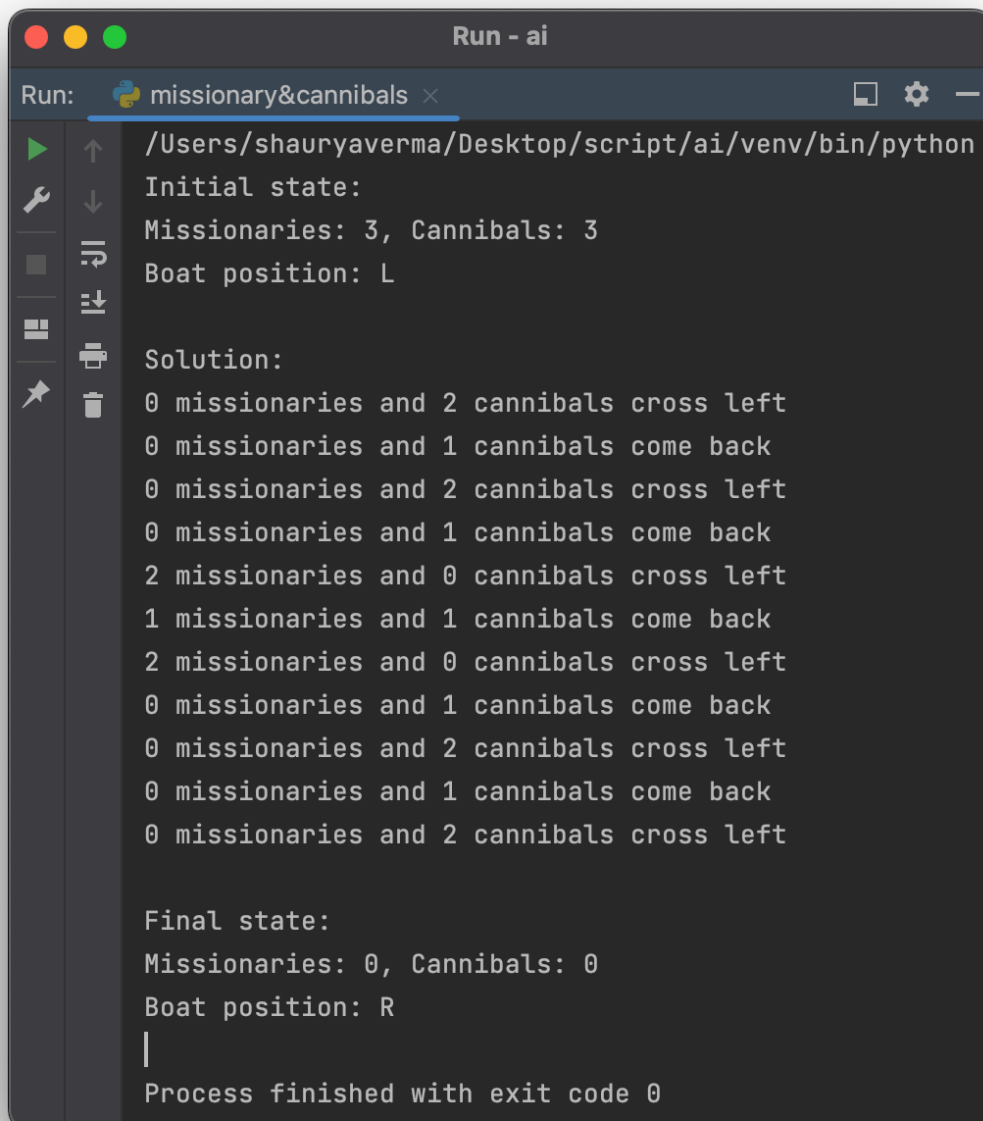This solves the infamous problem of the missionary and the cannibals using BFS (Breadth-First Search Algorithm)

BFS - Implemented in the solve() function

Problem – Transport missionaries and cannibals from one side of the river to the other side on a boat with a fixed capacity

Constraints: Number (Cannibals) <= Number (Missionaries) on either side of the river.

```
Run - ai

Run:    missionary&cannibals ×

    /Users/shauryaverma/Desktop/script/ai/venv/bin/python
    Initial state:
    Missionaries: 3, Cannibals: 3
    Boat position: L

    Solution:
    0 missionaries and 2 cannibals cross left
    0 missionaries and 1 cannibals come back
    0 missionaries and 2 cannibals cross left
    0 missionaries and 1 cannibals come back
    2 missionaries and 0 cannibals cross left
    1 missionaries and 1 cannibals come back
    2 missionaries and 0 cannibals cross left
    0 missionaries and 1 cannibals come back
    0 missionaries and 2 cannibals cross left
    0 missionaries and 1 cannibals come back
    0 missionaries and 2 cannibals cross left

    Final state:
    Missionaries: 0, Cannibals: 0
    Boat position: R

    Process finished with exit code 0
```

Checkout below the game by geeksforgeeks to challenge you to solve the missionary and the cannibals problem with initially 3 cannibals and 3 missionaries on the side of the river with a boat capacity of 2.

