

BITP 1113: PROGRAMMING TECHNIQUES

1BITS

Lab 4

Selection

Exercise 1

Write a program to compute the value of d. The formula to find the d is,

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

The program will display the square root and d values at the end of the program.

1. Analyse input, process and output.

Input : a, b and c

Process : `sqrtValue = pow(b, 2) - (4 * a * c);`

```
if sqrtValue is positive,  
d1 = (-b + sqrt(sqrtValue)) / (2 * a);  
d2 = (-b - sqrt(sqrtValue)) / (2 * a);
```

Output : if square root value is positive,
Display sqrtValue, d1 and d2
if square root value is negative,
Display sqrtValue and error message.

2. Create a new project named Formula
3. At **Solution Explorer**, right-click **Source Files** folder and add new item named QuadraticEq.cpp.
4. Write the following default code:

```
1  #include <iostream>  
2  using namespace std;  
3  
4  int main() {  
5  
6      return 0;  
7  }
```

5. Insert code to receive the values of a, b and c from user (Line 5 and 6).

```
4  int main() {  
5      cout << "Enter value for a, b and c : ";  
6      cin >> a >> b >> c;  
7  
8      return 0;  
9  }
```

6. Declare variables to fix the error (Line 5).

```
4  int main() {  
5      int a, b, c; // Declare variables  
6      cout << "Enter value for a, b and c : ";
```

7. Insert code to compute square root value (Line 15 to 18).

```
4  int main() {  
5      int a, b, c; // Declare variables  
6      cout << "Enter value for a, b and c : ";  
7      cin >> a >> b >> c;  
8  
9      sqrtValue = pow(b, 2) - (4 * a * c);  
10     return 0;  
11 }
```

8. Declare the sqrtValue variable (Line 5).

```
4  int main() {  
5      int a, b, c, sqrtValue; // Declare variables
```

9. Insert code to apply selection and calculate the value of d (Line 10 to 14).

```
9      sqrtValue = pow(b, 2) - (4 * a * c);  
10     if (sqrtValue > 0)  
11     {  
12         d1 = (-b + sqrt(sqrtValue)) / (2 * a);  
13         d2 = (-b - sqrt(sqrtValue)) / (2 * a);  
14     }
```

TIPS!

There are two possible values for d as stated in the quadratic equation given.

10. Declare the d1 and d2 variables (Line 6).

```
4  int main() {  
5      int a, b, c, sqrtValue; // Declare variables  
6      double d1, d2; // Declare variables
```

TIPS!

d1 and d2 are declared as double because there is division operation involve in finding the d values.

Cast the right-side expression to match the data type of d1 and d2 (Line 13 and 14).

```
11     if (sqrtValue > 0)  
12     {  
13         d1 = (double)(-b + sqrt(sqrtValue)) / (2 * a);  
14         d2 = (double)(-b - sqrt(sqrtValue)) / (2 * a);  
15     }
```

11. Modify `if` statement to insert code for displaying output (Line 16 to 23).

```
10      sqrtValue = pow(b, 2) - (4 * a * c);
11      if (sqrtValue > 0)
12      {
13          d1 = (double)(-b + sqrt(sqrtValue)) / (2 * a);
14          d2 = (double)(-b - sqrt(sqrtValue)) / (2 * a);
15
16          cout << "The square root value is " << sqrtValue << endl;
17          cout << "The d value is either " << d1 << " or " << d2 << endl;
18      }
19      else
20      {
21          cout << "The square root value is " << sqrtValue << endl;
22          cout << "The d value is undefined." << endl;
23      }
24
25      return 0;
```

TIPS!

Both `if` and `else` statements execute the same code. We could simplify the program to avoid code redundancy.

12. Modify the code to simplify the program (Line 11 to 19).

```
10      sqrtValue = pow(b, 2) - (4 * a * c);
11      cout << "The square root value is " << sqrtValue << endl;
12      if (sqrtValue > 0)
13      {
14          d1 = (double)(-b + sqrt(sqrtValue)) / (2 * a);
15          d2 = (double)(-b - sqrt(sqrtValue)) / (2 * a);
16          cout << "The d value is either " << d1 << " or " << d2 << endl;
17      }
18      else
19          cout << "The d value is undefined." << endl;
20
21      return 0;
```

13. Compile and run the program.

Example Output 1

```
Microsoft Visual Studio ...
Enter value for a, b and c : 5 2 1
The square root value is -16
The d value is undefined.
```

Example Output 2

```
Microsoft Visual Studio ...
Enter value for a, b and c : 2 9 4
The square root value is 49
The d value is either -0.5 or -4
```

Lab Attendance Week 3

Question 1

Modify the program to display the `d` value then the square root value.

Exercise 2

Fato Furniture management decides to classify the reject length into four types of material to avoid waste. At the same time, this decision will increase company profit besides benefit the community around. The following table shows the details of the classification. The operator will enter the rejected length and the program will display the action should be taken.

Table 1: Types of Material

Type	Rejected Length	Action
1	Less or equal 30 cm	Approved to export
2	Between 30 cm to 50 cm	Repair material
3	Between 50 cm to 70 cm	Open selling
4	More than 70 cm	Recycle to community

1. Analyse input, process and output.

Input : length

Process : input Validation,
if (length > 0),
Execute Output.
else
Display "Invalid Length".

Output : if (length <= 30),
Display "Approved to export".
else if (length > 30 && length <=50)
Display "Repair material".
else if (length > 50 && length <=70)
Display "Open selling".
else
Display "Repair material".

2. Create a new project named Material
3. At **Solution Explorer**, right click **Source Files** folder and add new item named `ClassifyMaterial.cpp`.
4. Write the following default code:

```
1  #include <iostream>
2  using namespace std;
3
4  int main() {
5
6      return 0;
7  }
```

5. Insert code to receive the values of length from user (Line 5 and 6).

```
4  int main() {
5      cout << "Enter the rejected length (cm) : "; // instruction to user
6      cin >> length; // read input
7
8      return 0;
9  }
```

6. Declare variables to fix the error (Line 5).

```
4  int main() {  
5      double length; // declare variable  
6      cout << "Enter the rejected length (cm) : "; // instruction to user  
7      cin >> length; // read input  
8  
9      return 0;  
10 }
```

7. Insert code to validate input using selection (Line 9 to 13).

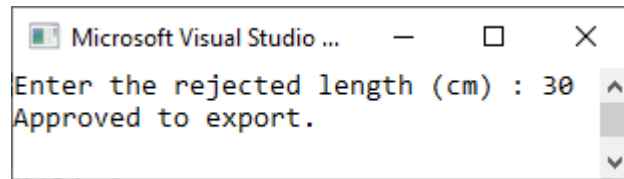
```
7      cout << "Enter the rejected length (cm) : "; // instruction to user  
8      cin >> length; // read input  
9      if (length > 0) { // input validation  
10  
11      }  
12      else // message if invalid input  
13          cout << "Invalid length.\n";
```

8. Insert code to apply selection for displaying output (Line 10 to 17).

```
4  int main() {  
5      double length; // declare variable  
6      int type;  
7      cout << "Enter the rejected length (cm) : "; // instruction to user  
8      cin >> length; // read input  
9      if (length > 0) { // input validation  
10          if (length <= 30) // selection; 1st choice  
11              cout << "Approved to export.\n";  
12          else if (length > 30 && length <= 50) // selection; 2nd choice  
13              cout << "Repair material.\n";  
14          else if (length > 50 && length <= 70) // selection; 3rd choice  
15              cout << "Open selling.\n";  
16          else // selection; last choice  
17              cout << "Recycle to community.\n";  
18      }  
19      else // message if invalid input  
20          cout << "Invalid length.\n";  
21  
22      return 0;  
23 }
```

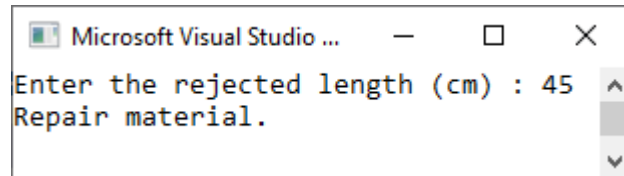
9. Compile and run the program.

