


# National University of Computer and Emerging Sciences, Lahore Campus

	Course Name:	Object Oriented Programming	Course Code:	CS1004
	Degree Program:	BS (CS, SE, DS)	Semester:	Spring 2023
	Exam Duration:	60 Minutes	Total Marks:	25
	Paper Date:	11-Apr-2023	Weight	15
	Section:	ALL	Page(s):	1
	Exam Type:	Midterm-II		

Student : Name: \_\_\_\_\_ Roll No. \_\_\_\_\_ Section: 2A

Instruction/Notes: Do not use pencil or red ink to answer the questions. In case of confusion or ambiguity make a reasonable assumption.

## Question 1: [CLO 3]

(Marks: 25)

Vectors are very useful mathematical OBJECTS used to solve many problems of practical interest. A vector of real numbers in a d-dimensional space can be represented using d components. Some example representation of vectors of various dimensions are given below

[5.2 6 -3] A 3-dimensional vector	[-9 0 7 3 4] A 5-dimensional vector	[2 9] A 2-dimensional vector
--------------------------------------	--	---------------------------------

Typically vectors having same dimension are combined to form new vectors but a Mathematician at a famous University extended the definition of vector operations to combine vectors having different dimensions to form new vectors. Following are some example operations defined on these vectors.

Operation	Example
Add Two Vectors	2D vector [-2 9] + [-9 0 7 3 4] 5D vector = [-9 0 7 1 13] 5D vector 2D vector [-2 9] + [-9 0] 2D vector = [-11 9] 2D vector
Multiply a vector by a number	2 * [-9 0 7 3 4] = [-18 0 14 6 8]

In this problem we are going to automate the computations of these vector operations using C++ (a famous programming language). For this purpose a class named flexibleVectors needs to be defined with several functions and operators. A Partial definition of that class is as follows:

```
class flexibleVectors {
    double* components; → elements
    int dimensions; → size
    //More members
};
```

Give the complete definition of the class flexibleVectors. Your code must be such that the following main function works correctly and produce the desired output. Your prototype must clearly specify if the operator/function must be a friend of the class. Also make sure that your program does not have any logical errors.

main function	Desired output
<pre>int main() {     flexibleVectors v1, v2(2), v3(5), v4;     cin &gt;&gt; v2 &gt;&gt; v3;     flexibleVectors v4 = v3;     v1 = v2 + v3;     cout &lt;&lt; v1;     cout &lt;&lt; 3 * v4; }</pre>	<p>//Assume the following input for v2 and v3 v2= [-2 9], v3= [-9 0 7 3 4].</p> <p>output must be [-9 0 7 1 13] output must be [-27 0 21 9 12]</p>