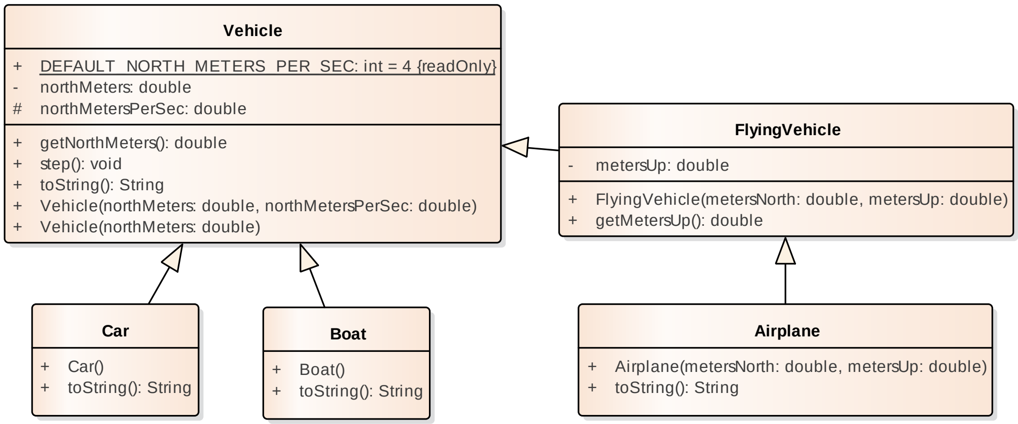
SE1021 Half Exam 2 Name:

Use only your pen/pencil/eraser (for example, no note-sheet). Review all questions before you get started. The exam is printed double-sided. Show all work. You do not need to comment your code. Problems throughout the exam refer to this class hierarchy:


Vehicle
+ DEFAULT_NORTH_METERS_PER_SEC: int = 4 {readOnly}
- northMeters: double
# northMetersPerSec: double
+ getNorthMeters(): double
+ step(): void
+ toString(): String
+ Vehicle(northMeters: double, northMetersPerSec: double)
+ Vehicle(northMeters: double)
FlyingVehicle
- metersUp: double
+ FlyingVehicle(metersNorth: double, metersUp: double)
+ getMetersUp(): double
Car
+ Car()
+ toString(): String
Boat
+ Boat()
+ toString(): String
Airplane
+ Airplane(metersNorth: double, metersUp: double)
+ toString(): String

1. (25 points) Consider the code-snippet below:

   ```
   Airplane airplane = new Airplane();
   Car car = new Car();
   ```

   Write code to **create** one list and **place** both the car and airplane in it. Then **write a loop** to make them both move one time-step forward (with the `step` method). ***Use*** interfaces where possible.

2. (20 points) ***Write*** the constructor for the Airplane class shown in the UML diagram.

3. (5 points) The northMetersPerSecond is declared protected, while northMeters is declared private. For each letter, circle either true or false
   a. **True / False** northMetersPerSecond is inherited by the same classes that inherit northMeters
   b. **True / False** northMetersPerSecond is directly accessible by the same class(es) that can directly access northMeters

4. (20 points) For each assignment below, ***write*** whether the code will compile and, if it will compile whether it will run successfully. ***Explain*** anything that either doesn't compile or doesn't run. (Only consider type-casting errors.)

   Compiles ***Runs*** ***Explain***

   a. Car car = new Airplane();

   b. Car car = new Vehicle();

   c. Vehicle vehicle = new Car();
      Car car = (Car) vehicle;

   d. Vehicle vehicle = new Boat();
      Car car = (Car) vehicle;

5. (20 points) Consider the code below.

```
Car c1 = new Car();
Car c2 = new Car();
Car c3 = c2;
c1.step();
c2.step();
c3.step();
System.out.println("c1: "+c1);
System.out.println("c2: "+c2);
System.out.println("c3: "+c3);
```

   Consider also this implementation for Car.toString():

```
  @Override public String toString() {return "car at
"+super.getNorthMeters()+ "m";}
```

   Complete what will be printed when this program runs. All vehicles start at 0 and increase their `metersNorth` by 4 each time `step` is called. Draw a memory diagram for partial credit.

`c1:`

`c2:`

`c3:`

6. (10 points) In an event-driven framework, there are event sources and event handlers.

   a. ***Give*** an example of a JavaFX class that could act as an event source.

   b. ***Give*** an example of a JavaFX class that could act as an event handler.