Welcome to
TA Live Session: Week 7

NPTEL | Artificial Intelligence Search Methods for Problem Solving

11-09-2022

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Let's Get Started ...

Questions 1 to 2

Question 1

```
ALPHA-BETA(N, α, β)
 1  if N is a terminal node
 2      return eval(N)

 3  if N is a MAX node
 4      for each child C of N
 5          α ← max( α, ALPHA-BETA(C, α, β) )
 6          if α ≥ β then return β
 7      return α

 8  if N is a MIN node
 9      for each child C of N
10          β ← min( β, ALPHA-BETA(C, α, β) )
11          if α ≥ β then return α
12      return β
```

In the Alpha-Beta algorithm, list the line numbers where alpha-cutoff and beta-cutoff occur, respectively.

Question 1

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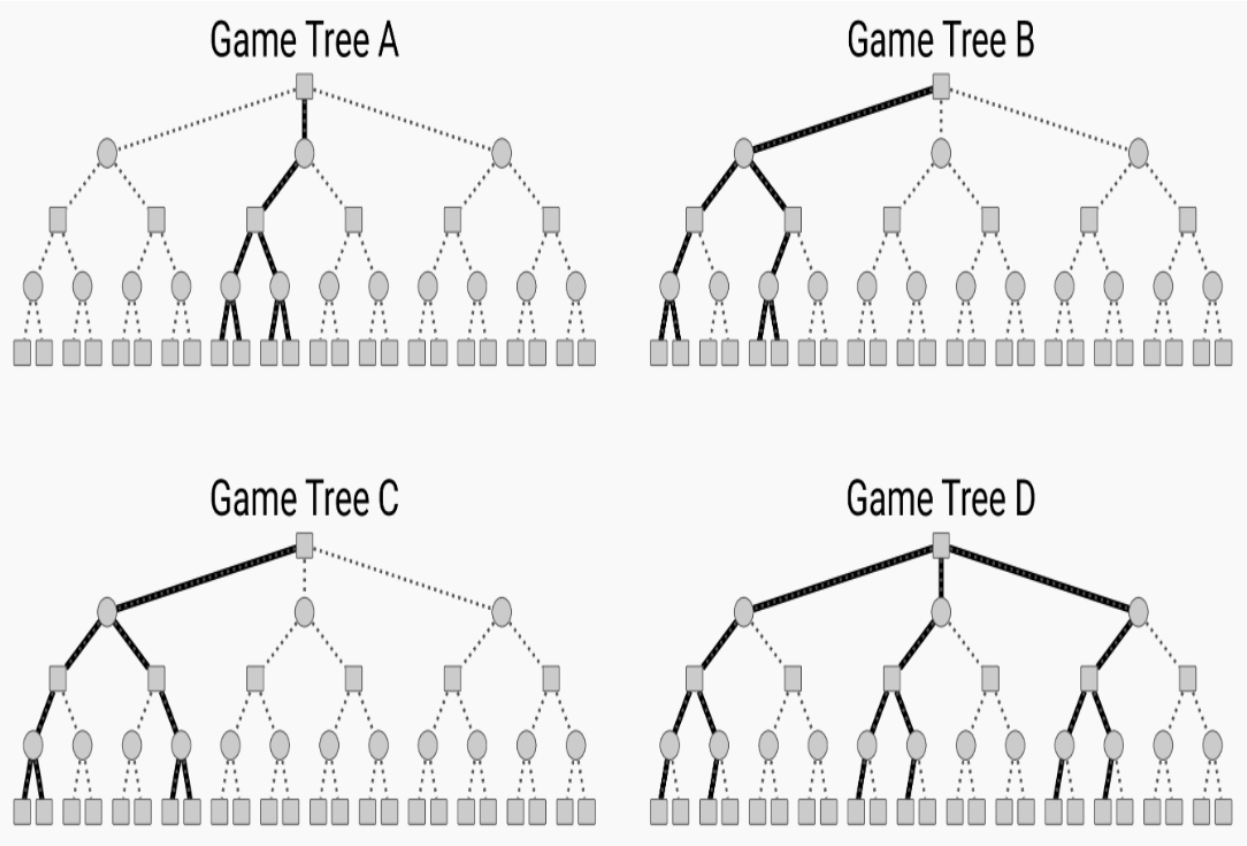
In the Alpha-Beta algorithm, list the line numbers where alpha-cutoff and beta-cutoff occur, respectively.

alpha-cut: 11
beta-cut: 6 ✓

Question 2

Four two-player game-trees are shown below with some edges highlighted in bold. Which of these depict a game strategy for the root (MAX)?



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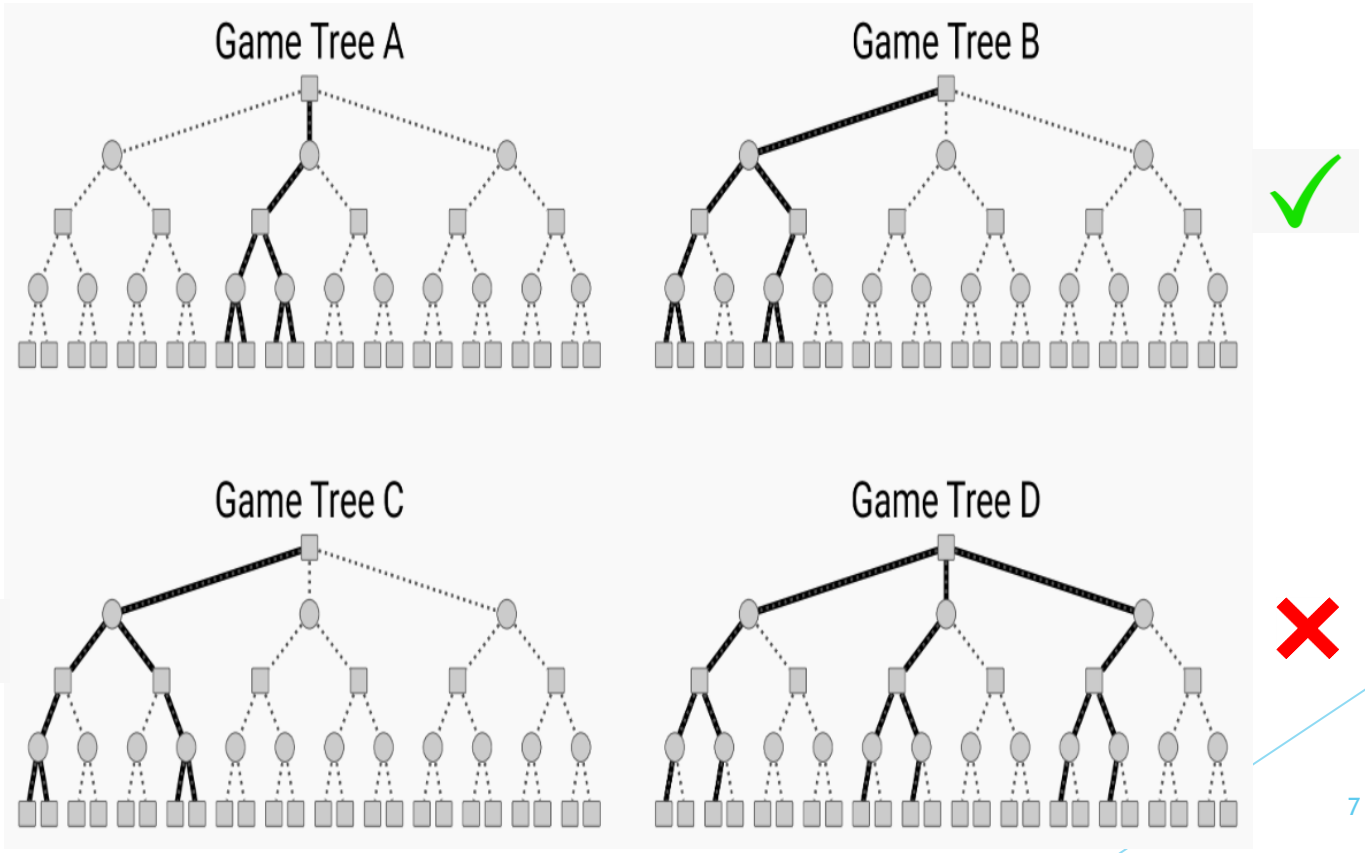
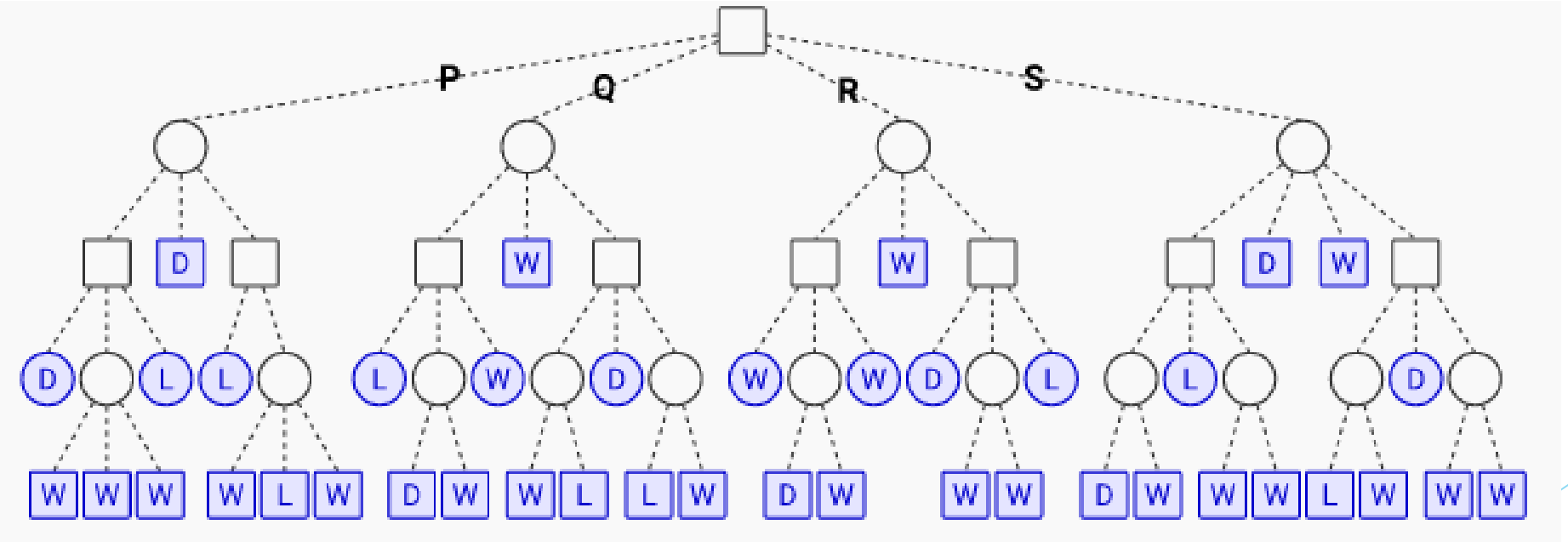