CODE –

```python
# Python program to illustrate Missionaries & cannibals Problem
# This code is contributed by Sunit Mal
print("\n")
print("\tGame Start\nNow the task is to move all of them to right side of
the river")
print(
    "rules:\n1. The boat can carry at most two people\n2. If cannibals num
greater than missionaries then the cannibals would eat the missionaries\n3.
The boat cannot cross the river by itself with no people on board")
lM = 3  # lM = Left side Missionaries number
lC = 3  # lC = Laft side Cannibals number
rM = 0  # rM = Right side Missionaries number
rC = 0  # rC = Right side cannibals number
userM = 0  # userM = User input for number of missionaries for right to
left side travel
userC = 0  # userC = User input for number of cannibals for right to left
travel
k = 0
print("\nM M M C C C |  --- | \n")
try:
    while (True):
        while (True):
            print("Left side -> right side river travel")
            # uM = user input for number of missionaries for left to right
travel
            # uC = user input for number of cannibals for left to right
travel
            uM = int(input("Enter number of Missionaries travel => "))
            uC = int(input("Enter number of Cannibals travel => "))

            if ((uM == 0) and (uC == 0)):
                print("Empty travel not possible")
                print("Re-enter : ")
            elif (((uM + uC) <= 2) and ((lM - uM) >= 0) and ((lC - uC) >=
0)):
                break
            else:
                print("Wrong input re-enter : ")
        lM = (lM - uM)
        lC = (lC - uC)
        rM += uM
        rC += uC

        print("\n")
        for i in range(0, lM):
            print("M ", end="")
        for i in range(0, lC):
            print("C ", end="")
        print("| --> | ", end="")
        for i in range(0, rM):
            print("M ", end="")
        for i in range(0, rC):
            print("C ", end="")
        print("\n")

        k += 1

        if (((lC == 3) and (lM == 1)) or ((lC == 3) and (lM == 2)) or ((lC
== 2) and (lM == 1)) or (
```

```python
                (rC == 3) and (rM == 1)) or ((rC == 3) and (rM == 2)) or
((rC == 2) and (rM == 1))):
            print("Cannibals eat missionaries:\nYou lost the game")

            break

        if ((rM + rC) == 6):
            print("You won the game : \n\tCongrats")
            print("Total attempt")
            print(k)
            break
        while (True):
            print("Right side -> Left side river travel")
            userM = int(input("Enter number of Missionaries travel => "))
            userC = int(input("Enter number of Cannibals travel => "))

            if ((userM == 0) and (userC == 0)):
                print("Empty travel not possible")
                print("Re-enter : ")
            elif (((userM + userC) <= 2) and ((rM - userM) >= 0) and ((rC -
userC) >= 0)):
                break
            else:
                print("Wrong input re-enter : ")
        lM += userM
        lC += userC
        rM -= userM
        rC -= userC

        k += 1
        print("\n")
        for i in range(0, lM):
            print("M ", end="")
        for i in range(0, lC):
            print("C ", end="")
        print("| <-- | ", end="")
        for i in range(0, rM):
            print("M ", end="")
        for i in range(0, rC):
            print("C ", end="")
        print("\n")

        if (((lC == 3) and (lM == 1)) or ((lC == 3) and (lM == 2)) or ((lC
== 2) and (lM == 1)) or (
                (rC == 3) and (rM == 1)) or ((rC == 3) and (rM == 2)) or
((rC == 2) and (rM == 1))):
            print("Cannibals eat missionaries:\nYou lost the game")
            break
except EOFError as e:
    print("\nInvalid input please retry !!")
```

Below is the step by step solution to the given challenge, try the game first and match your progress.

