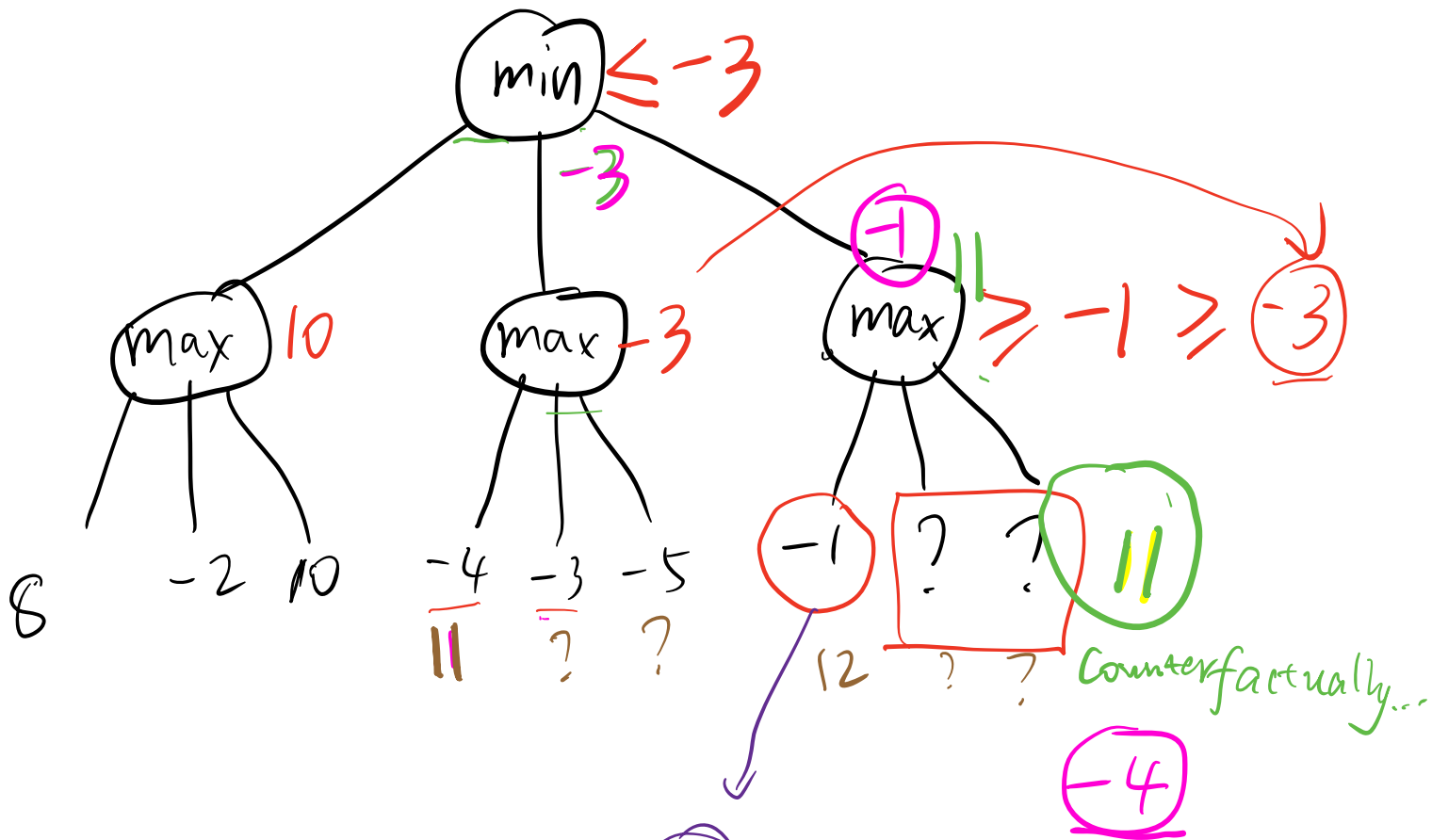


M15: Q6 Q9 Q10 Q11 Q2 Q4 Q14

Q6: Assume no reordering is allowed



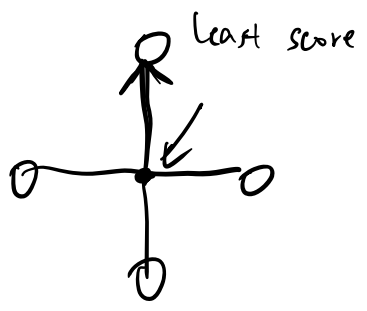
Find  $\min \{ \max \{ 8, -2, 10 \}, \max \{ -4, -3, -5 \}, \max \{ -1, ? ? \} \}$

Answer: ~~2~~ 4. We allow reordering of sub trees. See last page

Q9: Need to find the local minimum  
 $8i - 2j + 10k$  is linear  
 $\Rightarrow$  global minimum  $\equiv$  local minimum  
 (linear  $\Rightarrow$  convex  $\uparrow$ )

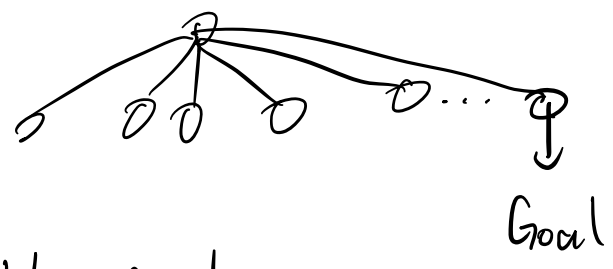
$\min 8i - 2j + 10k$

$$= \min(8j) + \min(-2j) + \min(10k)$$



minimize  $i$ , maximize  $j$ , minimize  $k$ .  
 $-6$ ,  $7$ ,  $-6$

Q10: 1st: Root  
 2nd:

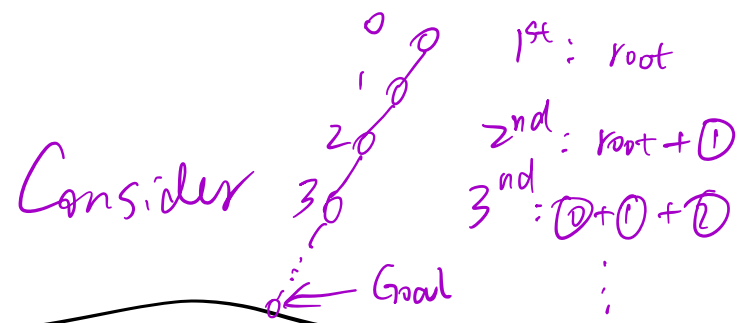


1  
 everything  
 ||  
 188

Goal: Find the goal

Uninformed search  $\Rightarrow$  In the worst case, need to visit every node

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Q11: 2 points

$$\begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}$$

Projection onto  $\begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix} \equiv$  to take middle coordinate

$$\{-2, -3\}$$

$$\frac{1}{2}((-2 - (-2.5))^2 + (-3 - (-2.5))^2)$$

$$= \frac{1}{2}(0.5^2 + 0.5^2) = 0.5^2$$

$$\underbrace{\langle x, \hat{d} \rangle}_{\text{length}} \cdot \underbrace{\hat{d}}_{\text{direction}} = \frac{\langle x, d \rangle}{\langle d, d \rangle} d$$

$d = \begin{bmatrix} 1 \\ 2 \\ 0 \end{bmatrix}$

Q2:  $N_0 \quad V$  vs  $V$

$$\begin{cases} -\alpha \frac{n}{N} \geq -c - \beta \frac{n-1}{N} \\ -\alpha \frac{n+1}{N} \leq -c - \beta \frac{n}{N} \end{cases}$$