Questions 3 to 5

Question 3

The figure shows a game tree with evaluations W (win), L (loss) and D (draw) from Max's perspective. In this game tree the labels P, Q, R, S indicate strategies/moves at the level of root.

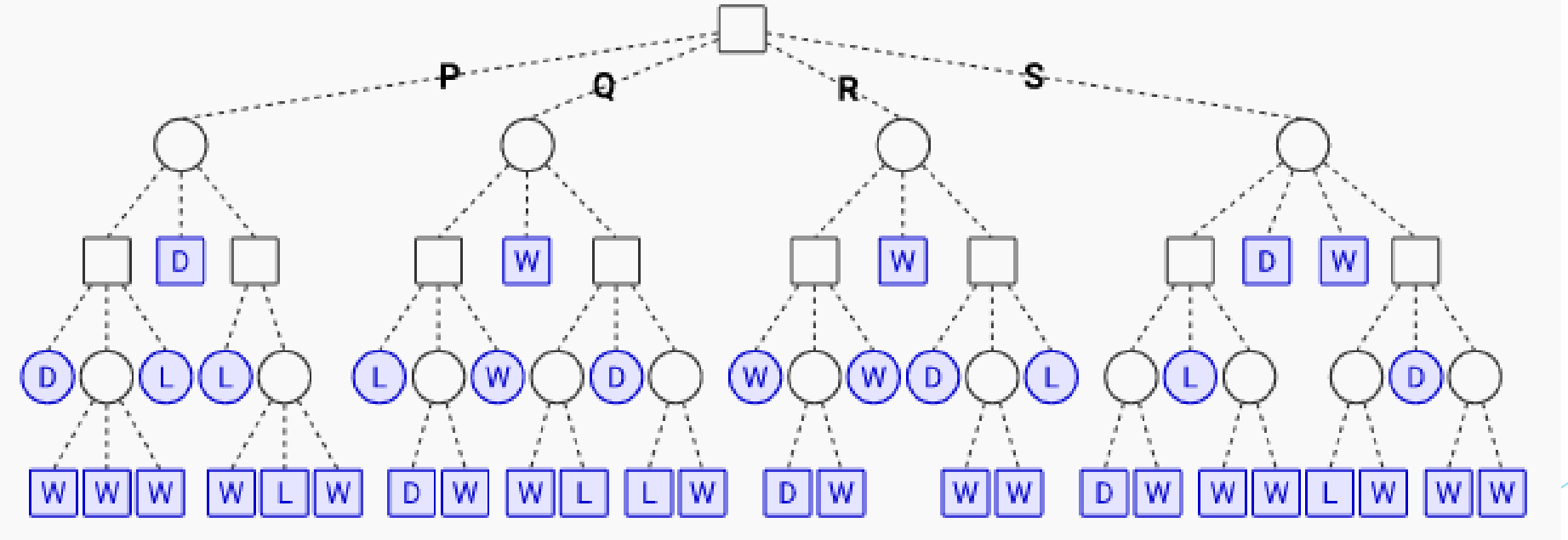
What is the outcome (W, L or D) of the game when both players play perfectly?



Question 3

The figure shows a game tree with evaluations W (win), L (loss) and D (draw) from Max's perspective. In this game tree the labels P, Q, R, S indicate strategies/moves at the level of root.

