

FINE 3300 (Winter 2025): Assignment #1

Important

- Assignment is due on February 3, 2025 by 8:30 am (Toronto – Eastern Standard Time)
- Upload your Python files (.py) and any write-up (.pdf) on Canvas.
- You may make multiple submissions online, but only the most recent submission will be graded.
- Late submissions will automatically receive a grade of *zero*.
- Your code should be commented appropriately. Specify the question number in the comments followed by your code that generates the results.
- Cite any material or source you have referenced.

Introduction

This assignment is a fun way to learn how to write code in Python, use Visual Studio Code, and work on GitHub. Before starting, make sure you have Python and Visual Studio Code installed on your computer. You can find instructions in Lectures #1 & #2.

For this assignment, you will create a GitHub repository and write a short program that calculates the *monthly*, *semi-monthly*, *bi-weekly*, *rapid bi-weekly*, *weekly*, and *rapid weekly* amounts based on user input. You will upload the code to GitHub (use Git commands) and share the link to your repository as part of your assignment.

Canadian Home Mortgages

In Canada, you can get a home mortgage with either a fixed or variable interest rate. With a fixed rate mortgage, the interest rate stays the same throughout the term of the mortgage, so your monthly payments stay the same. A new rate is renegotiated upon maturity (unless the outstanding principal balance is paid in full).

With a variable rate mortgage, the interest rate may go up or down during the term of your mortgage. Some lenders adjust your payments, while others keep them the same and extend the amortization period to pay off the loan. This only happens if the interest rate is below a certain limit called the “trigger rate.” If the interest rate goes above the trigger rate, you will have to recalculate your payments or make a lump-sum payment to keep up with the interest.

By convention (and law) rates on fixed rate mortgages are quoted as semiannually compounded rates, while variable rate mortgages do not necessarily follow the same convention. For this assignment, we will focus on fixed-rate mortgages.

GitHub Repository

Setup a new public repository on GitHub and name it FINE3300-Mortgage-Payments. When setting up the repository, provide a short description, and select the option to add a README file. You will notice README.md file appear upon creation of the repository.

The *.md* extension is for a Markdown file, and GitHub uses this file to display details about the repository. You can read about Markdown at: <https://www.markdownguide.org> and its basic syntax at <https://www.markdownguide.org/basic-syntax/>. Markdown files can easily be modified in a text editor such as Microsoft's Visual Studio Code.

Clone your repository to your local computer. Open the folder in Visual Studio Code and write a description about your project. Consider it like a webpage that provides detailed information about the project.

Mortgage Payments

Several payment options are available to borrowers, such as *monthly*, *semi-monthly*, *bi-weekly*, *weekly*, *rapid bi-weekly*, and *rapid weekly*.

Monthly payments mean that only one payment is made every month.

Semi-monthly payments mean that 2 payments are made every month. These payments would typically occur in the middle and the end of the month (24 payments a year).

Bi-weekly payments are made every two weeks (26 payments a year).

Accelerated Bi-weekly payments are also made every two weeks. The payment is equal to half the monthly amount.

Weekly payments are made every week (52 payments a year)

Accelerated Weekly payments are also made every week. The payment is equal to one-quarter of the monthly amount.

Python Implementation

To determine periodic payments, you will have to make use of the present value of annuity factor. Specifically, you will have to code the following:

$$PVA(r, n) = \frac{1 - (1 + r)^{-n}}{r}$$

where r is the periodic interest rate and n is the number of periods. Since fixed rate mortgages are quoted as semiannually compounded rates, you will have to calculate the appropriate periodic rate as follows:

If r_q is the quoted rate, then:

$$r = (1 + r_q/2)^{(2/12)} - 1 \text{ for monthly payments}$$

$$r = (1 + r_q/2)^{(2/24)} - 1 \text{ for semi-monthly payments}$$

$$r = (1 + r_q/2)^{(2/26)} - 1 \text{ for bi-weekly payments}$$

$$r = (1 + r_q/2)^{(2/52)} - 1 \text{ for weekly payments}$$

Assignment #1

1. Write a function named `mortgage_payments` that takes three parameters (named `principal`, `rate`, and `amortization`), and returns a tuple of six values representing the monthly, semi-monthly, bi-weekly, weekly, rapid bi-weekly, and rapid weekly payments.
2. Your program should prompt the user to enter the principal amount, the quoted interest rate (as a percent, for example, 4.85), and the amortization period in years. Use the `input()` function to prompt the user and read the entered values. We will assume that users will provide legitimate input values so no validation checks will be performed on the input values. <https://cs.stanford.edu/people/nick/py/python-input.html> has a simple example on using the `input()` function.
3. Format your output (rounded to the nearest penny) so that it appears as follows:

```
Monthly Payment:  $610.39
Semi-monthly Payment:  $304.85
Bi-weekly Payment:  $281.38
Weekly Payment:  $140.61
Rapid Bi-weekly Payment:  $305.20
Rapid Weekly Payment:  $152.60
```

The above values were obtained for a principal amount of \$100,000, a quoted rate of 5.5%, and an amortization period of 25 years.

4. Upload your final code to your GitHub account.
5. In your write-up,
 - (a) provide the link to your GitHub repository.
 - (b) paste the output from your program for a principal amount of \$500,000, quoted at 5.5%, and amortized over 25 years.
6. Submit your write-up and coding files on Canvas.