Hands-on Activity 6.2	
Built-in Functions	
Course Code: CPE007	**Program:** Computer Engineering
Course Title: Programming Logic and Design	**Date Performed:**
Section:CPE11S1	**Date Submitted:**
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6. Output

1.

Code:

```
#include <iostream>
#include <cmath>

using namespace std;

int getVolSqr(int side);


int main (){
    int inputSide;
    cout << "======================== Welcome to Square Volume Calculator ======================\n";
    cout << "Please input side to calculate the volume \nSide(in cm):";
    cin >> inputSide;
    int sqrVol = getVolSqr(inputSide);
    printf("If a cube has a side of %i cm , then it will have a volume of %i cubic cm\n",inputSide,sqrVol);
    cout << "Thank you for using The Square Volume Calculator\n================================================================================";
    return 0;
}

int getVolSqr(int side){
    return pow(side,3);
}
```

Output:

```
C:\Users\nielc\Documents\SqrVol.exe
======================== Welcome to Square Volume Calculator ======================
Please input side to calculate the volume
Side(in cm):3
If a cube has a side of 3 cm , then it will have a volume of 27 cubic cm
Thank you for using The Square Volume Calculator
================================================================================
--------------------------------
Process exited after 2.718 seconds with return value 0
Press any key to continue . . .
```

2.Code

```cpp
#include <iostream>
#include <cmath>
#include <conio.h>

using namespace std;

void printGreet();
void choiceDialogue(int &curChoice);
bool choiceSelect();

double hypotenuse(double adj, double opp);

int main (){
    bool runLoop = true;
    printGreet();
    while (runLoop){
        double inputSideA,inputSideO;
        cout << "Input 2 sides of the triangle (The opposite and the adjacent)\n";
        cout << "Input side a(Adjacent): ";
        cin >> inputSideA;
        cout << "Input side o(Opposite): ";
        cin >> inputSideO;
        double hyp = hypotenuse(inputSideA,inputSideO);
        printf("From the measurement of the sides: (%g and %g), the measurement of the hypotenuse is %g\n",inputSideA,inputSideO,hyp);
        cout << "\nWould you like to calculate more?\n(/)Yes ( )No";
        runLoop = choiceSelect();
        if (runLoop){
            system("cls");//CLears output
            printGreet();
        }
    }
    cout << "Exiting program if you need to calculate another hypotenuse, rerun the program" << endl;
    cout << "";
    retun 0;
}

void printGreet(){
    cout << "======================================== Welcome To Hypotenuse Finder ========================================\n";
}

void choiceDialogue(bool &curChoice){
    cout << "\r";// Move back to start of line to redraw
    if (curChoice == true){
        cout << "( )Yes (/)No" << flush;
    }
    else {
        cout << "(/)Yes ( )No" << flush;
    }
    curChoice = !curChoice;//Flips it
}
```

```cpp
//if return true break loop if not repeat loop
bool choiceSelect(){
    int ch;
    bool currentChoice = true;//true meaning yes
    while (true) {
        ch = _getch(); // Get a character without waiting for Enter

        if (ch == 0 || ch == 224) { // Special key indicator
            ch = _getch(); // Get the actual key code
            switch (ch) {
                case 75:
                case 77:
                    choiceDialogue(currentChoice);
                    break;
            }
        } else if (ch == 13) {
            cout << endl;
            if (currentChoice == true){
                return true;
            }
            else {
                return false;
            }
        }
    }
}

double hypotenuse(double adj, double opp){
    return sqrt(pow(adj,2) + pow (opp,2));
}
```

Output

```
======================================== Welcome To Hypotenuse Finder ========================================
Input 2 sides of the triangle (The opposite and the adjacent)
Input side a(Adjacent): 6
Input side o(Opposite): 7
From the measurement of the sides: (6 and 7), the measurement of the hypotenuse is 9.21954

Would you like to calculate more?
( )Yes (/)No
Exiting program if you need to calculate another hypotenuse, rerun the program
================================================================================================================

--------------------------------
Process exited after 8.499 seconds with return value 0
Press any key to continue . . .
```

3.
Code

```cpp
#include <iostream>
#include <iomanip>//for setprecision and setw
#include <cstdlib> //for clear screen func
#include <conio.h> // For _getch()
using namespace C:\Program Files (x86)\Embarcadero\Dev-Cpp\TDM-GCC-64\lib\gcc\x86_64-w64-mingw32\9.2.0\include\c++\cstdlib - Ctrl+Click for more info

const string degSymbol = string(1, char(248));
const string fTemp = degSymbol + "F";
const string cTemp = degSymbol + "C";

void printLine();
void printGreet(int greet);
void printOptions(char checkLoc[], int size);
void changeOption(int ch, int &choice, int minSize, int maxSize, char checkLoc[]);
int choiceSelect();
void printTempMultiples(int i, int mode);
void printTable();
float convTemp(int mode, float startTemp);
void convTempMain(int mode);

int main() {
    printGreet(0);
    cout << "Choose a function you want to use\n";
    int selected = choiceSelect();
    system("cls");

    printGreet(selected);
    switch (selected){
        case 1:
            convTempMain(1);
            break;
        case 2:
            convTempMain(2);
            break;
        case 3:
            printTable();
            break;
    }
    cout << endl;
    printGreet(6);
    return 0;
}

void printLine(){
    cout << "=============================================================================================================\n";
}

void printGreet(int greet){
    printLine();
    cout << "\t\t\t\t";
    switch (greet){
        case 0:
            cout << "Welcome To Temperature Program";
            break;
        case 1:
            cout << fTemp << " to " << cTemp << " converter";
            break;
        case 2:
            cout << cTemp << " to " << fTemp << " converter";
            break;
        case 3:
            cout << "Temperature Conversition Table";
            break;
        case 4:
            cout << cTemp << " to " << fTemp << " Table";
            break;
        case 5:
            cout << fTemp << " to " << cTemp << " Table";
            break;
        case 6:
            cout << "Thank you for using the Temperature Conversion Program";
            break;
    }
    cout << endl;
    printLine();
}

// Prints the options with the marker
void printOptions(char checkLoc[], int size) {
    cout << "\r";  // Move to start of line
    //used .c_str() to convert stdstring to cstring
    printf("(%c)Convert %s to %s (%c)Convert %s to %s (%c) View Conversion Table",checkLoc[0],fTemp.c_str(),cTemp.c_str(),checkLoc[1],cTemp.c_str(),fTemp.c_str(),checkLoc[2]);
}

// Updates the choice and marker
void changeOption(int ch, int &choice, int minSize, int maxSize, char checkLoc[]) {

    //Clear check
    for (int i = 0; i < maxSize; i++) {
        checkLoc[i] = ' ';
    }

    switch (ch) {
        case 77: // Right arrow
            choice++;
            if (choice > maxSize) {
                choice = minSize;
            }
            break;
        case 75: // Left arrow
            choice--;
            if (choice < minSize) {
                choice = maxSize;
            }
            break;
        }
        break;
    }

    checkLoc[choice - 1] = '/';
    printOptions(checkLoc, maxSize);
}

// Returns the selected option index (1..3)
int choiceSelect() {
    int ch;
    const int maxSize = 3;
    const int minSize = 1;
    int currentChoice = 1;
    char checkLoc[maxSize] = {'/', ' ', ' '};

    printOptions(checkLoc, maxSize);

    while (true) {
        ch = _getch();  // Get a key

        if (ch == 0 || ch == 224) { // Special key
            ch = _getch(); // Get actual key code
            if (ch == 75 || ch == 77) { // Left or right
                changeOption(ch, currentChoice, minSize, maxSize, checkLoc);
            }
        } else if (ch == 13) { // Enter key
            cout << endl;
            return currentChoice;
        }
    }
}

float convTemp(int mode,float startTemp){
    //used floats because integer division they become 0
    double convertedTemp;
    if (mode == 1){
        //f to c
        convertedTemp =  (startTemp - 32) * 5.0/9.0;
    }
    else {
        //c to f
        convertedTemp = (startTemp * (9.0/5.0)) + 32;
    }
    return convertedTemp;
}

void printTempMultiples(int i,int mode){
    string unit1 = (mode == 2) ? cTemp : fTemp;
    string unit2 = (mode == 2) ? fTemp : cTemp;
    cout << setw(2) << i << unit1 << " = " << setw(2) << fixed << setprecision(4) << convTemp(mode, i) << unit2 << "\t";
}
```

```
    cout << endl;

    for (int i = 0;i <= 10;i++){
        printTempMultiples(i,2);
        printTempMultiples(i + 11,2);
        printTempMultiples(i + 22,2);
        printTempMultiples(i + 33,2);
        printTempMultiples(i + 44,2);
        printTempMultiples(i + 55,2);
        printTempMultiples(i + 66,2);
        printTempMultiples(i + 77,2);
        printTempMultiples(i + 88,2);
        if (i < 2) {
            printTempMultiples(i + 99,2);
        }
        cout << endl;
    }

    cout << endl;
    printGreet(5);
    cout << endl;
    //12 to 212
    for (int j = 32; j < 50;j++){
        printTempMultiples(j,1);
        printTempMultiples(j+18,1);
        printTempMultiples(j+36,1);
        printTempMultiples(j+54,1);
        printTempMultiples(j+72,1);
        printTempMultiples(j+90,1);
        printTempMultiples(j+108,1);
        printTempMultiples(j+126,1);
        printTempMultiples(j+144,1);
        printTempMultiples(j+162,1);
        cout << endl;
    }
    cout << endl;
    printTempMultiples(212,1);
}

void convTempMain(int mode){
    float startTemp;

    cout << "You used temperature converter\n";

    cout << "Input Temperature Value:";
    cin >> startTemp;

    float outputTemp = convTemp(mode,startTemp);
    string initialUnit = (mode == 1) ? fTemp: cTemp;
    string outputUnit = (mode == 1) ? cTemp:fTemp;

    cout << startTemp << initialUnit << " is equal to " << outputTemp << outputUnit << endl;
}
```