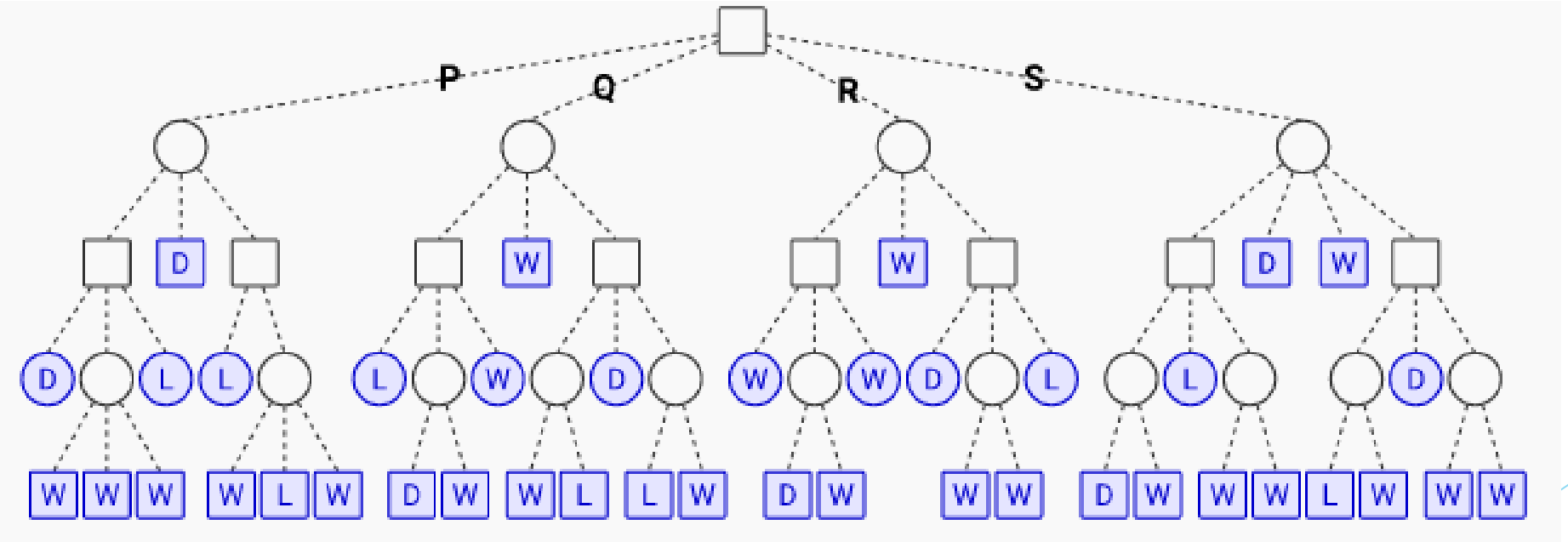
What is the outcome (W, L or D) of the game when both players play perfectly? *W* ✓



Question 4

The figure shows a game tree with evaluations W (win), L (loss) and D (draw) from Max's perspective. In this game tree the labels P, Q, R, S indicate strategies/moves at the level of root.

Which of the moves P, Q, R, S are best moves for Max?



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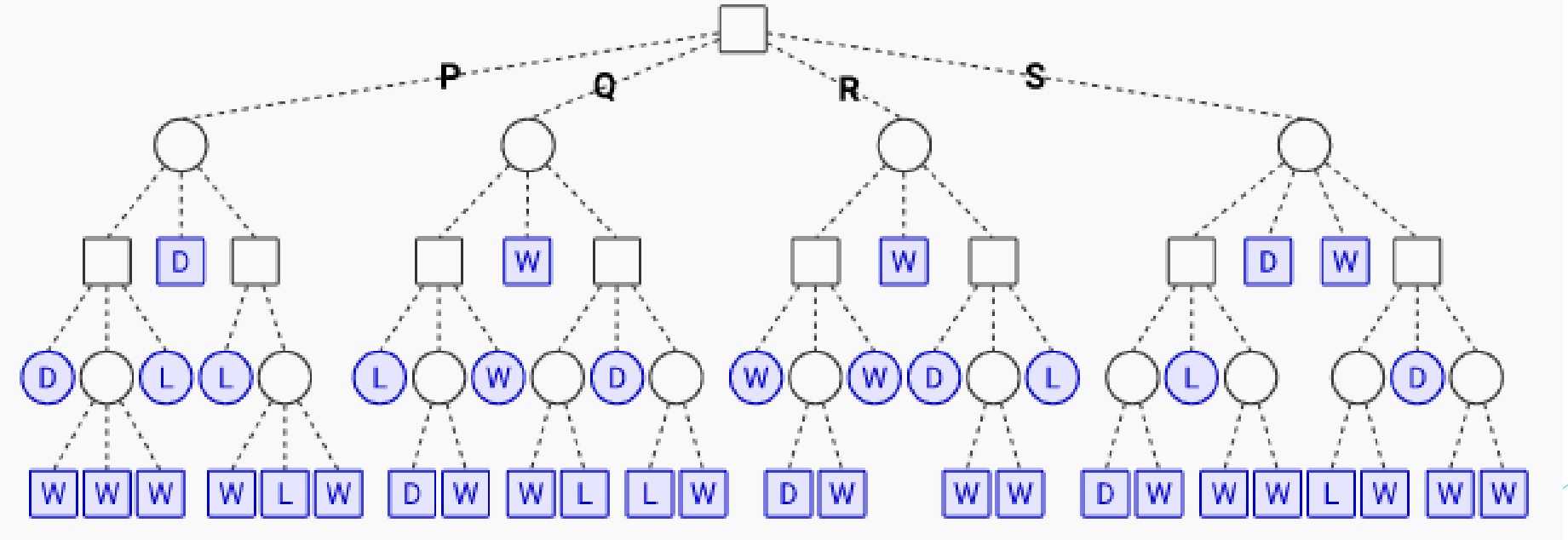
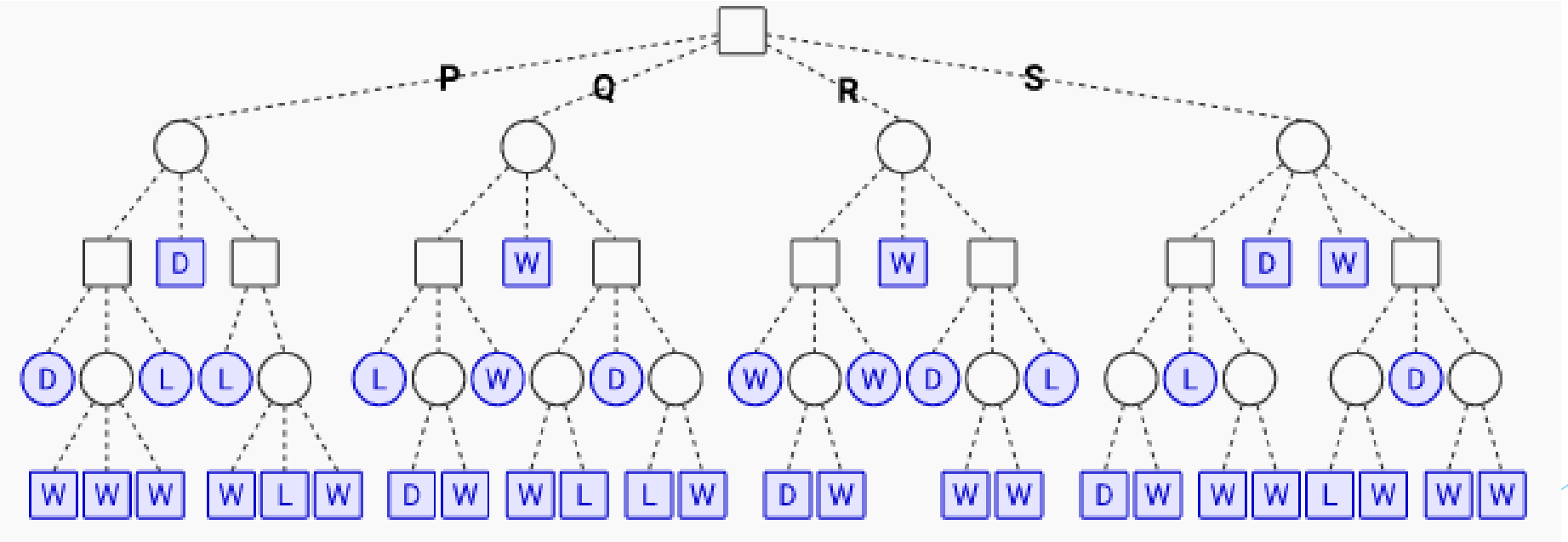
Which of the moves P, Q, R, S are best moves for Max? *R* ✓



Question 5

The figure shows a game tree with evaluations W (win), L (loss) and D (draw) from Max's perspective. In this game tree the labels P, Q, R, S indicate strategies/moves at the level of root.

Which of the moves P, Q, R, S lead to a draw if both play perfectly after the first move?



Question 5

The figure shows a game tree with evaluations W (win), L (loss) and D (draw) from Max's perspective. In this game tree the labels P, Q, R, S indicate strategies/moves at the level of root.