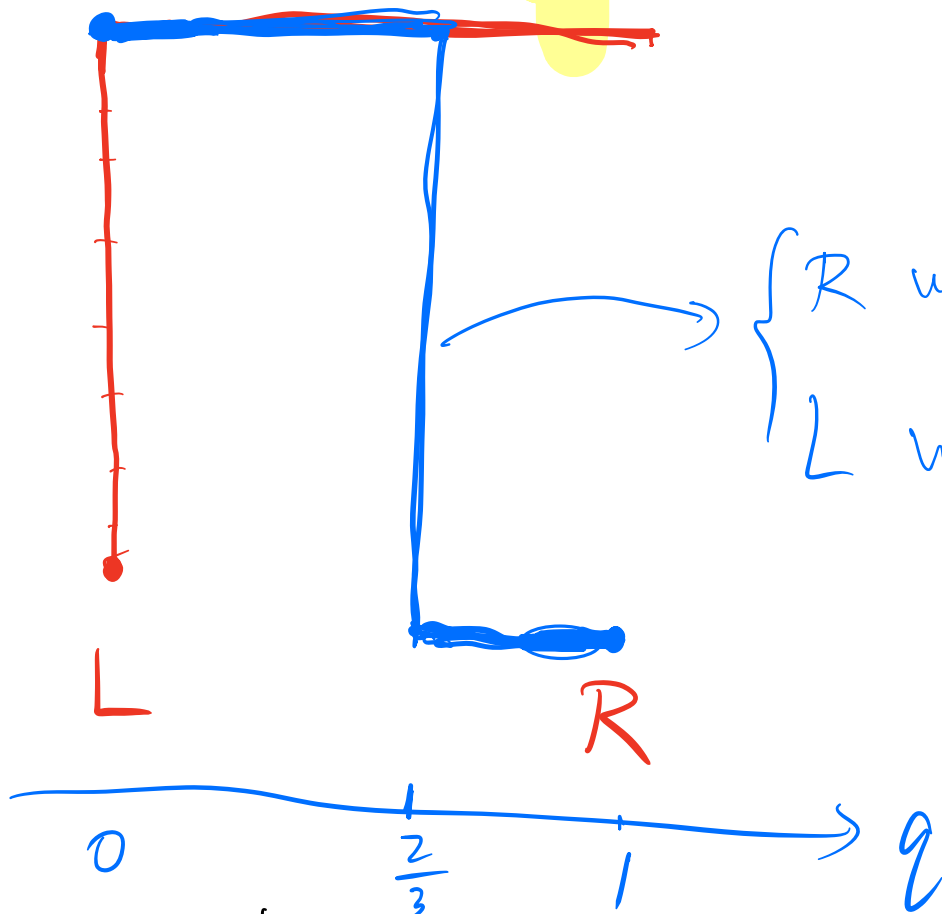
$n$ . # people in  $\{N_0 \quad V\}$

Q4:

Row \ Col	$1-p$ L	$p$ R
U	(Row, Col) 5, 9	0, 9
D	0, 9	10, 0

U

D



$\left\{ \begin{array}{l} R \text{ w.p. } \frac{1}{3} \\ L \text{ w.p. } \frac{2}{3} = q \end{array} \right.$

diagram of best responses

If Col chooses

$$pR + (1-p)L$$

$\left\{ \begin{array}{l} R \text{ w.p. } p \\ L \text{ w.p. } 1-p = q \end{array} \right.$

What would Row do?

