Bangladesh University of Engineering and Technology

Department of Computer Science and Engineering

CSE 108: Object Oriented Programming

Offline Assignment # 1 (Week 2)

Due Date:	**12 December 2025 at 11:55pm**
Cut-off Date:	**12 December 2025 at 11:55pm**
Full Marks:	20
Submission Method	WebFace (i.e., Moodle) Assignment System
Submitted File	Solutions to the given problems must be submitted in one file. The file name must be Ass1_YourStdID_Dec25.cpp Please don't use any other file name while submitting your assignment solutions through WebFace.
Reference:	Encapsulation – Data Hiding

Submission Policy

Assignment Submission Methods

- Assignments must be submitted through the WebFace (i.e., Moodle) Assignment Submission System. No submission based on any other channel like hardcopy, email is not allowed.

Late submission of assignments

- There is no probation of late submission of the assignment.

Extensions

- No request of date extension for submitting the assignment is permitted.

Assessment Policy

- You must ensure that others do not obtain access to your solutions for the purpose of copying a part of them. Where such plagiarism is detected, both of the assignments involved will be marked zero.
- Your assignment will be marked zero if you have posted any clues to assignment solutions before you receive your marked assignment back.
- Your assignment must not be AI generated. In such cases, your obtained marks in the assignment will be zero.

Assignment Problem:

A geometric shape like line, triangle, rectangle, etc., can be represented by a matrix. There are two end points for a line, three end-points for a triangle and four end-points for a rectangle. Each row of the matrix represents a point, and each column represents a dimension of it. For example, a triangle in two-dimensional (3D) space is represented as-

$$\begin{pmatrix} x_1 & y_1 \\ x_2 & y_2 \\ x_3 & y_3 \end{pmatrix}$$

While a triangle in three-dimensional (3D) space is represented as-

$$\begin{pmatrix} x_1 & y_1 & z_1 \\ x_2 & y_2 & z_2 \\ x_3 & y_3 & z_3 \end{pmatrix}$$

The class “Figure” is written as a template to store information about a line, triangle or rectangle. The class has the following variables:

- The variable ***row*** is an integer type data that represents number of points in the Figure.
- The variable ***col*** is an integer type data that represents the dimension of the Figure space.
- The variable ***name*** is a string type date that represents the name of the Figure like “Line2D”, “Triangle3D”, “Rectangle2D”, etc.
- The variable ***matrix*** is a 2D array that stores the points of the Figure.

Write down C++ codes for the Figure class that includes the following properties:

1. The encapsulation properties of object-oriented programing. (3)

2. Three overloaded constructors based on following requirements: (1+ 4 + 2 = 6)
   (a) The default constructor creates a zero-size matrix (i.e., ***row*** = ***col*** = 0), zero-length name and initializes all elements of the matrix to zero.
   (b) The parameterized constructor takes two integers ***r*** and ***c*** as well as a 1D integer array to fill up the matrix. Please note that the matrix

$$\begin{pmatrix} x_1 & y_1 \\ x_2 & y_2 \\ x_3 & y_3 \end{pmatrix}$$

   can be represented by a 1D array as (x_1, y_1, x_2, y_2, x_3, y_3).
   The object name will be selected automatically by the constructor from the value of r***ow*** and ***col*** of the object.

   (c) The clone constructor that creates a clone of the existing object.

3. The destructor method changes the values of ***row***, ***col*** and all elements of the matrix to zero as well as display a message that the object has been destroyed (say the message is like, “Triangle2D has been destroyed”). (3)

4. Write down two overloaded methods named ***getSum()*** and ***getSum(int x, int y)***. The ***getSum()*** method returns the sum of all values of the matrix; while the ***getSum(int m, int n)*** method returns the sum of all values of the matrix with row number ranges from 0 to ***m***-1 and column number ranges from 0 to ***n***-1. The values of ***m*** and ***n*** must be less than the values of the ***row*** and the ***col***; otherwise, it generates error. (2 x 2 = 4)

Your program must be written in such a way that it ensures the maximum code reuse policy. (2)

Write down a ***main()*** function to demonstrates the functionalities of your program. (2)

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