**Lab 5**

**1. Given a 4-gallon jug (X) and a 3-gallon jug (Y), fill X with exactly 2 gallons of water**

**(assume an infinite amount of water is available)**

**• Implement the above mentioned problem of water jug problem using Python.**

**\*You can implement using these rules or you can give It a try on your own**

**customized method.**

**Rule 1: If X = 0 then X = 4 (fill X)**

**Rule 2: If Y = 0 then Y = 3 (fill Y)**

**Rule 3: If X > 0 then X = 0 (empty X)**

**Rule 4: If Y > 0 then Y = 0 (empty Y)**

**Rule 5: If X + Y >= 3 and X > 0 then X = X – (3 – Y) and Y = 3 (fill Y from X)**

**Rule 6: If X + Y >= 4 and Y > 0 then X = 4 and Y = Y – (4 – X) (fill X from Y)**

**Rule 7: If X + Y <= 3 and X > 0 then X = 0 and Y = X + Y (empty X into Y)**

**Rule 8: If X + Y <= 4 and Y > 0 then X = X + Y and Y = 0 (empty Y into X)**

**Code:**

j1 = 0 # Initial amount in Jug X

j2 = 0 # Initial amount in Jug Y

x = 4 # Capacity of Jug X

y = 3 # Capacity of Jug Y

print("Initial state: (0, 0)")

print("Capacities: (4, 3)")

print("Goal state: (2, 0 or any number)")

while j1 != 2: # Continue until Jug X contains exactly 2 liters

print("\nChoose a rule to apply:")

print("1: Fill Jug X (if X < 4)")

print("2: Fill Jug Y (if Y < 3)")

print("3: Empty Jug X (if X > 0)")

print("4: Empty Jug Y (if Y > 0)")

print("5: Transfer water from Jug X to Jug Y (if X > 0)")

print("6: Transfer water from Jug Y to Jug X (if Y > 0)")

r = int(input("Enter the rule: "))

if r == 1: # Fill Jug X to its full capacity (4 liters)

j1 = x

elif r == 2: # Fill Jug Y to its full capacity (3 liters)

j2 = y

elif r == 3: # Empty Jug X

j1 = 0

elif r == 4: # Empty Jug Y

j2 = 0

elif r == 5: # Transfer water from Jug X to Jug Y without exceeding Jug Y's capacity

transfer = min(j1, y - j2) # Transfer the minimum of Jug X's contents or available space in Jug Y

j1 -= transfer

j2 += transfer

elif r == 6: # Transfer water from Jug Y to Jug X without exceeding Jug X's capacity

transfer = min(j2, x - j1) # Transfer the minimum of Jug Y's contents or available space in Jug X

j2 -= transfer

j1 += transfer

print(f"Current state: Jug X = {j1}, Jug Y = {j2}")

print("Goal achieved! Jug X = 2.")

Output:





