PURPOSE OF OUR PROGRAM

THE PURPOSE OF OUR CREATED PROGRAM IS TO HELP A HOUSEHOLD'S BUDGETING AND FINANCING BASED ON THE HOUSEHOLD'S INCOME.

Iteration 1

Problem Identification

BUDGET MANAGEMENT IN A HOUSEHOLD

THE MONTHLY INCOME ON A CERTAIN HOUSEHOLS IS ENOUGH FOR THE NEEDS LIKE RENT, GROCERIES, ELECTRICITY AND WATER BILLS, ETC. BUT SOMETIMES THERE ARE MISCELLANEOUS BILLS TO PAY FOR LIKE SPECIFIC WANTS, DEBTS, EMERGENCY BILLS, MAINTENANCE, TRAVEL COSTS, ETC.

To set up your identified problem

Graphic Organizer

Decomposition (How would you break down your problem into sub-problems?

- ASSESS TOTAL HOUSEHOLD INCOME AND DETERMINE ITS SUFFICIENCY FOR COVERING BOTH ESSENTIAL NEEDS AND MISCELLANEOUS BILLS.

Pattern Recognition (Are there related solutions to draw on?)

- RECOGNIZE PATTERNS IN SPENDING BEHAVIOR
- IDENTIFY IRREGULARITIES IN INCOME OR EXPENSES

Abstraction (How would you abstract this problem?)

- CREATE STRATEGIES TO INCREASE EFFICIENCY IN SPENDING

```
Your expenses:
    - RENT (Priority: 10.0, Cost: 8790.0)
    - WATER BILL (Priority: 7.0, Cost: 2345.0)
    - ELECTRICITY BILL (Priority: 7.0, Cost: 3456.0)
    - GROCERIES (Priority: 8.0, Cost: 5670.0)
    - NEW TIRES (Priority: 5.0, Cost: 5000.0)
    - BROKEN DOOR (Priority: 4.0, Cost: 700.0)
    - LEAK IN THE PIPES (Priority: 4.0, Cost: 2300.0)
    - BROKEN DISHWASHER (Priority: 3.0, Cost: 2400.0)
    - GTA VI (Priority: 6.0, Cost: 2500.0)
    - BATTLE PASS (Priority: 3.0, Cost: 1000.0)
    - NEW MOUSE (Priority: 2.0, Cost: 2100.0)

Enter Salary amount (monthly): 30000
```

Iteration 2

Problem Identification

HOW TO MAKE THE BEST CHOICE IN WHAT TO PAY FOR WITH THE LIMITED/FIXED INCOME OF THE HOUSEHOLD

To set up your identified problem

Decomposition (How would you break down your problem into sub-problems?)

SUBPROBLEM:

- IDENTIFY AND CATEGORIZE ESSENTIAL NEEDS VARIOUS MISCELLANEOUS BILLS

Pattern Recognition (Are there related solutions to draw on?)

- IDENTIFY COMMON CATEGORIES WHERE OVERSPENDING OCCURS

Abstraction (How would you abstract this problem?)

- PRIORITIZING EXPENSES: RANKING YOUR NEEDS BASED ON IMPORTANCE
- EVALUATION OF EXPENSES (IS THIS EXPENSE WORTH IT)

Graphic Organizer

```
Total expenses of selected items = 29961.0
    BROKEN DISHWASHER: <3.0, 2400.0>
    LEAK IN THE PIPES: <4.0, 2300.0>
    NEW TIRES: <5.0, 5000.0>
    ELECTRICITY BILL: <7.0, 3456.0>
    WATER BILL: <7.0, 2345.0>
    GROCERIES: <8.0, 5670.0>
    RENT: <10.0, 8790.0>

Left budget for miscellaneous: -6261.0
I recommend you to cut back on some non-essential spendings to satisfy your miscellaneous need.
```

HOW WILL WE SOLVE THE PROBLEM?

BY BASING OUR SOLUTION TO THE KNAPSACK PROBLEM. THE CODE SPECIFICALLY ADDRESSES THE KNAPSACK PROBLEM, WHERE THE GOAL IS TO DETERMINE THE MOST VALUABLE COMBINATION OF ITEMS (EXPENSES, IN THIS CASE) TO INCLUDE IN A KNAPSACK (WITHIN A GIVEN BUDGET) IN ORDER TO MAXIMIZE A CERTAIN VALUE (TOTAL PRIORITY).

THE ALGORITHM AIMS TO FIND THE COMBINATION OF EXPENSES THAT MAXIMIZES THE TOTAL PRIORITY WHILE STAYING WITHIN THE BUDGET CONSTRAINT.

WITH THIS SOLUTION, IT HELPS THE USER TO MAKE DECISIONS BASED ON THE OPTIMAL SELECTIONS OF ITEMS THAT ARE CHOSEN WITH MAXIMIZED VALUE (THE PRIORITY/COST RATIO IN OUR CASE).

HOW WILL WE SOLVE THE PROBLEM?

DYNAMIC PROGRAMMING (TOP-DOWN APPROACH WITH MEMOIZATION)

THE CODE APPLIES DYNAMIC PROGRAMMING WITH A TOP-DOWN APPROACH AND MEMOIZATION TO SOLVE THE KNAPSACK PROBLEM EFFICIENTLY. THE ALGORITHM EXPLORES DIFFERENT COMBINATIONS OF EXPENSES AND USES MEMOIZATION TO AVOID REDUNDANT CALCULATIONS, RESULTING IN AN OPTIMIZED SOLUTION.

THE MEMO DICTIONARY IS USED TO STORE AND RETRIEVE PREVIOUSLY COMPUTED RESULTS FOR SPECIFIC COMBINATIONS OF THE NUMBER OF EXPENSES AND THE REMAINING BUDGET.