OUTPUT –

Run: 🐍 gfgmac ✕

/Users/shauryaverma/Desktop/script/ai/venv/bin/python /Users/shauryaverma/Desktop/script/ai/gfgmac.py

```
        Game Start
Now the task is to move all of them to right side of the river
rules:
1. The boat can carry at most two people
2. If cannibals num greater than missionaries then the cannibals would eat the missionaries
3. The boat cannot cross the river by itself with no people on board

M M M C C C |    --- |

Left side -> right side river travel
Enter number of Missionaries travel => 0
Enter number of Cannibals travel => 2


M M M C | --> | C C

Right side -> Left side river travel
Enter number of Missionaries travel => 0
Enter number of Cannibals travel => 1


M M M C C | <-- | C

Left side -> right side river travel
Enter number of Missionaries travel => 0
Enter number of Cannibals travel => 2
```
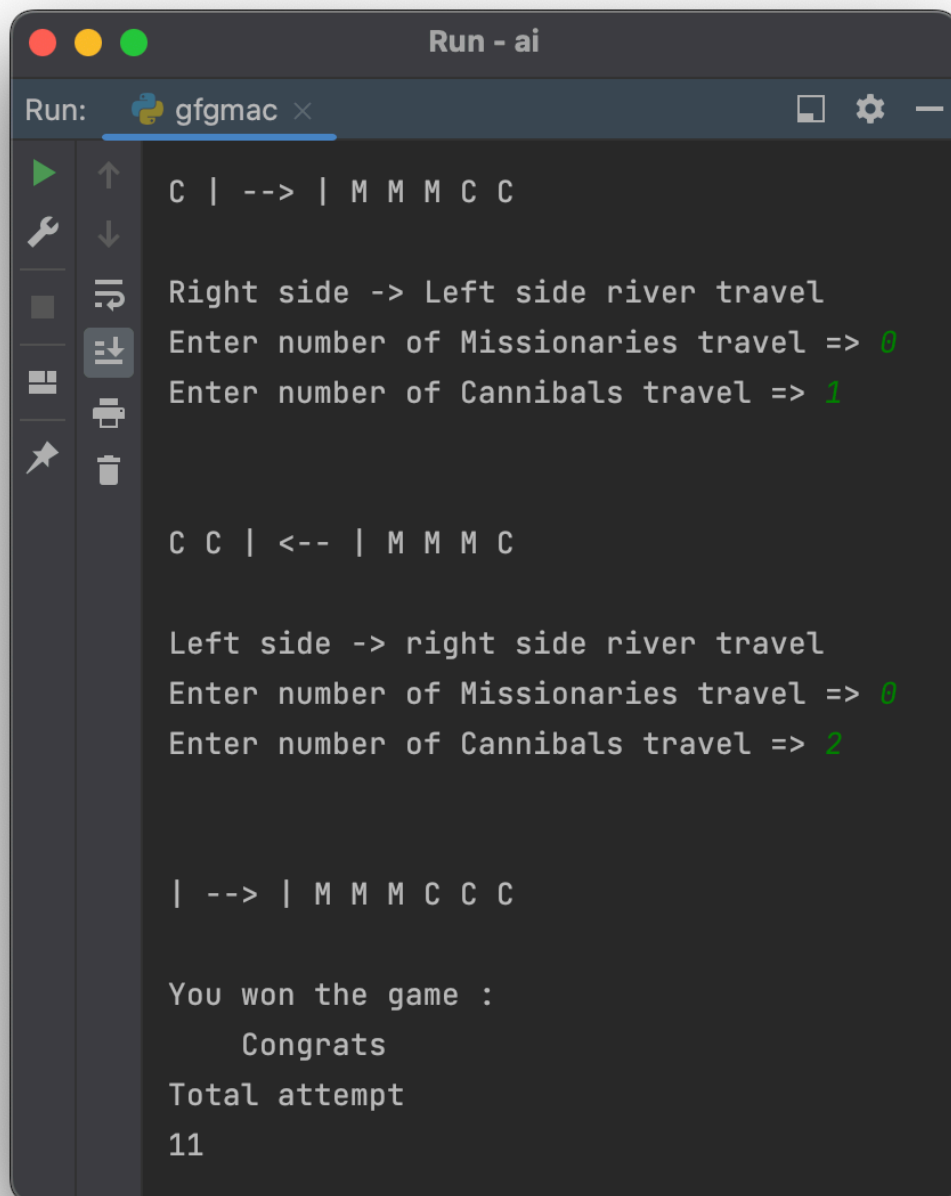
Run: 🐍 gfgmac ✕

```
M M M | --> | C C C

Right side -> Left side river travel
Enter number of Missionaries travel => 0
Enter number of Cannibals travel => 1


M M M C | <-- | C C

Left side -> right side river travel
Enter number of Missionaries travel => 2
Enter number of Cannibals travel => 0


M C | --> | M M C C

Right side -> Left side river travel
Enter number of Missionaries travel => 1
Enter number of Cannibals travel => 1
```

Run: 🐍 gfgmac ✕

```
M M C C | <-- | M C

Left side -> right side river travel
Enter number of Missionaries travel => 2
Enter number of Cannibals travel => 0


C C | --> | M M M C

Right side -> Left side river travel
Enter number of Missionaries travel => 0
Enter number of Cannibals travel => 1


C C C | <-- | M M M

Left side -> right side river travel
Enter number of Missionaries travel => 0
Enter number of Cannibals travel => 2
```

```
             Run - ai

Run:      🐍 gfgmac ✕                        🔲  ⚙  —

 ▶   ↑     C | --> | M M M C C
 🔧  ↓
          Right side -> Left side river travel
 ⬛  ⇥     Enter number of Missionaries travel => 0
 ⬇        Enter number of Cannibals travel => 1
 🖥  🖨
 📌  🗑     C C | <-- | M M M C

          Left side -> right side river travel
          Enter number of Missionaries travel => 0
          Enter number of Cannibals travel => 2


          | --> | M M M C C C


          You won the game :
              Congrats
          Total attempt
          11
```

See if you could do any better than 11 attempts.

Happy Coding !