Output:

```
================================================================================
                        Welcome To Temperature Program
================================================================================
Choose a function you want to use
(/)Convert °F to °C ( )Convert °C to °F ( ) View Conversion Table
```

```
================================================================================
                        °F to °C converter
================================================================================
You used temperature converter
Input Temperature Value:10
10°F is equal to -12.2222°C

================================================================================
                        Thank you for using the Temperature Conversion Program
================================================================================


--------------------------------
Process exited after 21.65 seconds with return value 0
Press any key to continue . . .
```

```
================================================================================
                        Welcome To Temperature Program
================================================================================
Choose a function you want to use
( )Convert °F to °C (/)Convert °C to °F ( ) View Conversion Table
```

```
================================================================================
                        °C to °F converter
================================================================================
You used temperature converter
Input Temperature Value:20
20°C is equal to 68°F

================================================================================
                        Thank you for using the Temperature Conversion Program
================================================================================


--------------------------------
Process exited after 3.843 seconds with return value 0
Press any key to continue . . .
```

```
================================================================================================================================
                                        Welcome To Temperature Program
================================================================================================================================
Choose a function you want to use
( )Convert °F to °C ( )Convert °C to °F (/) View Conversion Table
```

```
================================================================================================
                          Temperature Conversition Table
================================================================================================

================================================================================================
                              °C to °F Table
================================================================================================

0°C = 32.0000°F     11°C = 51.8000°F    22°C = 71.6000°F    33°C = 91.4000°F    44°C = 111.2000°F   55°C = 131.0000°F   66°C = 150.8000°F   77°C = 170.6000°F   88°C = 190.4000°F   99°C = 210.2000°F
1°C = 33.8000°F     12°C = 53.6000°F    23°C = 73.4000°F    34°C = 93.2000°F    45°C = 113.0000°F   56°C = 132.8000°F   67°C = 152.6000°F   78°C = 172.4000°F   89°C = 192.2000°F   100°C = 212.0000°F
2°C = 35.6000°F     13°C = 55.4000°F    24°C = 75.2000°F    35°C = 95.0000°F    46°C = 114.8000°F   57°C = 134.6000°F   68°C = 154.4000°F   79°C = 174.2000°F   90°C = 194.0000°F
3°C = 37.4000°F     14°C = 57.2000°F    25°C = 77.0000°F    36°C = 96.8000°F    47°C = 116.6000°F   58°C = 136.4000°F   69°C = 156.2000°F   80°C = 176.0000°F   91°C = 195.8000°F
4°C = 39.2000°F     15°C = 59.0000°F    26°C = 78.8000°F    37°C = 98.6000°F    48°C = 118.4000°F   59°C = 138.2000°F   70°C = 158.0000°F   81°C = 177.8000°F   92°C = 197.6000°F
5°C = 41.0000°F     16°C = 60.8000°F    27°C = 80.6000°F    38°C = 100.4000°F   49°C = 120.2000°F   60°C = 140.0000°F   71°C = 159.8000°F   82°C = 179.6000°F   93°C = 199.4000°F
6°C = 42.8000°F     17°C = 62.6000°F    28°C = 82.4000°F    39°C = 102.2000°F   50°C = 122.0000°F   61°C = 141.8000°F   72°C = 161.6000°F   83°C = 181.4000°F   94°C = 201.2000°F
7°C = 44.6000°F     18°C = 64.4000°F    29°C = 84.2000°F    40°C = 104.0000°F   51°C = 123.8000°F   62°C = 143.6000°F   73°C = 163.4000°F   84°C = 183.2000°F   95°C = 203.0000°F
8°C = 46.4000°F     19°C = 66.2000°F    30°C = 86.0000°F    41°C = 105.8000°F   52°C = 125.6000°F   63°C = 145.4000°F   74°C = 165.2000°F   85°C = 185.0000°F   96°C = 204.8000°F
