National University of Computer and Emerging Sciences, Lahore Campus

	Course Name:	**Programming Fundamentals**	**Course Code:**	**CS1002**
	Program:	**Electrical Engineering**	**Semester:**	**Fall 2023**
	Assigned on:	**12 September 2023**	**Total Marks:**	**50**
	Deadline:	**21 September 2023**	**Weight:**	**3.33**
	Section:	**EE-1A and EE-1C**	**Page(s):**	**1**
	Exam Type:	**Assignment-1 Solution**	**CLO #**	**2**

Instruction:
1. Do not forget to write your Name and Roll Numbers.
2. Submit hand-written hard copy at the Start of the Class on Thursday, 21 September.
3. **No Late submissions**. Plagiarism/copying cases to be referred to the DC.

Question No. 1 **Marks: 10**

The date June 10, 1960 is special because when we write it in the following format, the month times the day equals the year. 6/10/60. Write a C++ program that asks the user to enter a month (in numeric form), a day, and a two-digit year. The program should then determine whether the month times the day is equal to the year. If so, it should display a message saying the date is magic. Otherwise it should display a message saying the date is not magic.

Solution

```
#include <iostream>
using namespace std;

int main() {
   int month, day, year;

   cout << "Enter the month (numeric): ";
   cin >> month;

   cout << "Enter the day: ";
   cin >> day;

   cout << "Enter the two-digit year: ";
   cin >> year;

   // Check if the date is magic
   if (month * day == year) {
      cout << "The date is magic!" << endl;
   } else {
      cout << "The date is not magic." << endl;
   }

   return 0;
}
```

Question No. 2 **Marks: 10**

Write a C++ program that calculates and displays a person's body mass index (BMI). The BMI is often used to determine whether a person with a sedentary lifestyle is overweight or underweight for his or her height. A person's BMI is calculated with the following formula:

$$BMI = weight * 703/height^2$$

Where weight is measured in pounds and height is measured in inches. The program should display a message indicating whether the person has optimal weight, is underweight, or is overweight. A sedentary person's weight is considered to be optimal if his or her BMI is between 18.5 and 25. If the BMI is less than 18.5, the person is considered to be underweight. If the BMI value is greater than 25, the person is considered to be overweight.

Solution

```
#include <iostream>
using namespace std;

int main() {
   double weight, height, bmi;

   // Input weight in pounds
   cout << "Enter weight (in pounds): ";
   cin >> weight;

   // Input height in inches
   cout << "Enter height (in inches): ";
   cin >> height;

   // Calculate BMI using the formula
   bmi = (weight * 703) / (height * height);

   // Display BMI
   cout << "Your BMI is: " << bmi << endl;

   // Determine weight status
   if (bmi >= 18.5 && bmi <= 25) {
      cout << "You have optimal weight." << endl;
   } else if (bmi < 18.5) {
      cout << "You are underweight." << endl;
   } else {
      cout << "You are overweight." << endl;
   }

   return 0;
}
```

Question No. 3 **Marks: 10**

Write a C++ program that prompts the user to input the elapsed time for an event in seconds. The program then outputs the elapsed time in hours, minutes, and seconds. (For example, if the elapsed time is 9,630 seconds, then the output is 2:40:30.)

Solution

```
#include <iostream>
using namespace std;

int main() {
   int elapsedSeconds;

   // Input elapsed time in seconds
   cout << "Enter elapsed time in seconds: ";
   cin >> elapsedSeconds;

   // Calculate hours, minutes, and remaining seconds
   int hours = elapsedSeconds / 3600;
   int minutes = (elapsedSeconds % 3600) / 60;
   int seconds = elapsedSeconds % 60;

   // Output the elapsed time in the format HH:MM:SS
   cout << "Elapsed time: " << hours << ":" << minutes << ":" << seconds << endl;

   return 0;
}
```

Question No. 4 **Marks: 10**

Write a C++ program that inputs a five-digit number, separates the number into its individual digits and prints the digits separated from one another by three spaces each. (Hint: Use the integer division and modulus operators.) For example, if the user types in 42339 the program should print

```
4   2   3   3   9
```

Solution

```
#include <iostream>
using namespace std;

int main() {
   int number;

   // Input a five-digit number
   cout << "Enter a five-digit number: ";
   cin >> number;

   // Check if the input number is five digits
   if (number >= 10000 && number <= 99999) {
      // Extract and print individual digits separated by three spaces
      int digit1 = number / 10000;
      int digit2 = (number / 1000) % 10;
      int digit3 = (number / 100) % 10;
      int digit4 = (number / 10) % 10;
      int digit5 = number % 10;

      cout << digit1 << "   " << digit2 << "   " << digit3 << "   " << digit4 << "   " << digit5 << endl;
   } else {
      cout << "Please enter a valid five-digit number." << endl;
   }

   return 0;
}
```

Question No. 5 **Marks: 10**

Design an algorithm to find the real roots of a quadratic equation of the form $ax^2 + bx + c = 0$, where a, b, and c are real numbers, and a is nonzero.

Solution

1. Input the values of a, b, and c (real numbers) from the user.
2. Calculate the discriminant (D) using the formula D = b^2 - 4ac.
3. If D < 0, display "No real roots exist."
4. If D = 0, calculate the single real root using the formula:

   x = -b / (2a)

   Display "One real root: x = x."
5. If D > 0, calculate two real roots using the formulas:

   x1 = (-b + sqrt(D)) / (2a)

   x2 = (-b - sqrt(D)) / (2a)

   Display "Two real roots: x1 = x1 and x2 = x2."
6. End.