

# 1 Introduction

These exercises are to get you familiar with some simple calculations in C++. You have probably done similar calculations in other languages. For this series of exercises you can put all of them into one project file, that is a single cpp file.

## 2 Exercises

1. Write a program that calculates a car's gas mileage. The program should ask the user to enter the number of gallons of gas the car can hold and the number of miles it can be driven on a full tank. It should then display the number of miles that may be driven per gallon of gas.

2. A cookie recipe calls for the following ingredients:

- 1.5 cups of sugar
- 1 cup of butter
- 3 cups of flour

The recipe produces 48 cookies with this amount of the ingredients. Write a program that asks the user how many cookies he or she wants to make, and then displays the number of cups of each ingredient needed for the specified number of cookies.

3. Write a program that converts Celsius temperatures to Fahrenheit temperatures. The formula is

$$F = \frac{9}{5} \cdot C + 32$$

$F$  is the Fahrenheit temperature, and  $C$  is the Celsius temperature.

4. Write a program that converts Fahrenheit temperatures to Celsius temperatures.
5. Write a program that will convert U.S. dollar amounts to another currency given the exchange rate between the two. The program should ask the user for the amount of U.S. dollars to convert, the name of the new currency (for example, Euros, Yen, Pesos, ...), and the exchange rate (that is one U.S. dollar is worth this in the new currency, so if one U.S. dollar is worth 20 Pesos the user would input 20). The program should then print out something like,

25 U.S. dollar(s) is 1250 Pesos.

To test the program you use exchange rates from the Internet.

6. Write a program that asks the user for an angle, entered in radians. The program should then display the sine, cosine, and tangent of the angle, remember to use the `cmath` include.

7. Assuming there are no deposits other than the original investment, the balance in a savings account after one year may be calculated as

$$A = P \cdot \left(1 + \frac{r}{n}\right)^n$$

$P$  is the principal in the savings account,  $r$  is the annual interest rate in decimal form (that is,  $4\% = 0.04$ ), and  $n$  is the number of times the interest is compounded during a year ( $n$  is 4 if the interest is compounded quarterly, 12 if compounded monthly, ...). Write a program that asks for the principal, the annual interest rate, and the number of times the interest is compounded. It should then display a report similar to

```
Interest Rate:           4.25%
Times Compounded:       12
Principal:              $   1000.00
Interest:               $    43.34
Amount in Savings: $   1043.34
```

8. The monthly payment on a loan may be calculated by the following formula:

$$P = \frac{\frac{r}{12} \left(1 + \frac{r}{12}\right)^n}{\left(1 + \frac{r}{12}\right)^n - 1} \cdot L$$

$r$  is the annual interest rate,  $n$  is the number of payments, and  $L$  is the amount of the loan. Write a program that asks for these values and displays a report similar to

```
Interest Rate:           12.00%
Number of Payments:      36
Loan Amount:             $  10000.00
Monthly Payment:        $    332.14
Amount Paid Back:       $  11957.15
Interest Paid:          $    1957.15
```

### 3 Program Example Runs

```
Input the number of gallons the tank holds: 12
Input the number of miles you can drive on a full tank: 450
Your car gets 37.5 miles per gallon.
```

```
How many cookies do wish to make: 100
You will need,
3.125 cups of sugar
2.08333 cups of butter
6.25 cups of flour
```

Input the temperature in Celsius: 35  
The Fahrenheit temperature is 95 degrees.

Input the temperature in Fahrenheit: 72  
The Celsius temperature is 22.2222 degrees.

Number of U.S. dollars to exchange: 127.39  
Name of currency to exchange to: Peso  
Exchange rate (1 U.S. dollar is this number of Pesos): 50  
127.39 U.S. dollar(s) is 6369.5 Pesos.

Input the angle (in radians): 2.659  
 $\sin(2.659) = 0.464077$   
 $\cos(2.659) = -0.885795$   
 $\tan(2.659) = -0.523911$

Input the principal in the account: 1000  
Input the annual interest rate in decimal form ( $4\% = 0.04$ ): .0425  
Input the number of times interest is compounded per year: 12

Interest Rate:	4.25%
Times Compounded:	12
Principal:	\$ 1000.00
Interest:	\$ 43.34
Amount in Savings:	\$ 1043.34

Input the loan amount: 10000  
Input the annual interest rate in decimal form ( $4\% = 0.04$ ): .12  
Input the number of payments on the loan: 36

Interest Rate:	12.00%
Number of Payments:	36
Loan Amount:	\$ 10000.00
Monthly Payment:	\$ 332.14
Amount Paid Back:	\$ 11957.15
Interest Paid:	\$ 1957.15

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Input the number of gallons the tank holds: 15  
Input the number of miles you can drive on a full tank: 325  
Your car gets 21.6667 miles per gallon.

How many cookies do wish to make: 24

You will need,

0.75 cups of sugar

0.5 cups of butter

1.5 cups of flour

Input the temperature in Celsius: 12

The Fahrenheit temperature is 53.6 degrees.

Input the temperature in Fahrenheit: 55

The Celsius temperature is 12.7778 degrees.

Number of U.S. dollars to exchange: 1000

Name of currency to exchange to: Pound

Exchange rate (1 U.S. dollar is this number of Pounds): 0.86

1000 U.S. dollar(s) is 860 Pounds.

Input the angle (in radians): 1.258

$\sin(1.258) = 0.951477$

$\cos(1.258) = 0.30772$

$\tan(1.258) = 3.09202$

Input the principal in the account: 100000

Input the annual interest rate in decimal form ( $4\% = 0.04$ ): .014

Input the number of times interest is compounded per year: 4

Interest Rate: 1.40%

Times Compounded: 4

Principal: \$ 100000.00

Interest: \$ 1407.37

Amount in Savings: \$ 101407.37

Input the loan amount: 500000

Input the annual interest rate in decimal form ( $4\% = 0.04$ ): .0225

Input the number of payments on the loan: 360

Interest Rate: 2.25%

Number of Payments: 360

Loan Amount: \$ 500000.00

Monthly Payment: \$ 1911.23

Amount Paid Back: \$ 688042.98

Interest Paid: \$ 188042.98

## 4 Submit Your Work

As before, submit the code file through the file uploads to the MyClasses system.