9°C = 48.2000°F     20°C = 68.0000°F    31°C = 87.8000°F    42°C = 107.6000°F   53°C = 127.4000°F   64°C = 147.2000°F   75°C = 167.0000°F   86°C = 186.8000°F   97°C = 206.6000°F
10°C = 50.0000°F    21°C = 69.8000°F    32°C = 89.6000°F    43°C = 109.4000°F   54°C = 129.2000°F   65°C = 149.0000°F   76°C = 168.8000°F   87°C = 188.6000°F   98°C = 208.4000°F

================================================================================================
                              °F to °C Table
================================================================================================

32°F = 0.0000°C 50°F = 10.0000°C    68°F = 20.0000°C    86°F = 30.0000°C    104°F = 40.0000°C   122°F = 50.0000°C   140°F = 60.0000°C   158°F = 70.0000°C   176°F = 80.0000°C   194°F = 90.0000°C
33°F = 0.5556°C 51°F = 10.5556°C    69°F = 20.5556°C    87°F = 30.5556°C    105°F = 40.5556°C   123°F = 50.5556°C   141°F = 60.5556°C   159°F = 70.5556°C   177°F = 80.5556°C   195°F = 90.5556°C
34°F = 1.1111°C 52°F = 11.1111°C    70°F = 21.1111°C    88°F = 31.1111°C    106°F = 41.1111°C   124°F = 51.1111°C   142°F = 61.1111°C   160°F = 71.1111°C   178°F = 81.1111°C   196°F = 91.1111°C
35°F = 1.6667°C 53°F = 11.6667°C    71°F = 21.6667°C    89°F = 31.6667°C    107°F = 41.6667°C   125°F = 51.6667°C   143°F = 61.6667°C   161°F = 71.6667°C   179°F = 81.6667°C   197°F = 91.6667°C
36°F = 2.2222°C 54°F = 12.2222°C    72°F = 22.2222°C    90°F = 32.2222°C    108°F = 42.2222°C   126°F = 52.2222°C   144°F = 62.2222°C   162°F = 72.2222°C   180°F = 82.2222°C   198°F = 92.2222°C
37°F = 2.7778°C 55°F = 12.7778°C    73°F = 22.7778°C    91°F = 32.7778°C    109°F = 42.7778°C   127°F = 52.7778°C   145°F = 62.7778°C   163°F = 72.7778°C   181°F = 82.7778°C   199°F = 92.7778°C
38°F = 3.3333°C 56°F = 13.3333°C    74°F = 23.3333°C    92°F = 33.3333°C    110°F = 43.3333°C   128°F = 53.3333°C   146°F = 63.3333°C   164°F = 73.3333°C   182°F = 83.3333°C   200°F = 93.3333°C
39°F = 3.8889°C 57°F = 13.8889°C    75°F = 23.8889°C    93°F = 33.8889°C    111°F = 43.8889°C   129°F = 53.8889°C   147°F = 63.8889°C   165°F = 73.8889°C   183°F = 83.8889°C   201°F = 93.8889°C
40°F = 4.4444°C 58°F = 14.4444°C    76°F = 24.4444°C    94°F = 34.4444°C    112°F = 44.4444°C   130°F = 54.4444°C   148°F = 64.4444°C   166°F = 74.4444°C   184°F = 84.4444°C   202°F = 94.4444°C
41°F = 5.0000°C 59°F = 15.0000°C    77°F = 25.0000°C    95°F = 35.0000°C    113°F = 45.0000°C   131°F = 55.0000°C   149°F = 65.0000°C   167°F = 75.0000°C   185°F = 85.0000°C   203°F = 95.0000°C
42°F = 5.5556°C 60°F = 15.5556°C    78°F = 25.5556°C    96°F = 35.5556°C    114°F = 45.5556°C   132°F = 55.5556°C   150°F = 65.5556°C   168°F = 75.5556°C   186°F = 85.5556°C   204°F = 95.5556°C
43°F = 6.1111°C 61°F = 16.1111°C    79°F = 26.1111°C    97°F = 36.1111°C    115°F = 46.1111°C   133°F = 56.1111°C   151°F = 66.1111°C   169°F = 76.1111°C   187°F = 86.1111°C   205°F = 96.1111°C
44°F = 6.6667°C 62°F = 16.6667°C    80°F = 26.6667°C    98°F = 36.6667°C    116°F = 46.6667°C   134°F = 56.6667°C   152°F = 66.6667°C   170°F = 76.6667°C   188°F = 86.6667°C   206°F = 96.6667°C
45°F = 7.2222°C 63°F = 17.2222°C    81°F = 27.2222°C    99°F = 37.2222°C    117°F = 47.2222°C   135°F = 57.2222°C   153°F = 67.2222°C   171°F = 77.2222°C   189°F = 87.2222°C   207°F = 97.2222°C
46°F = 7.7778°C 64°F = 17.7778°C    82°F = 27.7778°C    100°F = 37.7778°C   118°F = 47.7778°C   136°F = 57.7778°C   154°F = 67.7778°C   172°F = 77.7778°C   190°F = 87.7778°C   208°F = 97.7778°C
47°F = 8.3333°C 65°F = 18.3333°C    83°F = 28.3333°C    101°F = 38.3333°C   119°F = 48.3333°C   137°F = 58.3333°C   155°F = 68.3333°C   173°F = 78.3333°C   191°F = 88.3333°C   209°F = 98.3333°C
48°F = 8.8889°C 66°F = 18.8889°C    84°F = 28.8889°C    102°F = 38.8889°C   120°F = 48.8889°C   138°F = 58.8889°C   156°F = 68.8889°C   174°F = 78.8889°C   192°F = 88.8889°C   210°F = 98.8889°C
49°F = 9.4444°C 67°F = 19.4444°C    85°F = 29.4444°C    103°F = 39.4444°C   121°F = 49.4444°C   139°F = 59.4444°C   157°F = 69.4444°C   175°F = 79.4444°C   193°F = 89.4444°C   211°F = 99.4444°C

212°F = 100.0000°C
================================================================================================
                          Thank you for using the Temperature Conversion Program
================================================================================================
```

