Python Compound Interest Calculator

Calculating the interest earned or paid on an investment or loan requires some user data and a formula. We can use Python to do the calculations.

The Compound Interest Formula:

$$A = P(1 + \frac{r}{n})^{nt}$$

A = final amount

P = initial principal balance

r = interest rate

n = number of times interest applied per time period

t = number of time periods elapsed

For this exercise we'll need to ask the user to enter the:

- principal (P) amount they want to invest
- what the interest rate (r – as a decimal) is
- how often we'll be compounding (n – if compounding daily, n is 365)
- the number of years (t).

These numbers are put into the formula to find:

- amount in the bank at the end of the time.

How would we extend this to find the Interest earned (I)?

```
# Python Compound Interest Calculator

# Declare the four variables
principle = 0
rate = 0
compounding_period = 365 # <-- Assumes daily
time = 0

# For Input Validation we use a While Loop
# The While Loop prompts user to enter a (+)ve number
while principle <= 0:
    principle = float(input("Enter the amount to invest: "))
    if principle <= 0:
        print("Principal must be greater than zero!")

# Use a While Loop to prompt user to enter a (+)ve number
while rate <= 0:
    rate = float(input("Enter the interest rate: "))
    if rate <= 0:
        print("Rate must be a positive number!")

# Use a While Loop to prompt user to enter a (+)ve number
while time <= 0:
    time = float(input("Enter investment time in years: "))
    if time <= 0:
        print("Time must be greater than zero!")

#total = principle * pow(1 + rate/(100*compounding_period),
(compounding_period * time))
total = principle * ((1 + rate/(100*compounding_period)) **
(compounding_period * time))

print(f"Your balance after {time} years compounded daily at")
print(f"an interest rate of {rate}% will be ${total:.2f}")
```

Note in the calculation, we can bring one value to the power of another using multiple techniques:

$$x = y^z$$

- x = pow(y, z) or
- x = y ** z

Basic: Extend this code to specify the amount of interest earned at the end of the period.

Advanced: Extend the code to allow the user to specify if the investment is compounded daily (365), weekly (52), monthly (12) or annually (1).