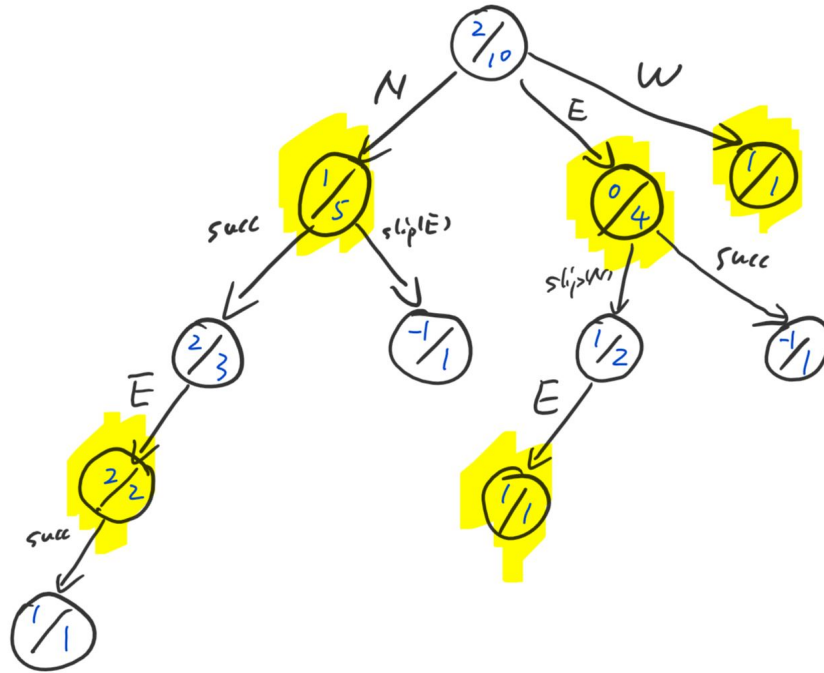


## Sample Solutions for Problem Set VIII: Monte-Carlo Tree Search

1. MCTS tree:



2. Calculate using  $\operatorname{argmax}_{a \in A} Q(s, a)$ . The answer would be W (West) because it has the highest Q-value.

$$W \quad Q((2, 1), W) = 1/1$$

$$E \quad Q((2, 1), E) = 0/4$$

$$N \quad Q((2, 1), N) = 1/5$$

$$S \quad Q((2, 1), S) = 0$$

3. Need to calculate  $\pi$  for each of N, S, E, W based on the UCT formula and then normalise.

$$\pi(s) = \operatorname{argmax}_{a \in A(s)} \begin{pmatrix} W & : & 1 + \sqrt{2 \ln 10} \\ E & : & \frac{\sqrt{2 \ln 10}}{2} \\ S & : & \infty \\ N & : & \frac{1 + \sqrt{10 \ln 10}}{5} \end{pmatrix}$$

Therefore, UCT would choose S to expand next.