$$\text{Row} = U$$

$$\text{Payoff: } 5(1-p) + 0 \cdot p = 5 - 5p$$

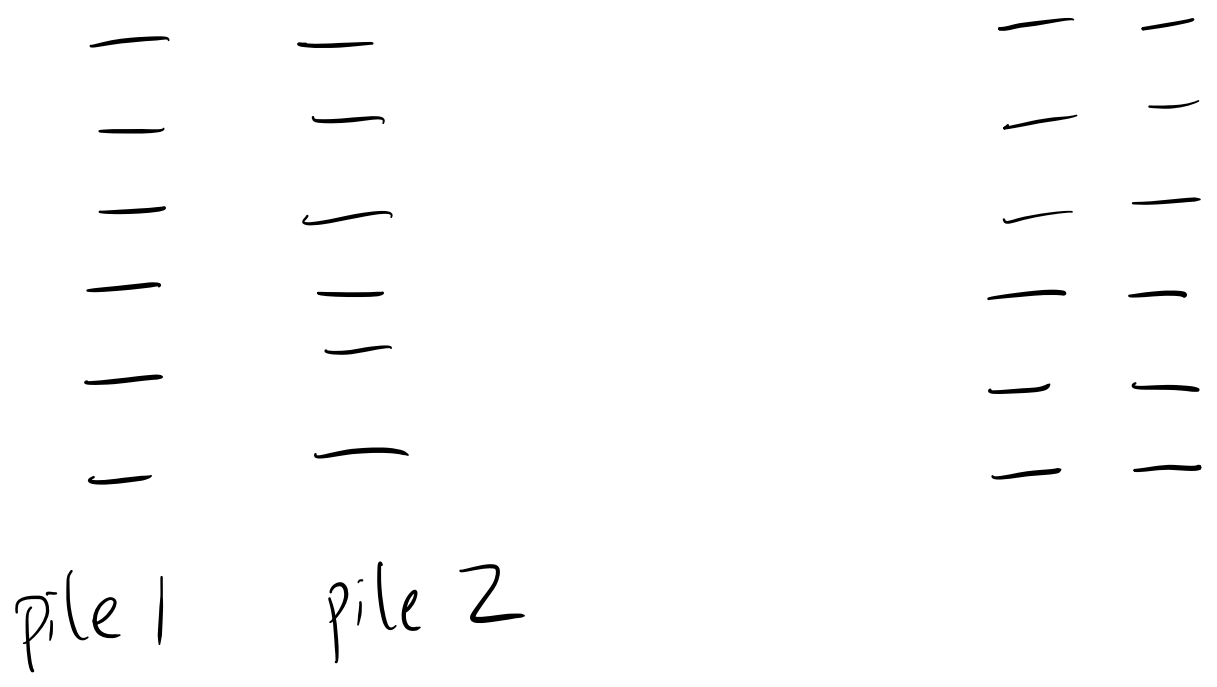
$$\text{Row} = D$$

$$\text{payoff: } 0 \cdot (1-p) + 10 \cdot p = 10p$$

$$5 - 5p = 10p \Rightarrow p = \frac{5}{15} = \frac{1}{3}$$

$$\text{Ans: } 0, \frac{2}{3}$$

Q14:



Ans: - 1

Q12

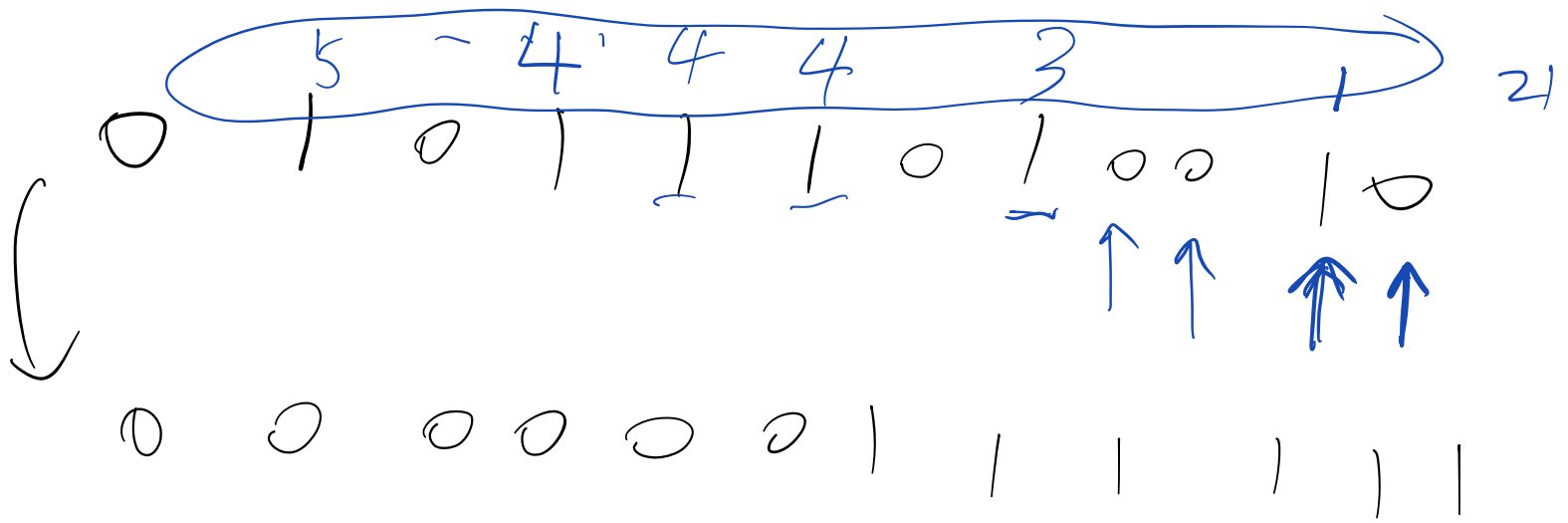
01 → 10

"move 1 to the left"

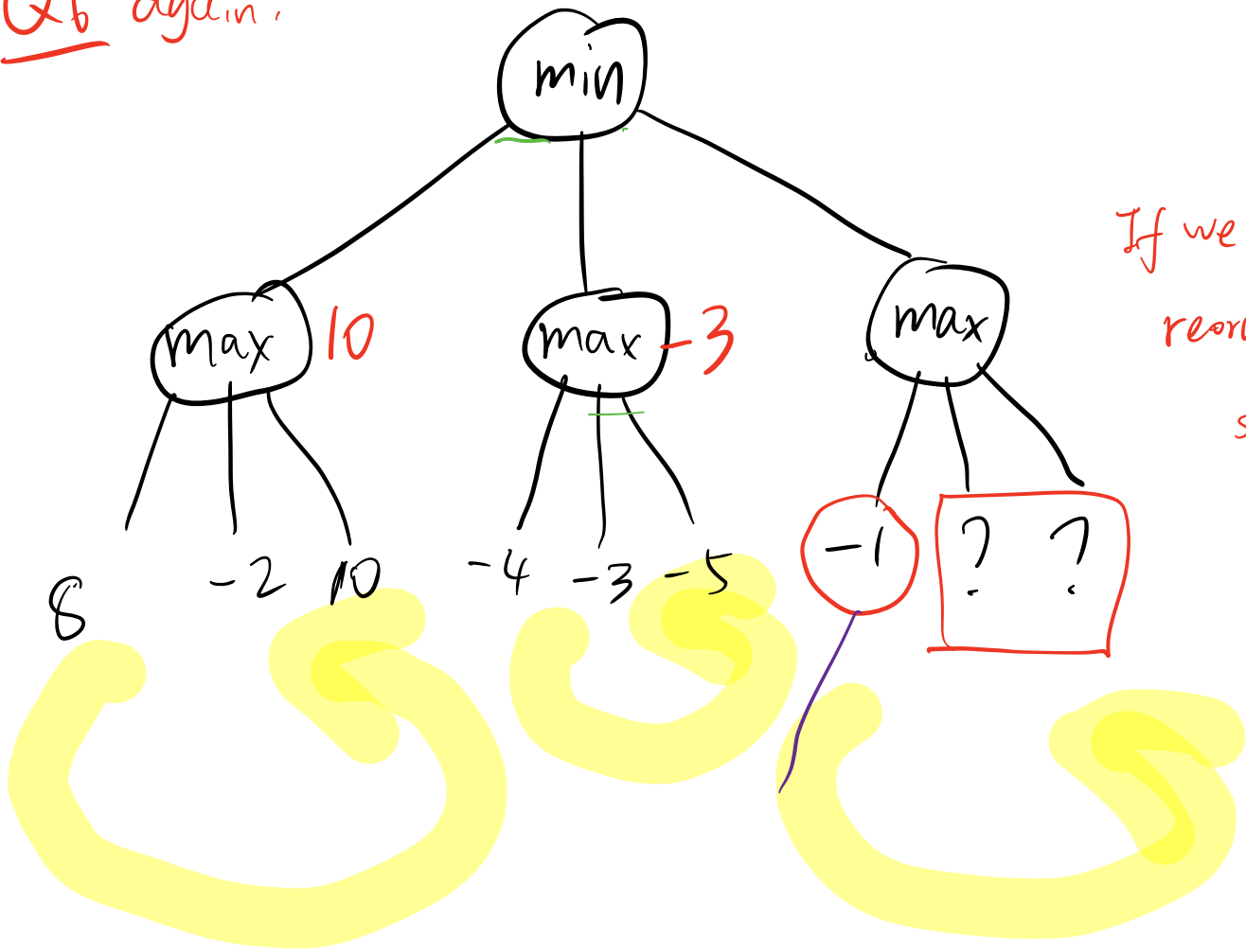
(for 1 slot)