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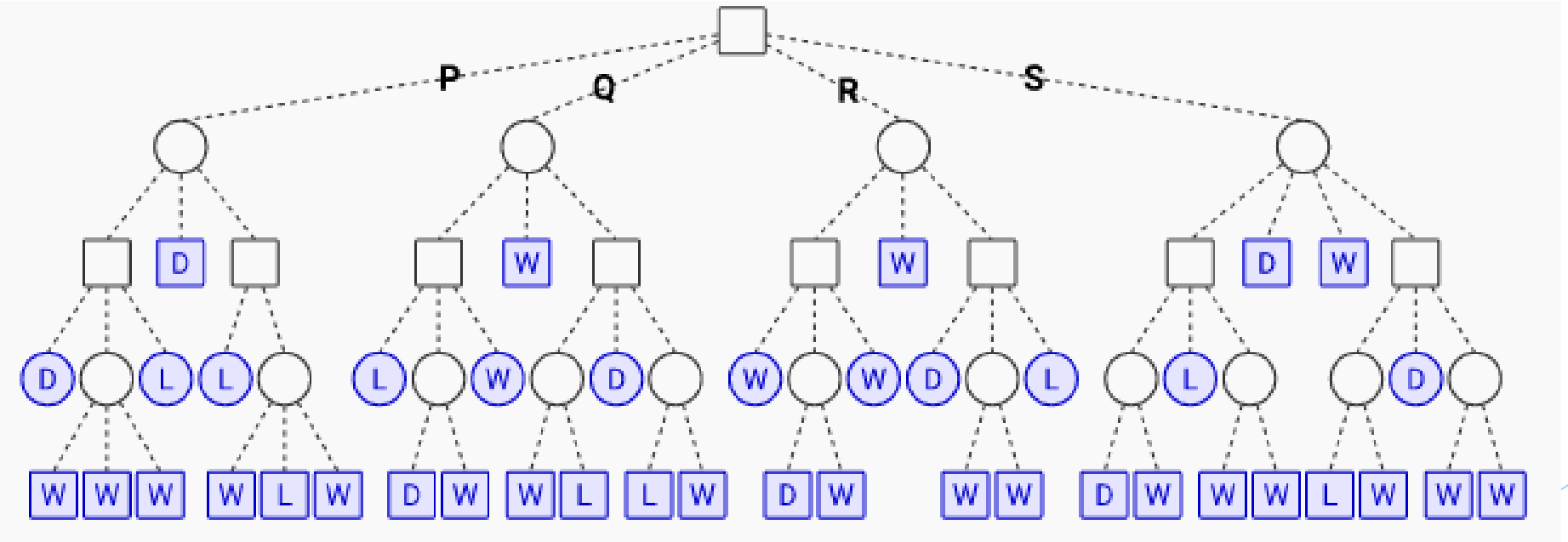
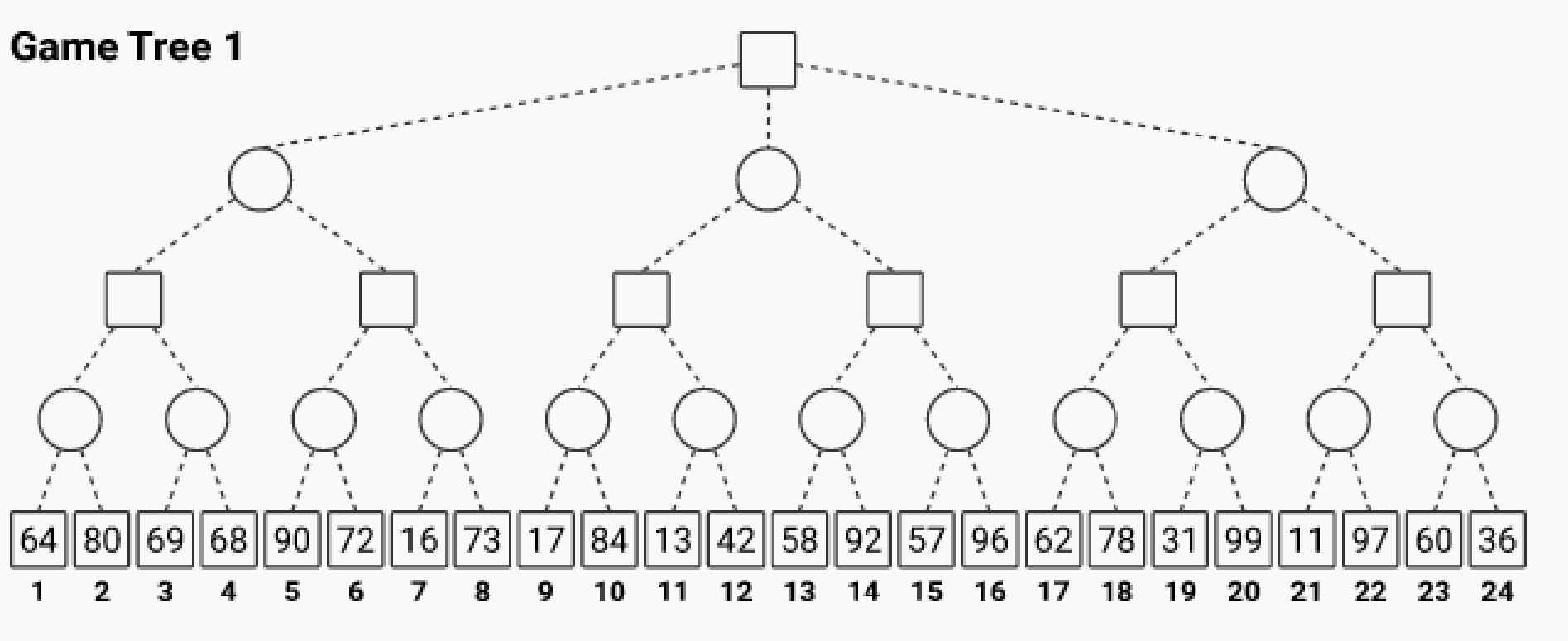


Q, S ✓

Questions 6 onwards

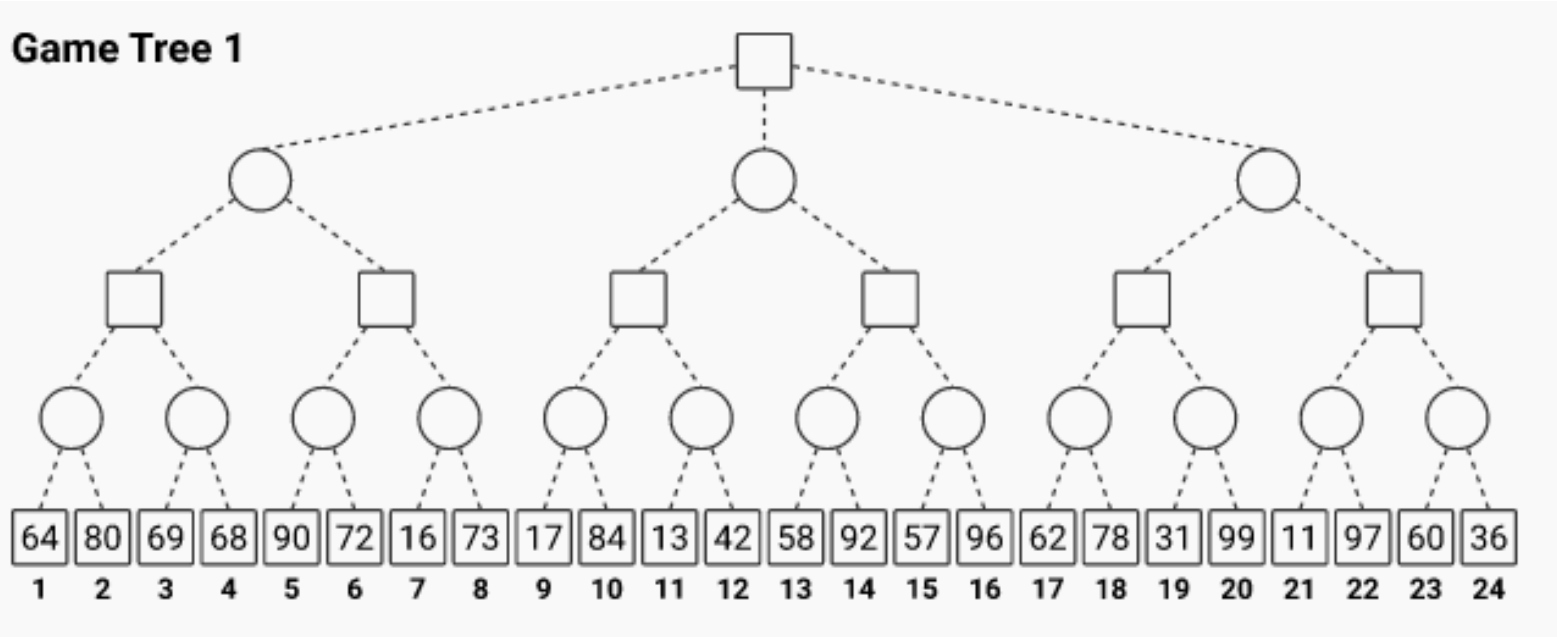
The figure shows a 4-ply game tree with evaluation function values at the horizon. The nodes in the horizon carry reference numbers (sequence numbers going left to right) at the bottom. Use these reference numbers when you want to enter a list of nodes. Where necessary assume top-down and left-to-right node order. Use this game tree to answer the following questions.



