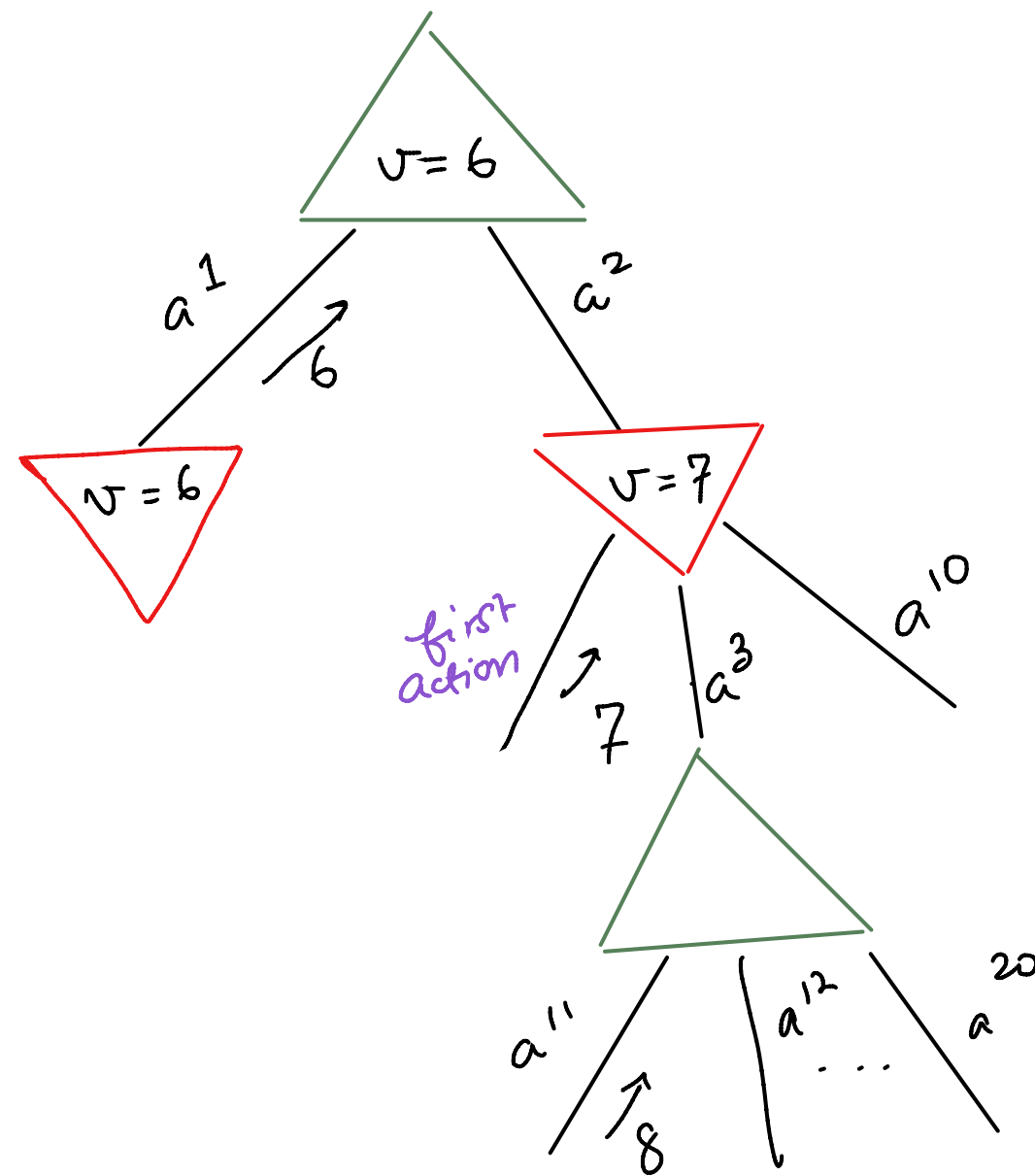
return V

Alpha - Cutoff



by investigating all of these
the min player can pull you
below 3 $\Rightarrow a^3$ to a^{10}
need not be
investigated

Beta cut off



min player is already getting 7, but if it plays a^3
 max player can make value greater than or equal to 8.
 \Rightarrow min player is not playing a^3 at all $\Rightarrow a^{12} \dots a^{20}$
 no need to expand

max-eval (state)

$$\alpha = -\infty, \beta = +\infty$$

for all $a \in A_{\text{state}}$

next_state \leftarrow Result (state, a) ^{depth}

$$V(a) \leftarrow \min\text{-eval}(\text{next_state}, 2, \alpha, \beta)$$

$$\alpha \leftarrow \max \{ \alpha, V(a) \}$$

return $\text{val} = \max_a V(a)$, action: $\underset{\hat{a}}{\text{argmax}} V(a)$

max-eval (state, depth, α , β)

$\alpha_{\text{local}} \leftarrow \alpha$

if depth \geq max-depth

evaluate (state)

if state = Terminal

evaluate (state)