10 → 01

→ right

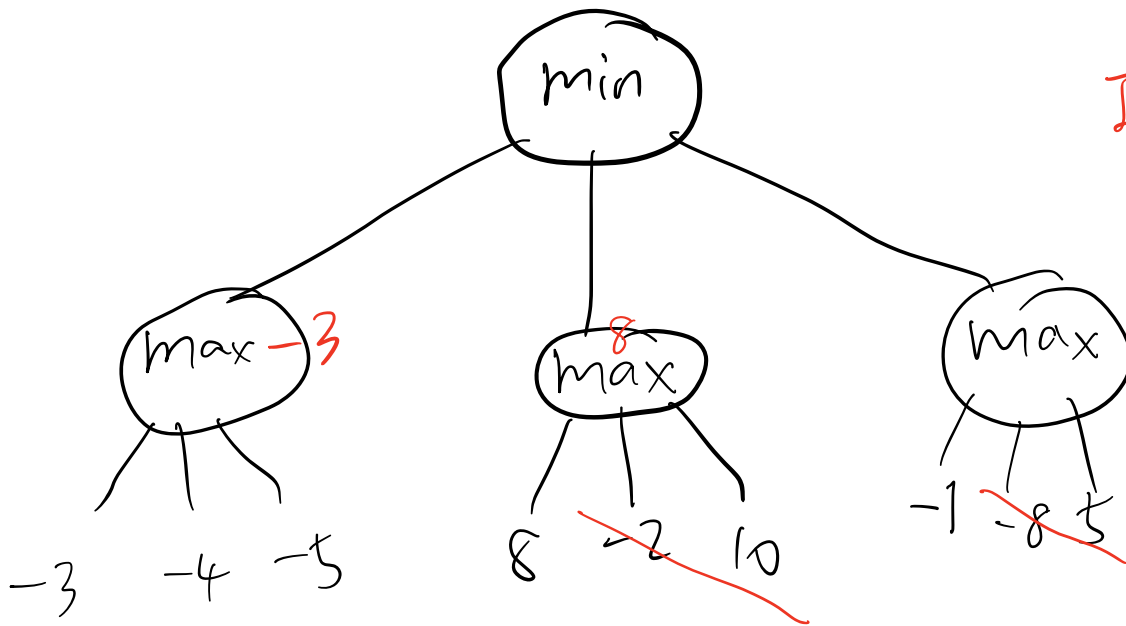


Q6 again:



If we only allow reordering within subtree

$\Rightarrow 2$



If we allow reordering of subtrees

$\Rightarrow 4$