Module 1 Assignment – Part A – Problem 1

- Compare Advantages and Disadvantages of IoT.
- Define what's the Gateway and explains its role in IoT layers.
- Compare fog computing to cloud computing, then comment what is better for the IoT Application?
- State the difference between HTTP and MQTT in IoT systems and which is preferred in most cases?
- Mention the three main kinds of program errors and compare them to each others.
- State difference between source code and object code.
- What is enum data type is used for?

Module 1 Assignment – Part A – Problem 2

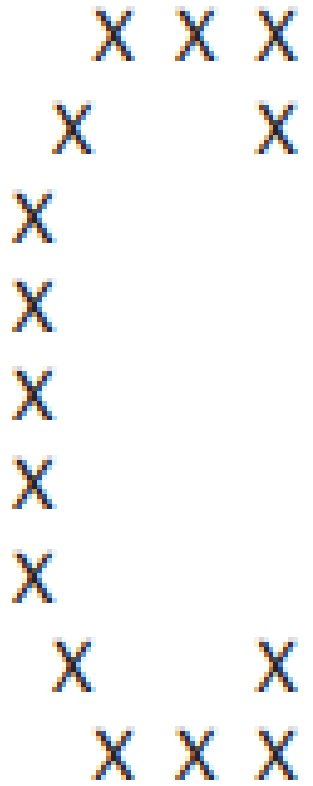
- Write a program that allows the user to enter a time in seconds and then outputs how far an object would drop if it is in freefall for that length of time. Assume that the object starts at rest, there is no friction or resistance from air, and there is a constant acceleration of 32 feet per second due to gravity. Use the equation:

$$\text{distance} = \frac{\text{acceleration x time}^2}{2}$$

- NB: You should first compute the product and then divide the result by 2

Module 1 Assignment – Part A – Problem 3

Write a program that inputs a character from the keyboard and then outputs a large block letter “C” composed of that character. For example, if the user inputs the character “X,” then the output should look as follows:



Module 1 Assignment – Part A – Problem 3

Sound travels through air as a result of collisions between the molecules in the air. The temperature of the air affects the speed of the molecules, which in turn affects the speed of sound. The velocity of sound in dry air can be approximated by the formula:

$$\text{velocity} \approx 331.3 + 0.61 \times T\text{c}$$

where *T*c is the temperature of the air in degrees Celsius and the velocity is in meters/second.

Write a program that allows the user to input a starting and an ending temperature. Within this temperature range, the program should output the temperature and the corresponding velocity in 1° increments. For example, if the user entered 0 as the start temperature and 2 as the end temperature, then the program should output as the following:

At 0 degrees Celsius the velocity of sound is 331.3 m/s
At 1 degrees Celsius the velocity of sound is 331.9 m/s
At 2 degrees Celsius the velocity of sound is 332.5 m/s

Module 1 Assignment – Part A – Problem 4

Write a program to compute the interest due, total amount due, and the minimum payment for a revolving credit account. The program accepts the account balance as input, then adds on the interest to get the total amount due. The rate schedules are the following: The interest is 1.5 percent on the first $1,000 and 1 percent on any amount over that. The minimum payment is the total amount due if that is $10 or less; otherwise, it is $10 or 10 percent of the total amount owed, whichever is larger. Your program should include a loop that lets the user repeat this calculation until the user says she or he is done.

Module 1 Assignment – Part A – Problem 5

Write a program that takes a positive integer as input from the user and performs the following tasks:

1. Function isPerfectSquare(): Implement a function that checks whether a number is a perfect square. The function should return true if the number is a perfect square, and false otherwise.
2. Function reverseDigits(): Implement a function that reverses the digits of a given number. For example, if the input is 12345, the function should return 54321.
3. Function calculateSum(): Implement a function that calculates the sum of all digits in a given number.
4. In the main() function, prompt the user to enter a positive integer. Perform the following tasks:
5. Check if the number is a perfect square using the isPerfectSquare() function. Display an appropriate message.
6. Reverse the digits of the number using the reverseDigits() function. Display the reversed number.
7. Calculate the sum of all digits in the number using the calculateSum() function. Display the sum.

Module 1 Assignment – Part A – Problem 6

A liter is 0.264179 gallons. Write a program that will read in the number of liters of gasoline consumed by the user's car and the number of miles traveled by the car and will then output the number of miles per gallon the car delivered. Your program should allow the user to repeat this calculation as often as the user wishes. Define a function to compute the number of miles per gallon. Your program should use a globally defined constant for the number of liters per gallon.

Module 1 Assignment – Part A – Problem 7

The gravitational attractive force between two bodies with masses m_1 and m_2 separated by a distance d is given by:

$$F = \frac{Gm_1m_2}{d^2}$$

where G is the universal gravitational constant:

$$G = 6.673 \times 10^{-8}\left(\frac{cm^3}{g \times \sec^2}\right)$$

Write a function definition that takes arguments for the masses of two bodies and the distance between them and that returns the gravitational force. Since you will use the preceding formula, the gravitational force will be in dynes. One dyne equals

$$\left(\frac{g \times cm}{\sec^2}\right)$$

You should use a globally defined constant for the universal gravitational constant. Embed your function definition in a complete program that computes the gravitational force between two objects given suitable inputs. Your program should allow the user to repeat this calculation as often as the user wishes.

Module 1 Assignment – Part A – Bonus

The large “economy” size of an item is not always a better buy than the smaller size. This is particularly true when buying pizzas. Pizza sizes are given as the diameter of the pizza in inches. however, the quantity of pizza is determined by the area of the pizza, and the area is not proportional to the diameter. Most people cannot easily estimate the difference in area between a 10-inch pizza and a 12-inch pizza and so cannot easily determine which size is the best buy—that is, which size has the lowest price per square inch. In this case study we will design a program that compares two sizes of pizza to determine which is the better buy?

Module 1 Assignment – Part A – Bonus

Input:

The input will consist of the diameter in inches and the price for each of two sizes of pizza.

Output:

The output will give the cost per square inch for each of the two sizes of pizza
and will tell which is the better buy, that is, which has the lowest cost per square inch. (If they are the same cost per square inch, we will consider the smaller one to be the better buy.)

Module 1 Assignment – Part A – Bonus

Analysis of the Problem
We will use top-down design to divide the task to be solved by our program
into the following subtasks:
Subtask 1: Get the input data for both the small and large pizzas.
Subtask 2: Compute the price per square inch for the small pizza.
Subtask 3: Compute the price per square inch for the large pizza.
Subtask 4: Determine which is the better buy.
Subtask 5: output the results.

Module 1 Assignment – Part A – Bonus

Note about sub-task 2 & 3:

1. They are exactly the same task. The only difference is that they use different
data to do the computation. The only things that change between subtask 2
and subtask 3 are the size of the pizza and its price.
2. The result of subtask 2 and the result of subtask 3 are each a single value:
the price per square inch of the pizza.

Module 1 Assignment – Part A – Double Bonus

- Write the algorithm and C++ code for bubble sorting using functional programming only – Double Bonus