"""

Alpha - Beta - Pruning with Mini-Max Algorithm

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"""

import math

import random

ID = input("Please enter your id: ")

check = False

if len(ID) == 8:

check = True

else:

check = False

updated = ''

if check:

for i in range(len(ID)):

if ID[i] == '0':

updated += '8'

else:

updated += ID[i]

lowest = int(updated[4])

to\_win = int(updated[len(ID)-1:len(ID)-3:-1])

highest = int(to\_win \* 1.5)

shuffles = int(updated[3])

levels = int(input("Enter the number of levels: "))

depth = levels - 1

leaf\_nodes = int(math.pow(2, (levels-1)))

root = int(input("Enter the root node: "))

value = int((input("Enter the value of staring node: ")))

print()

m\_node = True

alpha = -math.inf

beta = math.inf

def mini\_max\_algo(start, term, bool, point, alpha, beta):

if start == depth:

return point[term]

elif bool == True:

score = alpha

for i in range(0, depth-1):

temp = mini\_max\_algo(start+1, (term \* 2) + i, False, point, alpha, beta)

score = max(score, temp)

alpha = max(alpha, score)

if alpha >= beta:

break

else:

score = beta

for i in range(0, depth-1):

temp = mini\_max\_algo(start+1, (term \* 2) + i, True, point, alpha, beta)

score = min(score, temp)

beta = min(beta, score)

if alpha >= beta:

break

return score

print("Total points to win: ", to\_win)

print()

shuffle\_list = []

for i in range(shuffles):

terminal = []

for i in range(leaf\_nodes):

a = random.randint(lowest, highest)

terminal.append(a)

print("Generated 8 random points between the minimum and maximum point limits: ")

print(terminal)

a = mini\_max\_algo(root, value, True, terminal, alpha, beta)

print("Achieved point by applying alpha-beta pruning = ", a)

if a >= to\_win:

print("The winner is Optimus Prime")

else:

print("The Winner is Megatron")

print()

shuffle\_list.append(a)

print("After the shuffle: ")

print("List of all points values from each shuffles:")

print(shuffle\_list)

count = 0

for i in range(len(shuffle\_list)):

if shuffle\_list[i] >= to\_win:

count += 1

print("The maximum value of all shuffles: ", max(shuffle\_list))

print("Won", count, "times out of", len(shuffle\_list), "number of shuffles")