

Date: Ex No: 1.2	Title of the Lab Farmer-Goat-Wolf-Grass	Name: Yuvraj Singh Chauhan Registration Number: RA1911027010058 Section: N1 Lab Batch: 1 Day Order: 3
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AIM:

To implement the Farmer-Goat-Wolf-Grass problem in python.

Description of the Concept or Problem given:

A farmer wants to cross a river but he is not alone. He also has a goat, a wolf, and a grass along with him. There is only one boat available which can support the farmer and either of the goat, wolf or the grass. So at a time, the boat can have only two objects (farmer and one other).

But the problem is, if the goat and wolf are left alone (either in the boat or onshore), the wolf will eat the goat. Similarly, if the Goat and grass are left alone, then goat will eat the grass. The farmer wants to cross the river with all three of his belongings: goat, wolf, and grass.

Manual Solution:

- Taking wolf on other side will leave goat and cabbage together. Also taking away cabbage will make wolf and goat be alone. Hence, the farmer will first take goat on the other side and return back alone. We have farmer, wolf, and cabbage at one side and goat on the other side.
- Now, he will take the wolf along, drop the wolf on the other side and return with the goat. So now on one side, we have farmer, cabbage, and goat and on the other side, we have a wolf.
- Now, he takes the cabbage along and returns alone. So now the scenario is: farmer, goat on one side and wolf, cabbage on the other side.
- Now, finally, he crosses the river with the goat and hence succeeds in taking all his belongings with him.

Program Implementation [Coding]

```
import os  
import time
```

```
names = {"F": "Farmer",  
         "W": "Wolf",  
         "G": "Goat",  
         "GR": "Grass"}
```

```
forbidden_states = [{"W", "G"}, {"G", "GR"}, {"G", "GR", "W"}]
```

```
def print_story():
```

```
    print("""
```

```
##### WOLF, GOAT and CABBAGE PROBLEM #####
```

Once upon a time a farmer went to a market and purchased a wolf, a goat, and a cabbage. On his way home, the farmer came

to the bank of a river and rented a boat. But crossing the river by boat, the farmer could carry only himself and a single

one of his purchases: the wolf, the goat, or the cabbage.

If left unattended together, the wolf would eat the goat, or the goat would eat the cabbage.

The farmer's challenge was to carry himself and his purchases to the far bank of the river, leaving each purchase intact.

How did he do it?

```
""")
```

```
    input("Press enter to continue.")
```

```
def clear():  
    print("*" * 60, "\n")  
  
def print_state(state):  
    left_bank, right_bank = state  
    print("#### CURRENT STATE OF PUZZLE ####")  
    print()  
    left_bank_display = [names[item] for item in left_bank]  
    right_bank_display = [names[item] for item in right_bank]  
    print()  
  
def get_move():  
    print("Which item do you wish to take across the river?")  
    answer = ""  
    while answer.upper() not in ["F", "W", "G", "GR"]:  
        answer = input("Just Farmer (f), Wolf (w), Goat (g) or Grass (gr)? ")  
    return answer.upper()  
  
def process_move(move, state):  
    temp_state = [state[0].copy(), state[1].copy()]  
    containing_set = 0 if move in state[0] else 1  
    if "F" not in state[containing_set]:  
        print("Illegal move.")  
        print()  
        time.sleep(1)  
        return state  
    if containing_set == 0:  
        temp_state[0].difference_update({move, "F"})
```

```
    temp_state[1].update([move, "F"])
elif containing_set == 1:
    temp_state[1].difference_update({move, "F"})
    temp_state[0].update([move, "F"])
if temp_state[0] not in forbidden_states and temp_state[1] not in forbidden_states:
    state = [temp_state[0].copy(), temp_state[1].copy()]
else:
    print("Illegal move.")
    print()
    time.sleep(1)
print()
return state

def is_win(state):
    return state[1] == {"F", "W", "G", "GR"}

def main():
    left_bank = {"F", "W", "G", "GR"}
    right_bank = set()
    state = [left_bank, right_bank]
    print_story()
    while not is_win(state):
        clear()
        print_state(state)
        move = get_move()
        state = process_move(move, state)
    print("Well done - you solved the puzzle!")

main()
```

Screenshots of the Outputs:

WOLF, GOAT and CABBAGE PROBLEM

Once upon a time a farmer went to a market and purchased a wolf, a goat, and a cabbage. On his way home, the farmer came to the bank of a river and rented a boat. But crossing the river by boat, the farmer could carry only himself and a single one of his purchases: the wolf, the goat, or the cabbage.

If left unattended together, the wolf would eat the goat, or the goat would eat the cabbage.

The farmer's challenge was to carry himself and his purchases to the far bank of the river, leaving each purchase intact. How did he do it?

Press enter to continue.

CURRENT STATE OF PUZZLE

Which item do you wish to take across the river?
Just Farmer (f), Wolf (w), Goat (g) or Grass (gr)? g

CURRENT STATE OF PUZZLE

Which item do you wish to take across the river?
Just Farmer (f), Wolf (w), Goat (g) or Grass (gr)? f

CURRENT STATE OF PUZZLE

Which item do you wish to take across the river?
Just Farmer (f), Wolf (w), Goat (g) or Grass (gr)? gr

```
Which item do you wish to take across the river?  
Just Farmer (f), Wolf (w), Goat (g) or Grass (gr)? gr
```

```
*****
```

```
#### CURRENT STATE OF PUZZLE ####
```

```
Which item do you wish to take across the river?  
Just Farmer (f), Wolf (w), Goat (g) or Grass (gr)? g
```

```
*****
```

```
#### CURRENT STATE OF PUZZLE ####
```

```
Which item do you wish to take across the river?  
Just Farmer (f), Wolf (w), Goat (g) or Grass (gr)? w
```

```
*****
```

```
#### CURRENT STATE OF PUZZLE ####
```

```
Which item do you wish to take across the river?  
Just Farmer (f), Wolf (w), Goat (g) or Grass (gr)? f
```

```
*****
```

```
#### CURRENT STATE OF PUZZLE ####
```

```
Which item do you wish to take across the river?  
Just Farmer (f), Wolf (w), Goat (g) or Grass (gr)? g
```

```
Well done - you solved the puzzle!
```

Signature of the Student

[YUVRAJ SINGH CHAUHAN]