

Name: (as it would appear on official course roster)	
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Lab Section Time:	
Optional: name you wish to be called if different from above	
Optional: name of "homework buddy" (leaving this blank signifies "I worked alone")	

Homework 08: Classes

Assigned: Tuesday, December 1st, 2020

Due: Monday, December 7th, 2020 by 11:59 PM

Points: 40 (normalized to 100 in grade book)

- You may collaborate on this homework with AT MOST one person, an optional "homework buddy".
- MAY ONLY BE TURNED IN ON **GRADESCOPE as a PDF file**. Instructions on How to Submit (applicable to ALL homework assignments in this class) are on Piazza.
- There is NO MAKEUP for missed assignments.
- We are strict about enforcing the LATE POLICY for all assignments (see syllabus).
- **IMPORTANT:** If you use code techniques we have NOT covered in class, you will **get a zero grade** on that problem. If you cheat, or have someone else do your work, you will **get an F in the class**.
Only use the space provided for answers. Use clear and clean handwriting (or typing).

Reading: Classes – all of Ch. 10

1. (5 pts) What is the difference between **public** and **private** member elements of a class in C++?
2. (5 pts) What are class **constructors**? And even though we did not talk about it, what do you think a "**destructor**" is – give some reasoning to your answer using concepts we have talked about in CS16 (i.e. don't give me some cut-and-paste answer from the internet...)

- (4 pts) According to lecture and the textbook, what are the rules of class definition in order to make that class an abstract data type (ADT)?
- (2 pts) What are *derived classes* and what mechanism do they use in order to fulfill what they need to do?
- (2 pts) Can a derived class directly access by name a private member variable of the parent class?
- (2 pts) Suppose the class **SportsCar** is a derived class of a class **Automobile**. Suppose also that the class **Automobile** has public member functions named **accelerate** and **addGas**. Will an object of the class **SportsCar** have member functions named **accelerate** and **addGas**?

7. (4 pts) Suppose your program contains the following class definition:

```
class Automobile {  
    public:  
        void set_price(double new_price);  
        void set_profit(double new_profit);  
        double get_price();  
    private:  
        double price;  
        double profit;  
        double get_profit();  
};
```

and suppose the main part of your program contains the following declaration and that the program somehow sets the values of all the member variables to some values:

```
Automobile hyundai, jaguar;
```

Which of the following statements are then **NOT** allowed in the **main** part of your program and explain **WHY**?

- (a) `hyundai.price = 4999.99;`
- (b) `jaguar.set_price(30000.97);`
- (c) `double a_price, a_profit;`
- (d) `a_price = jaguar.get_price();`
- (e) `a_profit = jaguar.get_profit();`
- (f) `a_profit = hyundai.get_profit();`
- (g) `if (hyundai == jaguar) {
 cout << "Want to swap cars?";
 hyundai = jaguar; }`

8. (16 pts) Suppose your program contains the following incomplete class definition:

```
class TwoNumbers {  
    public:  
        TwoNumbers(int n1, int n2);  
        TwoNumbers();           // initializes num1, num2 to 0  
        double sum();           // returns sum of num1 & num2  
        double difference();    // returns diff. of num1 from num2  
        double max();           // returns larger of num1, num2  
    private:  
        double num1, num2;  
};
```

- a. (10 pts) Given the comments shown on these function definitions, give definitions to all 5 of these member functions/constructors:

- b. (2 pts) Consider these instructions in **main()**:

```
TwoNumbers thisOne, thatOne(5,7);  
thisOne.num1++;  
thisOne.num2 -= 7;  
thatOne.num2 = thatOne.sum() + thisOne.difference();  
cout << thisOne.max() / thatOne.max();
```

Explain all the reasons **WHY** this code will NOT compile.

- c. (2 pts) What would you change to the class definition to make this code compile?

- d. (2 pts) When you fix it, what would these instructions do?