Solution 2: Simple Application of Statements

Task 1: BMI Calculator

Write a Python program that asks the user for their name, height, and weight, then calculate and print the BMI value with the user's name.

```python
name = input("Enter your name: ")
height = input("Enter your height: ")
weight = input("Enter your weight: ")

# BMI Calculation
BMI = weight / height**2 # weight (kg) and height (m)

print(f"Hello {name}! Your BMI is {BMI}.")
```

*Task 2: Combination Calculation ($\mathbf{C_r^n = \frac{n!}{(n-r)!r!}}$)

Define C_r^n as number of ways to choose r items from n items without repetition and without order. The task is to assign two inputs: n and r, and use math library (see url attached) to compute the associated combination. url: `https://docs.python.org/3/library/math.html#`

```python
# import library
import math

n = input("n = ")
r = input("r = ")

num_c = math.comb(n, r)

"""
Another method

num_c = math.factorial(n) / (math.factorial(n-r) * math.factorial(r))

"""

print(f"The combination of choosing {r} items from {n} items is {num_c}")
```

*Task 3: Acid-Base Calculation

2 L of solution of $5 \times 10^{-}3$ M HCL and $3 \times 10^{-}3$ M $AgNO_3$ mixing together. Calculate the followings:

1. pH of the solution
2. Mass of precipitation
3. Mass of pure water (without HCL and $AgNO_3$)

```python
# import library
import math

HCL_M = 5e-3     # equals to 5 * 10**-3
AgNO3_M = 3e-3   # equals to 3 * 10**-3
V = 2            # 2 L of water

total_H = HCL_M + AgNO3_M
precipitation = AgNO3_M # the precipitation is AgNO3

pH = -math.log10(total_H)

print(f"The pH of the solution is {pH}")     # 2.097

AgCl_molar_mass = 143.32    # g/mol

AgCl_mass = precipitation * V * AgCl_molar_mass

print(f"The precipitation is AgCl, and it weighs {AgCl_mass}")  # 0.860 g

HCl_density = 1.18       # g/cm3
HCL_molar_mass = 36.46   # g/mol

AgNO3_density = 4.35         # g/cm3
AgNO3_molar_mass = 169.87    # g/mol

HCl_mass = HCL_M * V * HCL_molar_mass
AgNO3_mass = AgNO3_M * V * AgNO3_molar_mass

water_density = 0.997 # g/cm3

water_mass = V * (water_density * 1000) - (HCl_mass + AgNO3_mass)

print(f"Pure water mass is {water_mass}")    # 1992.616 g
```