7. Supplementary Activity

1.
The code includes 2 libraries, iostream and cmath. The code also uses the namespace std. Inside the main function, it first initializes a variable where to store the inputted value of the side. The next lines print a greeting and ask for the value of the side. Then, it calls the getVolSqr function which returns the number cubed. After that, it uses printf to print the result.
2.

The program starts by including three libraries: <iostream>, <cmath>, and <conio.h>. After including these libraries, the using namespace std; statement is added so that standard library names can be used without the std:: prefix.Next, the program lists several function prototypes. These include printGreet() which displays a welcome message, choiceDialogue(int &curChoice) which updates the displayed selection for “Yes” or “No,” choiceSelect() which manages user input for choosing whether to continue or exit, and hypotenuse(double adj, double opp) which calculates the hypotenuse of a triangle. These prototypes let the compiler know that these functions will be defined later in the code.The main function begins by declaring a boolean variable named runLoop and setting it to true so that the program can continue running until the user decides to stop. It then calls printGreet() to display the greeting message. Inside a while loop, the program asks the user to input two side lengths of a right triangle: the adjacent side and the opposite side. These values are stored in variables named inputSideA and inputSideO. After that, the program calls the hypotenuse() function with these two values as arguments. The function uses the Pythagorean theorem to calculate the hypotenuse by applying the formula sqrt(pow(adj, 2) + pow(opp, 2)). The result is then displayed on the screen using printf(), showing the two sides entered and the computed hypotenuse.After the result is shown, the program asks the user if they would like to perform another calculation. The prompt “Would you like to calculate more? (/)Yes ( )No” is displayed. The choiceSelect() function is used to handle the user’s input. It detects arrow key presses so the user can switch between Yes and No, and it confirms the selection when the Enter key is pressed. If the user selects Yes, the screen is cleared using system("cls") and the greeting is displayed again before repeating the process. If the user selects No, the loop ends and the program displays a closing message telling the user they can rerun the program if they want to calculate another hypotenuse.

3.
The program begins by including different libraries. <iostream> , <iomanip> , <cstdlib> , and <conio.h>. The program then uses the standard namespace std to simplify syntax. It defines two string constants, fTemp and cTemp, representing the Fahrenheit (°F) and Celsius (°C) symbol. After that, the program declares several functions that handle printing, menu navigation, temperature conversion, and table display. The main function starts by greeting the user and asking them to choose a function. The choiceSelect() function is called to allow selection using the arrow keys. The user can choose between three options: converting Fahrenheit to Celsius, converting Celsius to Fahrenheit, or viewing a temperature conversion table. Once a selection is made, the screen is cleared using system("cls"), and depending on the user's choice, the corresponding function is executed through a switch statement.If the user chooses one of the conversion modes, the program calls convTempMain(), which handles the input and conversion process. It prompts the user to enter a temperature, then calls the convTemp() function to perform the conversion. The conversion formula depends on the mode: Fahrenheit to Celsius uses (startTemp - 32) * 5.0 / 9.0, while Celsius to Fahrenheit uses (startTemp * 9.0 / 5.0) + 32. The converted temperature is then displayed with the correct symbol and formatted neatly using precision control from the <iomanip> library.If the user selects the table option, the program calls printTable(). This function first prints a Celsius-to-Fahrenheit conversion table, followed by a Fahrenheit-to-Celsius table. It does this by repeatedly calling printTempMultiples(), which prints individual temperature pairs in a formatted manner. The output is aligned using setw() for consistent spacing, and values are rounded to four decimal places with setprecision(4) for clarity. The table covers a wide range of values to give the user a comprehensive reference for conversions.The menu navigation system uses arrow keys to move between options. The choiceSelect() function handles user input by continuously detecting keystrokes through _getch(). When the user presses the left or right arrow keys, the function changeOption() updates which choice is highlighted by adjusting a character array that tracks the marker position. When Enter is pressed, the selected option is returned to the main function.Finally, after the chosen function is executed, the program prints a farewell message thanking the user for using the temperature conversion tool.

8. Conclusion

From the activity, I learned and used different built in functions. These built in functions are stored inside a library that can be called using #include. There are several different libraries but the ones I mostly used in this activity is the cmath library that has different builtin functions that is kind of an equation. I frequently used the pow and sqrt function in this activity. Also, I searched online how I can make it more interactive and saw more different builtin functions like system() and _getch() which made the output more clear. Overall, I think there are more libraries that I can explore and make use in the future. This can make the coding process more time efficient and easier.

9. Assessment Rubric