

```
1 import math
2
3 def alphabeta(depth, node_index, is_maximizing, values, alpha, beta, max_depth):
4     if depth == max_depth:
5         return values[node_index]
6
7     if is_maximizing:
8         best = -math.inf
9         for i in range(2):
10             val = alphabeta(depth + 1, node_index * 2 + i, False, values, alpha, beta, max_depth)
11             best = max(best, val)
12             alpha = max(alpha, best)
13
14             print(f"Max node at depth {depth}: value={val}, alpha={alpha}, beta={beta}")
15
16             if beta <= alpha:
17                 print("🚫 Pruned remaining branches (beta cutoff)")
18                 break
19     return best
```

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20
21 else:
22     best = math.inf
23     for i in range(2):
24         val = alphabeta(depth + 1, node_index * 2 + i, True, values, alpha, beta, max_depth)
25         best = min(best, val)
26         beta = min(beta, best)
27
28     print(f"Min node at depth {depth}: value={val}, alpha={alpha}, beta={beta}")
29
30     if beta <= alpha:
31         print("🚫 Pruned remaining branches (alpha cutoff)")
32         break
33     return best
34
35 values = [3, 5, 6, 9, 1, 2, 0, -1]
36
37 print("Leaf Node Values:", values)
38 print("\nAlpha-Beta Pruning Process:\n")
39
40 result = alphabeta(0, 0, True, values, -math.inf, math.inf, 3)
41
42 print("\nOptimal value found:", result)
43
```

>>> %Run -c \$EDITOR_CONTENT

Leaf Node Values: [3, 5, 6, 9, 1, 2, 0, -1]

Alpha-Beta Pruning Process:

Max node at depth 2: value=3, alpha=3, beta=inf

Max node at depth 2: value=5, alpha=5, beta=inf

Min node at depth 1: value=5, alpha=-inf, beta=5

Max node at depth 2: value=6, alpha=6, beta=5

🚫 Pruned remaining branches (beta cutoff)

Min node at depth 1: value=6, alpha=-inf, beta=5

Max node at depth 0: value=5, alpha=5, beta=inf

Max node at depth 2: value=1, alpha=5, beta=inf

Max node at depth 2: value=2, alpha=5, beta=inf

Min node at depth 1: value=2, alpha=5, beta=2

🚫 Pruned remaining branches (alpha cutoff)

Max node at depth 0: value=2, alpha=5, beta=inf

Optimal value found: 5

>>>