$v \leftarrow -\infty$

for all a in A_{state}

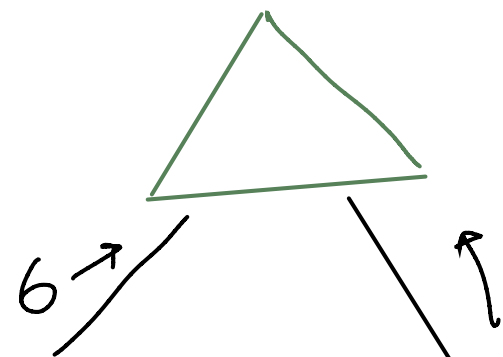
next-state \leftarrow Result (state, a)

$v \leftarrow \max \{ v, \text{Min-eval}(\text{next-state}, \text{depth}+1, \alpha_{\text{local}}, \beta) \}$

β cutoff

$\left\{ \begin{array}{l} \text{if } v \geq \beta \\ \text{return } v \end{array} \right.$

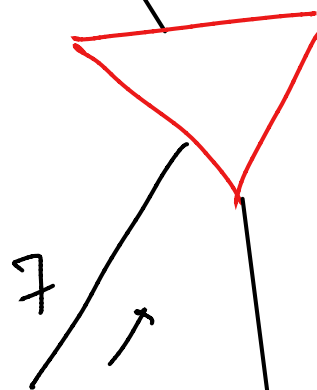
$\alpha_{\text{local}} \leftarrow \max \{ \alpha_{\text{local}}, v \}$
return v



Can never be greater than 7
and hope is that it is
greater than 6

$$\alpha = 6$$

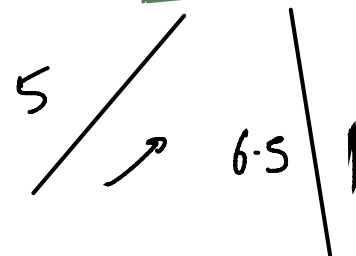
Cut off if value
at this level
goes less than 6



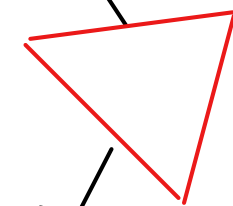
$$\beta = 7$$

Cut off if value
at this level
goes more than 7

$$\alpha_{local} = 6$$

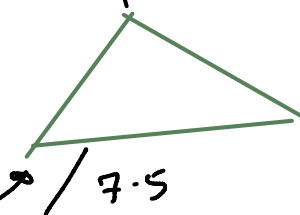


$$\alpha_{local} = 6.5$$



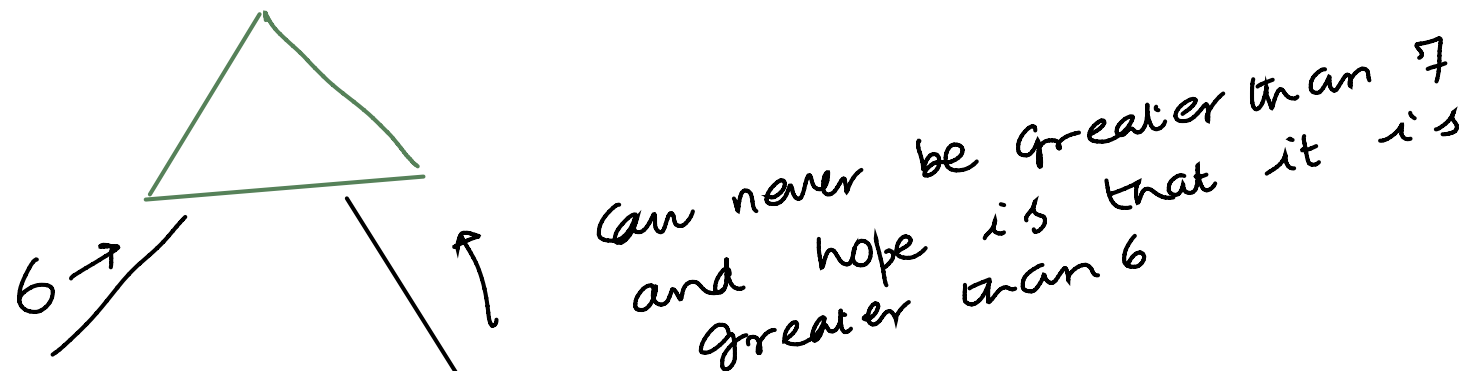
$$\alpha = 6.5$$

$$\beta_{local} = 7$$



$$\beta = 7$$

No need to stop at 5
even if elsewhere
max player is getting
6



$$\alpha = 6$$

Cut off if value
at this level
goes less than 6

$$\beta = 7$$

Cut off if value
at this level
goes more than 7

$$\alpha_{local} = 6$$

5

6.5

$$\alpha_{local} = 6.5$$

6.7

$$\alpha = 6.5$$

$$\beta_{local} = 6.7$$

$$\beta = 6.7$$

Cut off

No need to stop at 5
even if elsewhere
max player is getting
6

6.8