Question 6

What is the MinMax value of the game?

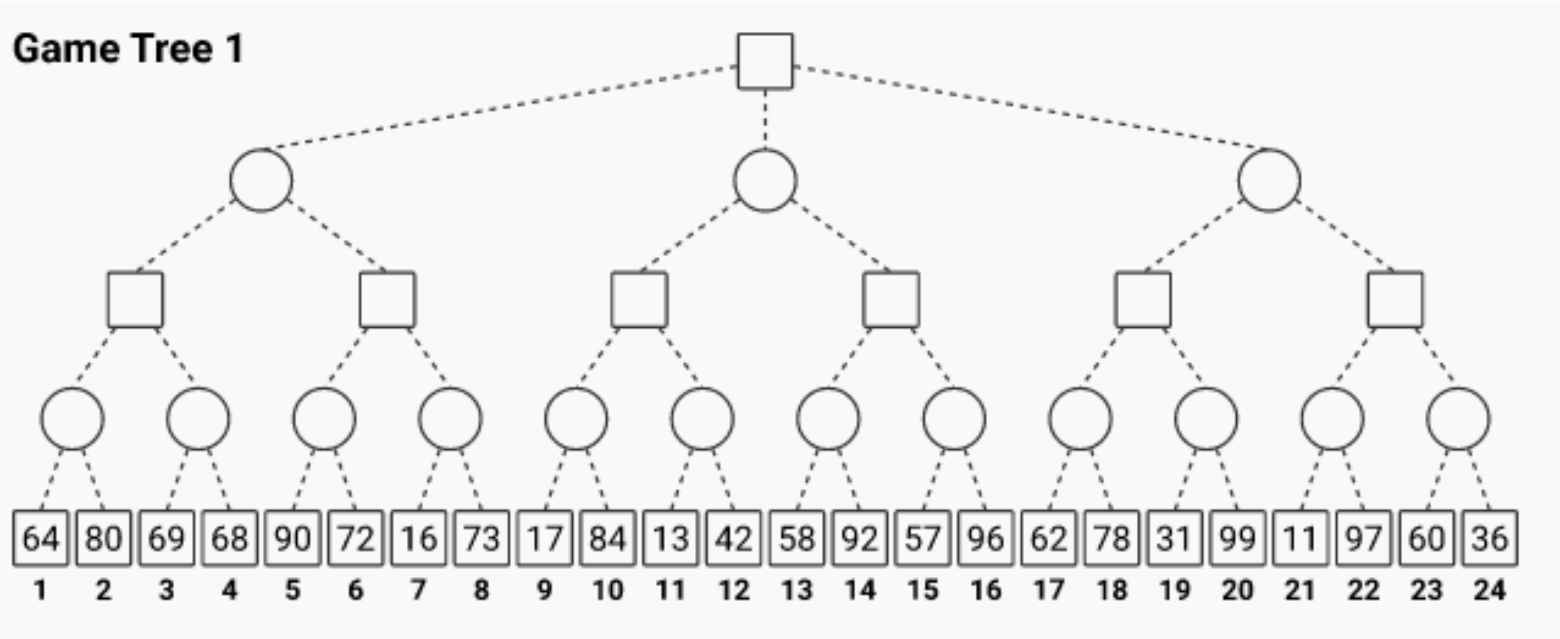
List the nodes (node reference numbers) in the best strategy.



Question 6

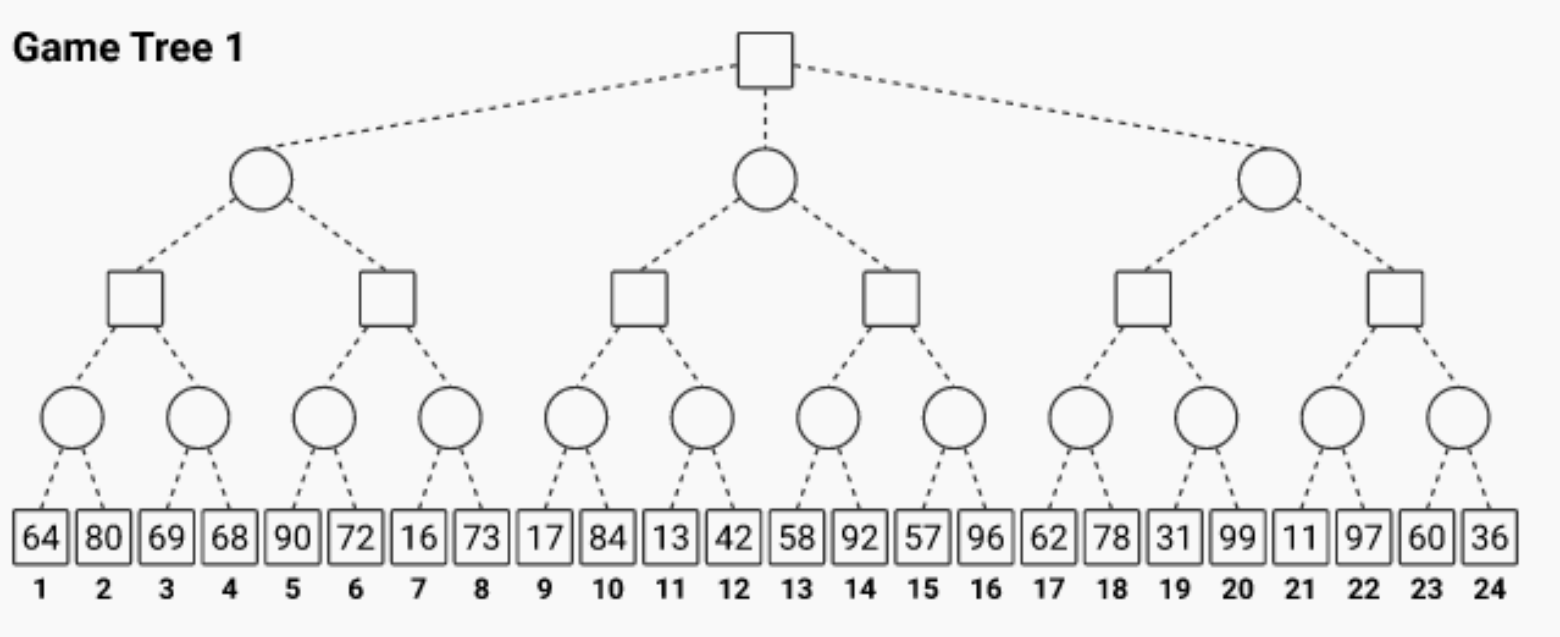
What is the MinMax value of the game? *68* ✓

List the nodes (node reference numbers) in the best strategy. *3,4,5,6* ✓



Question 7

Simulate AlphaBeta algorithm on Game Tree 1. What is the number of alpha-cuts and beta-cuts? Note that a single cut may remove a bunch of edges at once.



