

2143 OOP - Test 2

Name:

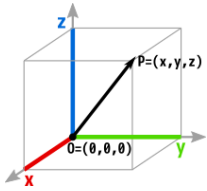
Instructions

- Use pencil only
 - Write your name at the top of all pages turned in.
 - Staple pages together at the top left corner.
 - Make sure your pages are in order, with questions also in order.
 - Handwriting that is illegible (messy, small, not straight) will lose points.
 - Indentation matters. Keep code aligned correctly.
 - Failure to comply will result in loss of letter grade.
 - **All answers will be written on the paper provided, and not directly on the test.**
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Question 1: definitions

#	Word	Choice	Definition
1	Constructor	A	The redefinition of base class function in its derived class with same signature
2	Friend	B	The capability of a class to derive properties and characteristics from another class
3	Inheritance	C	Supports an important feature of Object Oriented Programming known as Data Hiding
4	Overloading	D	Preserves their value even after they are out of their scope
5	Override	E	Overriding an operator for a class is an example of
6	Polymorphism	F	It provides multiple definitions of the function by changing signature (parameters)
7	Protected	G	Can access private and protected members of other class in which it is declared
8	Static	H	A member function which is declared within base class and is re-defined by derived class
9	This	I	A member function of which initializes objects of a class
10	Virtual	J	A constant pointer that holds the memory address of the current object

A point in 3D space can be represented using a standard 2D point with a **Z** added to represent the 3rd dimension.



Question 2 : constructors

- Write a **Point3D** class **definition** that will represent our new 3D point. Assume all values to be integers.
- Do not add any setters or getters.
- You should include:
 - a default constructor that sets each value to zero.
 - another constructor that sets each value to one passed in.
 - a copy constructor

Question 2A:

What happens if you don't write a copy constructor for a class you are defining?

Question 3 : operator overloading

If $\mathbf{a}=(x_1,y_1,z_1)$ and $\mathbf{b}=(x_2,y_2,z_2)$, then $\mathbf{a+b} = (x_1 + x_2 , y_1 + y_2 , z_1 + z_2)$

- Overload the addition operator for your **Point3D** class so that the following code snippet would be valid.
- Assume you are defining the function outside of the class definition.

```
Point3D P1;  
Point3D P2(3,-1,12);  
Point3D P3 = P1 + P2;
```

Question 4: operator overloading

Overload the the **Point3D** class so that the following statement:

```
Point3D P1(3,-1,12);  
cout<<P1<<endl;
```

would print to std out:

```
[3 , -1 , 12]
```

Assume you are defining the function inline of the class definition.

Question 5: friend keyword

- **A)** Why does the overloading `cout` require the use of the `friend` keyword?
 - **B)** T / F : *Friendship* is mutual.
 - **C)** T / F : *Friendship* can be inherited.
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Question 6: inheritance vs composition

- Write a `Line3D` class **definition** that either inherits from, or is composed of our `Point3D` class.
 - You should have at least 3 constructors and a length method.
 - Explain your reasoning for choosing inheritance or composition (with a short explanation of what each are).
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Question 7: overriding / overloading

Given:

```
class Animal {
    int speed;
    int legs;
public:
    int speed() {                // get the animals speed
        return speed;
    }
    virtual int legs() = 0;      // set the number of legs
    virtual void legs(int) = 0;  // get the number of legs
};

class Cheetah : public Animal {
public:

    // your methods would go here ...

};
```

Write the necessary code such that you override and / or overload each method. Make sure you write in your comments which one you are doing and why,

Question 8:

Write a function called `countMe` that returns the number of times it has been called.

