Name:
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Laptop #

PURDUE UNIVERSITY

Midterm 2 Examination

Problem-Solving and Object-Oriented Programming

Writing Time: TWO Hours

Question 1: Interfaces, 25 pts

In today's world, most people have a Facebook Account. You will be designing a `FacebookAccount` class that implements two interfaces:

1. `Friendable`
2. `Likeable`

TODO: Define a public class FacebookAccount in the file `FacebookAccount.java`.

- The class FacebookAccount implements the interfaces Friendable and Likeable .
- Provide two private instance variables `numFriends` and `numLikes` within the class. `numFriends` is of type `int` and `numLikes` is of type `int`.
- Provide a constructor

  ```
  public FacebookAccount(int numFriends, int numLikes)'.
  ```

  The constructor initializes the instance variables.
- DO NOT include additional INSTANCE VARIABLES or CONSTRUCTORS and DO NOT modify the interfaces.

- See the file `FacebookAccount.java` for details.

Question 2: Exceptions, 40 pts

Complete the classes `AreaCheck` and `ArithmeticOverflowException`.
In the class `AreaCheck` you will be implementing two methods:

1. `int multiply(int a, int b)`:
   Calculates the product of argument 'a' multiplied by argument 'b'.

   - This method must throw an ArithmeticOverflowException. This exception will be thrown if the result of multiplying 'a' and 'b' is too large to fit in a signed int. You can determine if the result will overflow by checking if 'a' is greater than the quotient of `Integer.MAX_VALUE` and 'b'. While throwing the exception you may or may not include a message.
   - Returns the product of 'a' and 'b'. You may use the multiplication operator, '*', in this method.

2. `boolean isEqualArea(int w1, int h1, int w2, int h2)`: Determines if two rectangles have equal area, where the first rectangle is given as a pair of dimensions w1 and h1 and the second rectangle is given as a pair of dimensions w2 and h2.

   - The area is calculated as width times height.
   - You can assume that all arguments passed will be positive.
   - You must NOT use the multiplication operator, '*'. You must call the `multiply()` method that you wrote.
   - Returns true if the the two rectangles have equal area and false otherwise.

The class `ArithmeticOverflowException` is a custom Exception which will be used when performing multiplication. The class should have two constructors:

1. `public ArithmeticOverflowException()`
2. `public ArithmeticOverflowException(String message)`

See the file `AreaCheck.java` for details.

Question 3: Inheritance, 35 pts

You are given the class `Vehicle.java`. Do not modify this class in any way! You will be writing the following subclasses:

1. Define a class `Car` in `Vehicle.java`.

   - Provide the private instance variable `mileage` of type `double`
   - Provide a constructor

     ```
     public Car(String make, String model, int year, double mileage)
     ```

     This initializes the instance variables.
   - Provide a getter function for `mileage`
   - Provide a `print()` that overrides that of the parent class- prints the vehicle make, model and year, then displays the mileage in the NEXT line as
     "Mileage: 12000.0"
     where mileage=12000.0 in the above example.

2. Define a class `Truck` in `Vehicle.java`.

   - Provide the private instance variable `tonnage` of type `double`.
   - Provide a constructor

     ```
     public Truck(String make, String model, int year, double
         tonnage)
     ```

     This initializes the instance variables.
   - Provide a getter function for `tonnage`.
   - Provide a `print()` that overrides that of the parent class- prints the vehicle make, model and year, then displays the tonnage in the NEXT line as
     "Tonnage: 12000.0"
     where tonnage=12000.0 in the above example.

See the file `Vehicle.java` for details.