

1\$ → ①

4\$ → (1, 2, 3, 4).

5\$ → (1, 2, 3, 4, 5).

$S: \{1, 2, \dots, 9\}$

coin toss happens:

If toss = head → 1 → 2

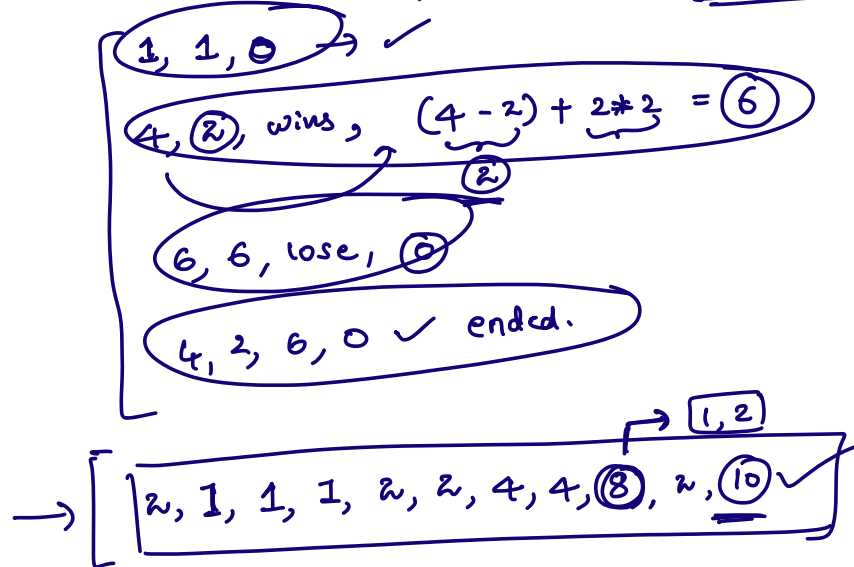
3 → 6

tail → lose

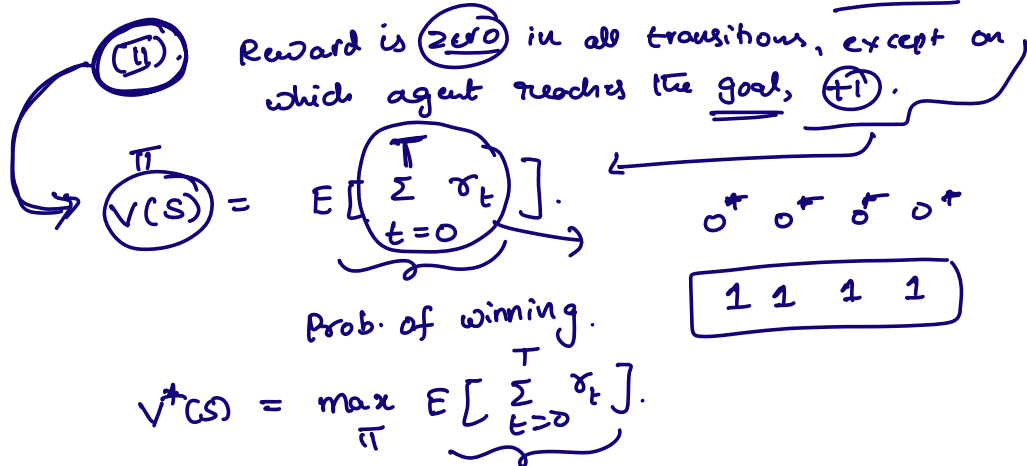
• Episodic :-

if gambler loses everything. OR

if gambler earns 10\$.



Reward :- ①. give +1 when agent wins and -1 when agent loses. (checked).



MDP:-

State space: $\{1, \dots, 9\}$; Terminal states: $\{0, 10\}$.

Action space:

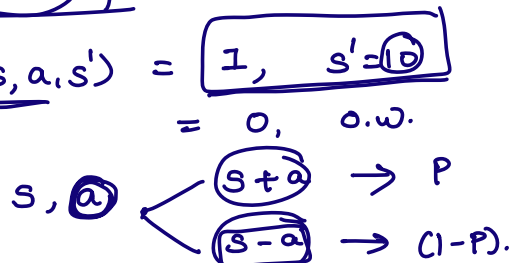
$$s \rightarrow 1 \dots \min\{s, 10-s\}$$

Reward function: $r(s, a, s') = \boxed{1, s' = 0}$
 $= 0, \text{ o.w.}$

Transition fn:-

(P)

\hookrightarrow prob. of coin ending up as head:



$V_0 = 0;$

$\textcircled{*} V_{n+1}(s) = \max_{a \in A(s)} \left[\overset{0+}{P} V_n(s+a) + \overset{0+}{(1-P)} V_n(s-a) \right]$ $\hookrightarrow s \in \{1, \dots, 9\}$.

where

$$\boxed{\begin{matrix} V_n(0) = 0 \quad \forall n \\ V_n(10) = 1 \quad \forall n \end{matrix}}$$

$P: \quad P < 0.5 \rightarrow \textcircled{0.4}$
 $P > 0.5 \rightarrow \textcircled{P=0.9}$

$\{ \underline{1, 1, 2, 2, 4, 4, 8, 10} \}$
 $\hookrightarrow \{$