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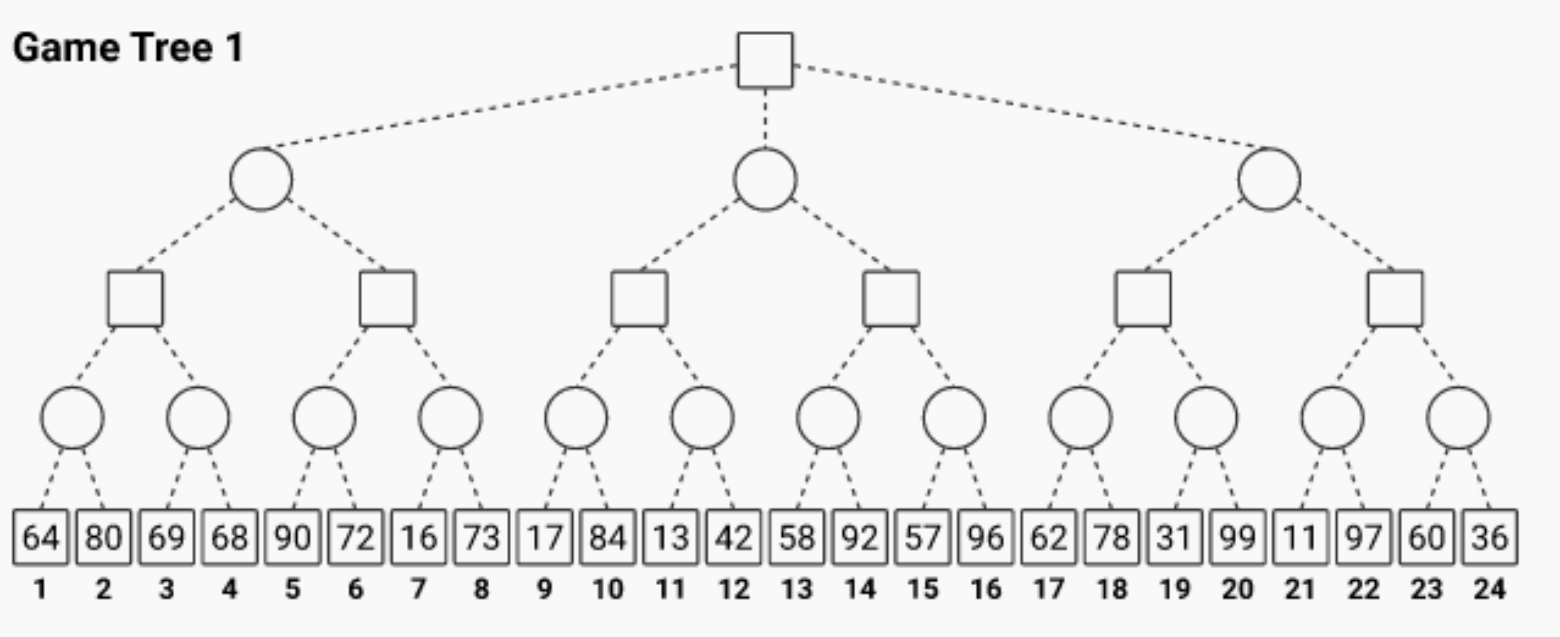
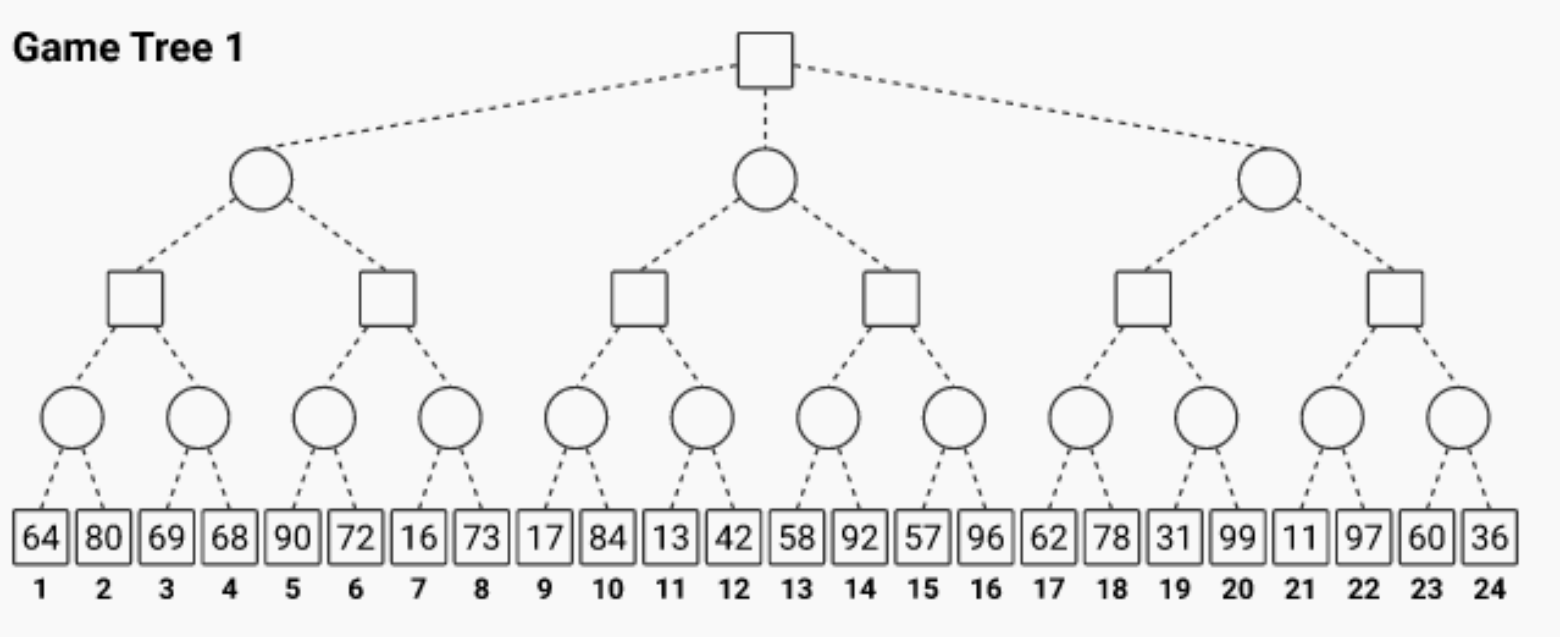