Example Output 1



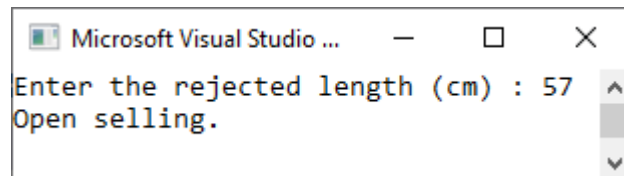
```
Microsoft Visual Studio ...  
Enter the rejected length (cm) : 30  
Approved to export.
```

Example Output 2



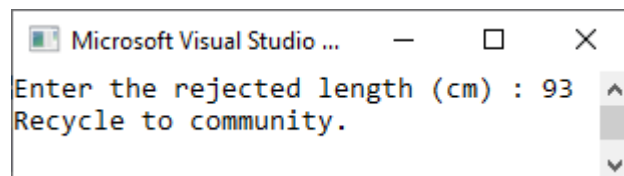
```
Microsoft Visual Studio ...  
Enter the rejected length (cm) : 45  
Repair material.
```

Example Output 3



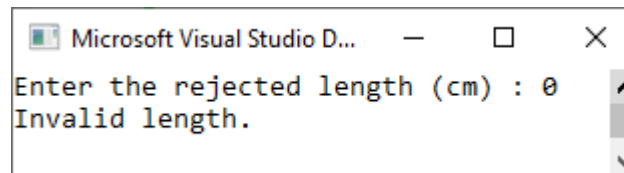
```
Microsoft Visual Studio ...  
Enter the rejected length (cm) : 57  
Open selling.
```

Example Output 4



```
Microsoft Visual Studio ...  
Enter the rejected length (cm) : 93  
Recycle to community.
```

Example Output 5



```
Microsoft Visual Studio D...  
Enter the rejected length (cm) : 0  
Invalid length.
```

Lab Attendance Week 3

Question 2

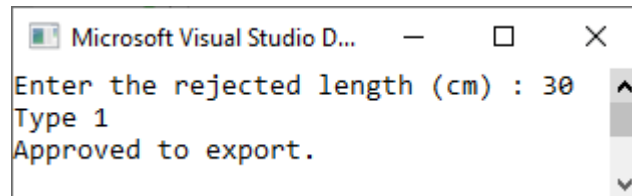
Modify code at Exercise 2:

- To find the "Type" of material based on Table 1.
- Then display the output based on the "Type" defined at a).

Notes: You must add switch statement to the code.

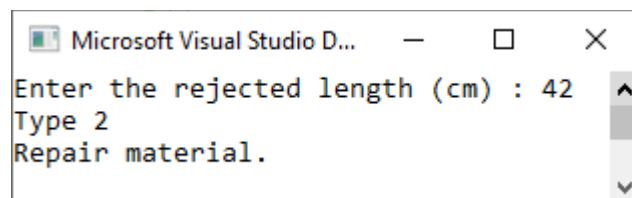
Example input/output:

Example 1



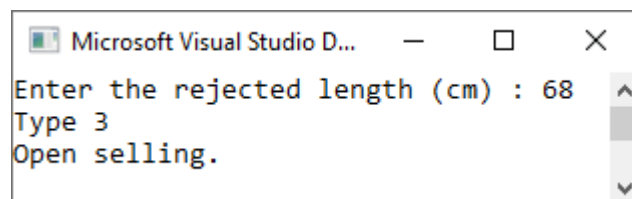
```
Microsoft Visual Studio D...  
Enter the rejected length (cm) : 30  
Type 1  
Approved to export.
```

Example 2



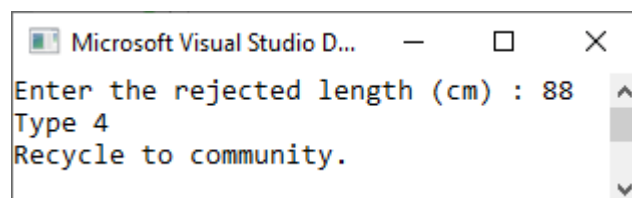
```
Microsoft Visual Studio D...  
Enter the rejected length (cm) : 42  
Type 2  
Repair material.
```

Example 3



```
Microsoft Visual Studio D...  
Enter the rejected length (cm) : 68  
Type 3  
Open selling.
```

Example 4



```
Microsoft Visual Studio D...  
Enter the rejected length (cm) : 88  
Type 4  
Recycle to community.
```

Submit this exercise at ULearn before 12.00 p.m. 5 November 2020 (Thursday).

*~NEVER GIVE UP. Everyone has bad days. Pick yourself up and KEEP GOING.~
- Unknown*