Project: p03
Assignment: Project p03 is a suite of programs. Program p03a finds the monthly payment. Program p03b finds the principal. Program p03c finds the term. Figure 1 illustrates the dialog produced by program p03a. Figure 2 shows the dialog produced by program p03b and figure 3 shows the dialog produced by program p03c. Input entered by the user is italicized and shown in bold.

You must employ functions similar to the example shown in figure 2 of lecture 13 to receive full credit for this project.

Discussion:
Solve \( R = P \frac{i}{1-(1+i)^{-n}} \) for \( P \) in program p03b. Solve \( R = P \frac{i}{1-(1+i)^{-n}} \) for \( n \) in program p03c.

Implementation Requirements
Implement prompts for principal, monthly payment, term, and interest using separate functions. Implement the calculation of payment in program p03a, the calculation of principal in program p03b, and the calculation of the term in p03c as separate functions.

Program Files: Project 3 consists of files p03a.cpp, p03b.cpp, and p03c.cpp.

Project files must be stored in the root directory of your student account. Failure to store project files in the root directory of your student account will result in a score of zero (0) for this project.

Command Line: Executable files p03a, p03b, and p03c are invoked with no program parameters as shown below.

\$ p03a
\$ p03b
\$ p03c

Note:
\[ R = P \frac{i}{1-(1+i)^{-n}} \]

\( R \): (rent) monthly payment
\( P \): principal (amount borrowed)
\( i \): monthly interest rate
\( n \): number of months in the term

Enter the principal. 1000
Enter the APR. 8
Enter the number of years in the term. 1
Your monthly payment is $86.99.

Figure 1. Output format for program p03a.

Enter the monthly payment. 86.99
Enter the APR. 8
Enter the number of years in the term. 1
You can borrow $1000.02.

Figure 2. Output format for program p03b.
Enter the principal. **1000**
Enter the monthly payment. **86.99**
Enter the APR. **8**
You must make payments for 12.00 months or 1.00 years.

Figure 3. Output format for program p03b.

**Project:** p03d (10 points extra credit)
You must make this program function correctly to receive the bonus for this program.

**Assignment:** Project **p03d** finds the monthly interest rate given principal, payment, and the term. Figure 4 shows the output produced by program **p03d**.

**Discussion:** There is no closed form expression $i = f(P, R, n)$ where $P$ is the principal, $R$ is the payment, and $n$ is the term given in months. The monthly interest rate $i$ can be found using Newton’s method.

**Program Files:** Project **p03d** consists of files **p03d.cpp**.

**Command Line:** Executable files **p03d** is invoked with no program parameters as shown below.

```
$ p03d
```

**Note:**

\[
R = P \frac{i}{1-(1+i)^{-n}}
\]

$R$: (rent) monthly payment

$P$: principal (amount borrowed)

$i$: monthly interest rate

$n$: number of months in the term

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Enter the principal. **1000**
Enter the monthly payment. **86.99**
Enter the number of years in the term. **1**
Your monthly interest rate is 0.006669.
Your APR is 8.00.

Figure 4. Output format for program p03d.