alpha cuts: 6
beta cuts: 1

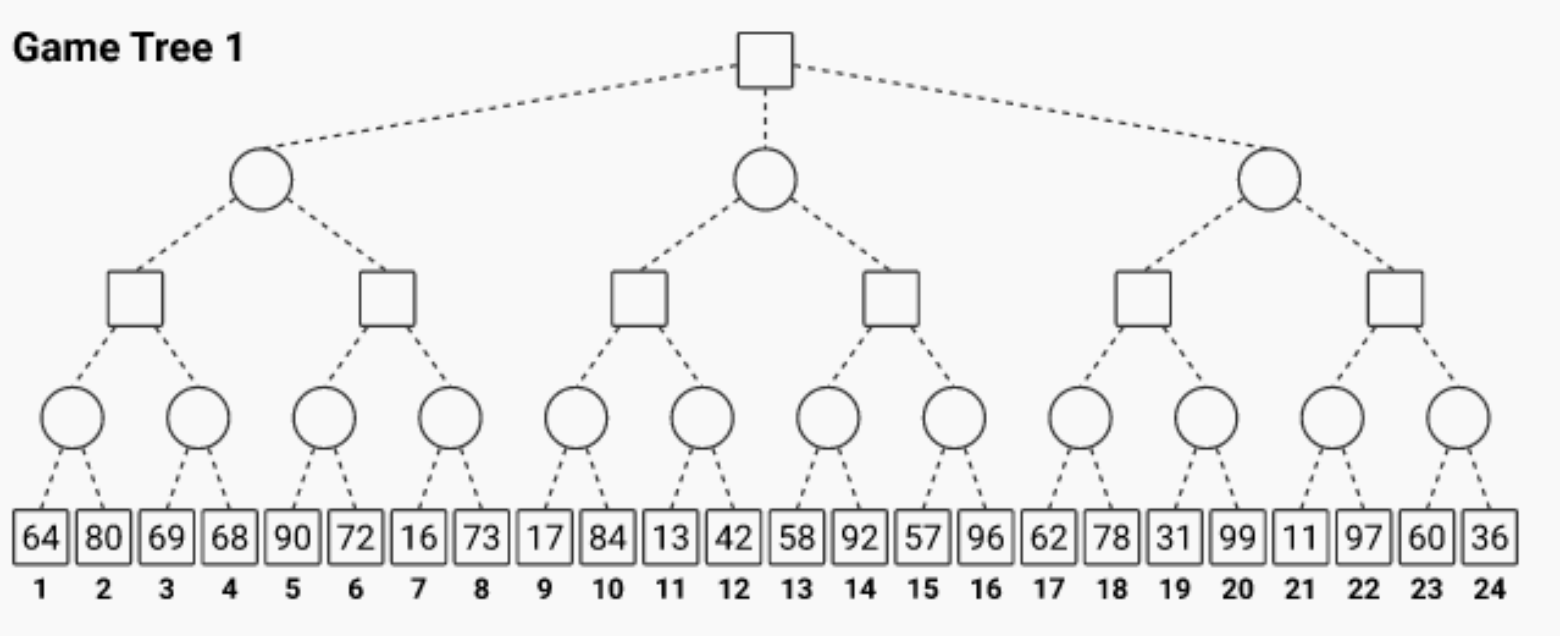
Question 8

What is the total number of strategies in Game Tree 1?



Question 8

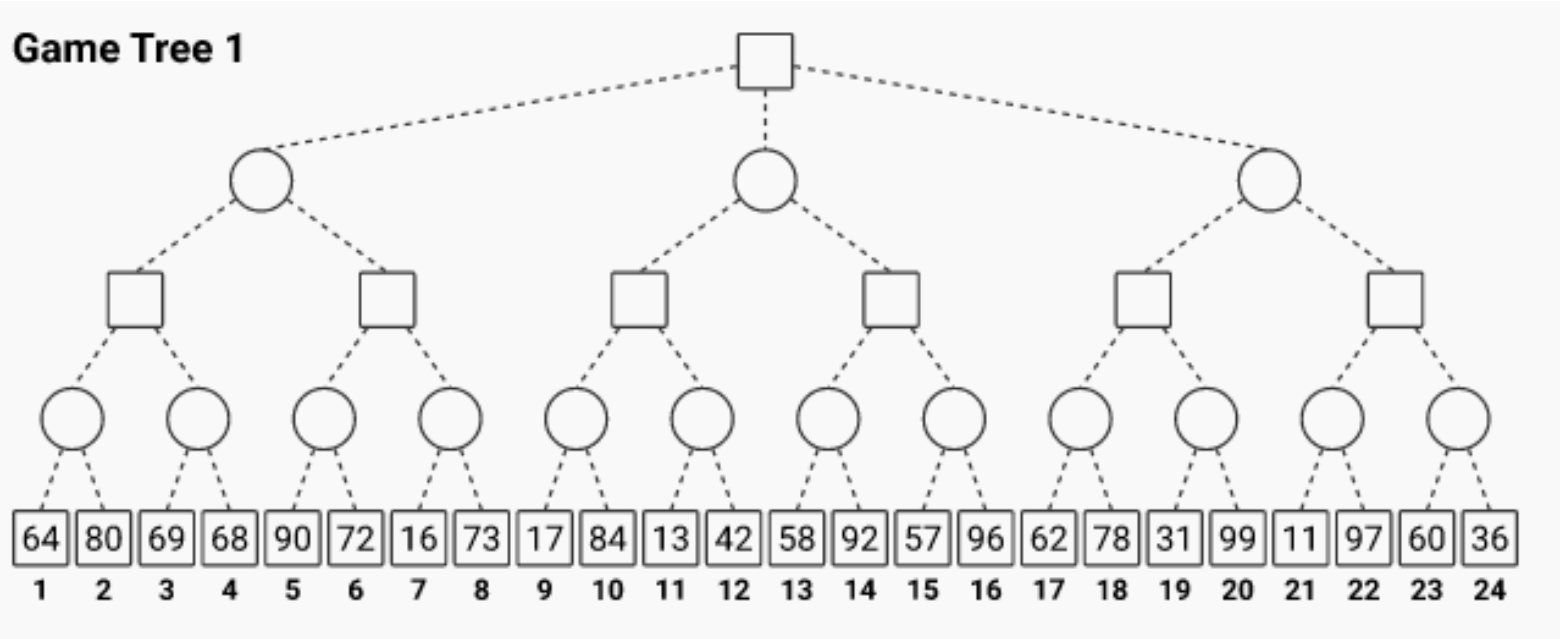
What is the total number of strategies in Game Tree 1? *12* ✓



Question 9

In Game Tree 1, what is the number of initial clusters formed by SSS*?

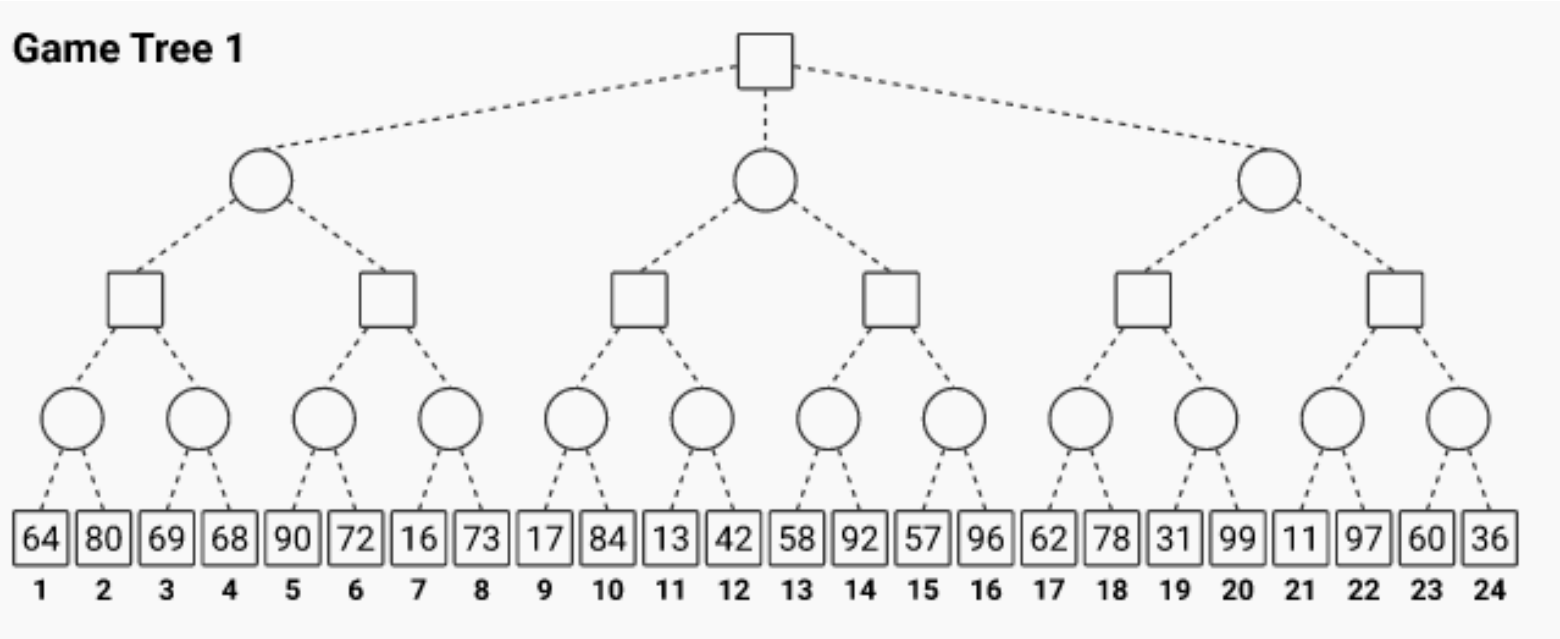
List the horizon nodes in the initial clusters formed by SSS*?



Question 9

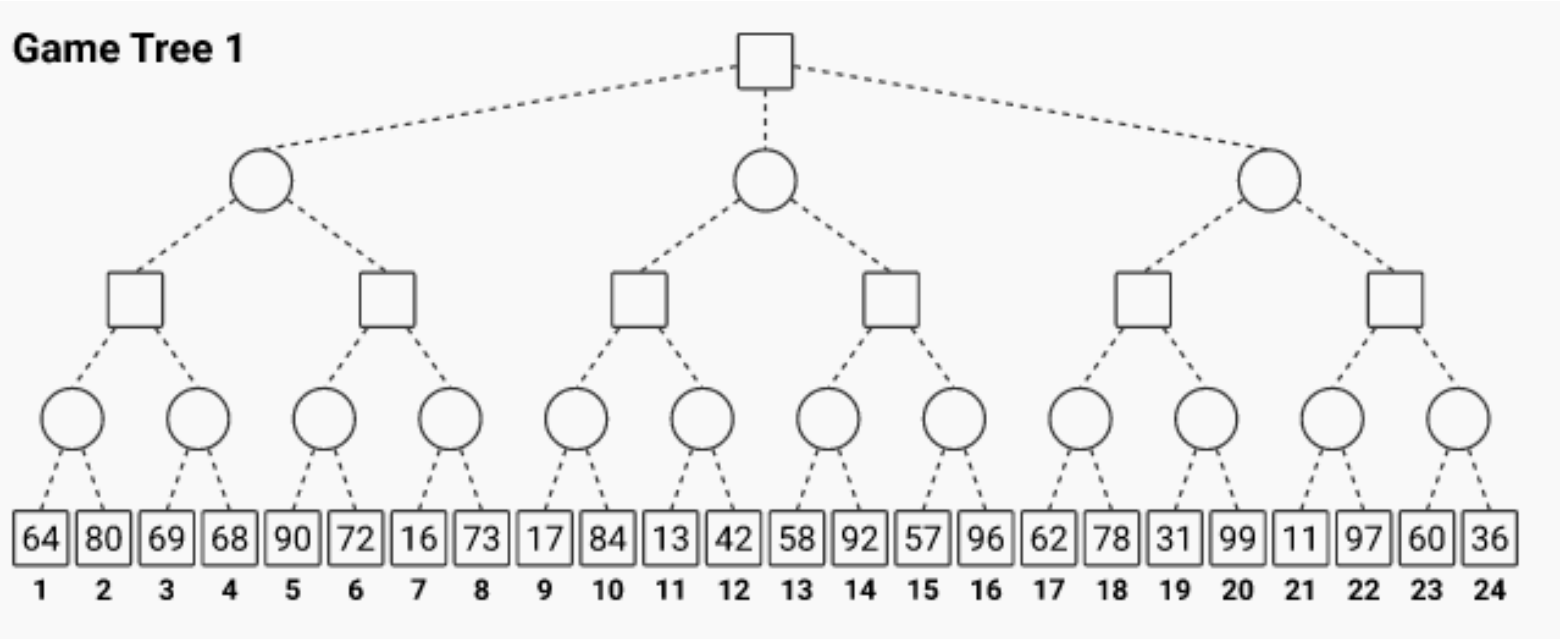
In Game Tree 1, what is the number of initial clusters formed by SSS*? *6* ✓

List the horizon nodes in the initial clusters formed by SSS*? *1,3,9,11,17,19* ✓



Question 10

What are the horizon nodes that are assigned SOLVED status by SSS*? When h-values are equal then select the leftmost deeper node in the tree to break the tie.



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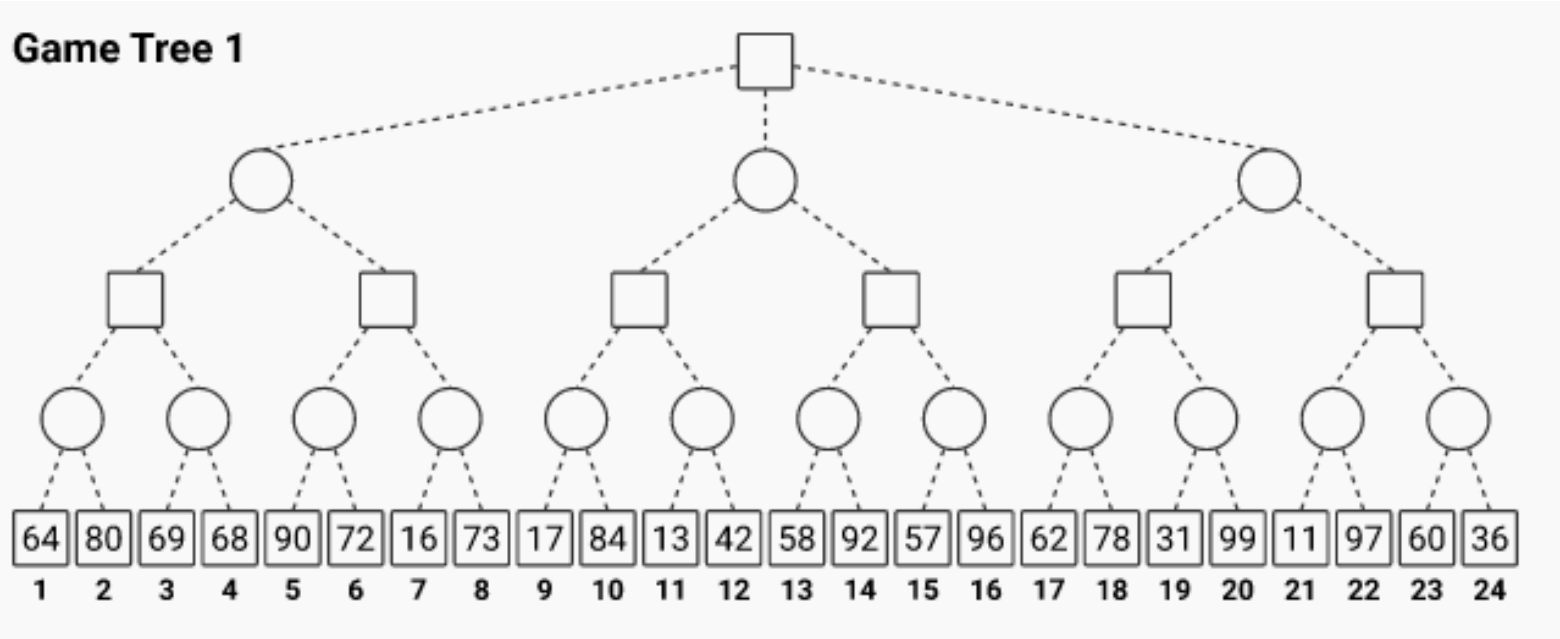

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THANK YOU!