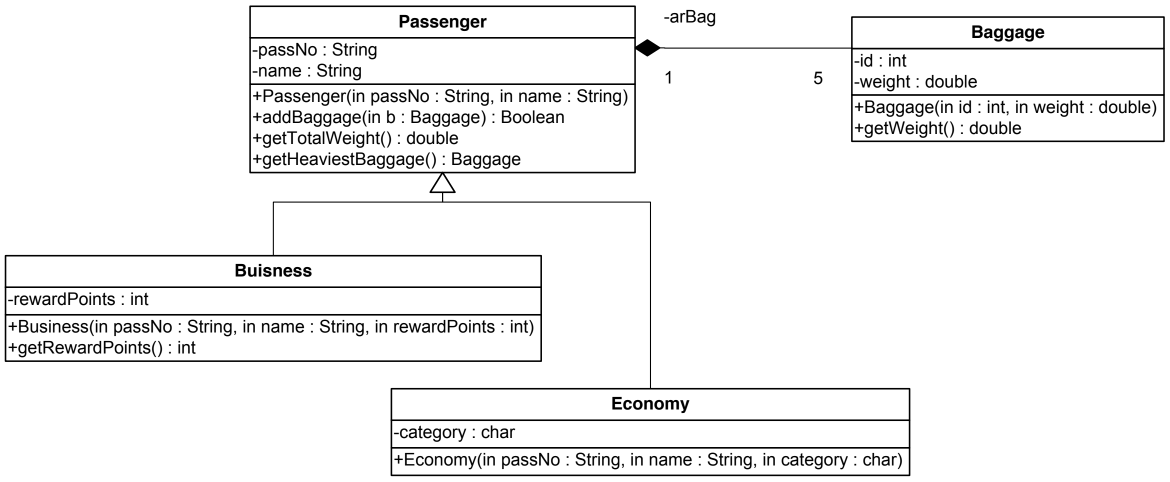
King Saud University
College of Computer and Information Sciences
Department of Computer Science
CSC113 – Computer Programming II – Final Exam – Spring 2016

Exercise1:



Passenger
-passNo : String
-name : String
+Passenger(in passNo : String, in name : String)
+addBaggage(in b : Baggage) : Boolean
+getTotalWeight() : double
+getHeaviestBaggage() : Baggage
-arBag
1
5
Baggage
-id : int
-weight : double
+Baggage(in id : int, in weight : double)
+getWeight() : double
Buisness
-rewardPoints : int
+Business(in passNo : String, in name : String, in rewardPoints : int)
+getRewardPoints() : int
Economy
-category : char
+Economy(in passNo : String, in name : String, in category : char)

Baggage class***:***

- Attributes:
  - ***id***: the id of the baggage item.
  - ***weight:*** the weight of the baggage item.
- Methods:
  - ***Baggage(id: int, weight: double)*****:** constructor.
  - ***getWeight():*** this method returns the weight of the baggage item.

Passenger class***:***

- Attributes:
  - ***passNo***: the passport number of the passenger.
  - ***name:*** the name of the passenger.
- Methods:
  - ***Passenger(passNo: String, name: String)*****:** constructor.
  - ***addBaggage(b: Baggage)*****:** this method adds the Baggage ***b*** to the passenger. It returns true if ***b*** is added successfully, and false otherwise.
  - ***getTotalWeight()*****:** this method calculates and returns the total weight of all baggage of the passenger.

- ▪ ***getHeaviestBaggage():*** this method returns the baggage object that has the maximum weight among all baggage of the passenger.

Business class***:***

- Attributes:
  - ***rewardPoints***: the number of reward points of the business passenger.
- Methods:
  - ▪ ***Business (passNo: String, name: String, rewardPoints: int)***: constructor
  - ▪ ***getRewardpoints*(): **this method returns the reward points of the business passenger.

Economy class

- Attributes:
  - ***category:*** the category of the economy passenger.
- Methods:
  - ▪ ***Economy (passNo: String, name: String, category: char)***: constructor

QUESTION: Translate into Java code:

- the class ***Baggage***
- and the class ***Passenger***.

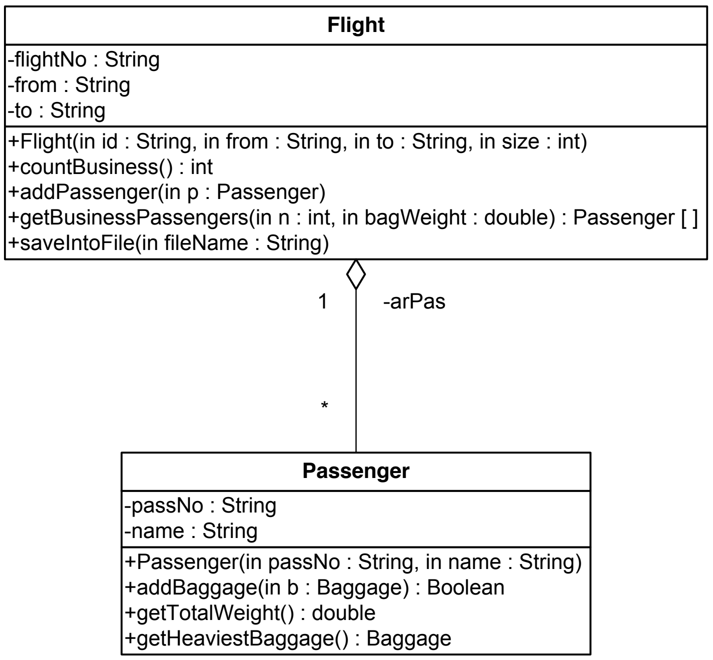
Answer:

```
public class Baggage {     ...................... /3
       private int id;
        private double weight;

        public Baggage(int id, double weight){
          this.id = id;
          this.weight = weight;
        }

        public Baggage(Baggage b){  ..................... 2
          id = b.id;
          weight = b.weight;
        }

        public double getWeight(){
          return weight;      ..................... 1
        }
}
```

```
public class Passenger {        ..................... / 18
       private String passNo;
        private String name;

        private Baggage[] arBag;     ..................... 1
        private int nbBag;           ..................... 1

        public Passenger(String passNo, String name){
          this.passNo = passNo;
          this.name = name;

          arBag = new Baggage[5];    ..................... 1
          nbBag = 0;                 ..................... 1
        }

        public boolean addBaggage(Baggage b){
          if (nbBag < arBag.length) {            ..................... 1
                arBag[nbBag] = new Baggage(b);   ..................... 1
                nbBag++;        ..................... 1
                return true;    ..................... 0.5

          }
          else
            return false;       ..................... 0.5

        }

        public double getTotalWeight(){
          double total = 0;            ..................... 1

          for (int i=0; i < nbBag; i++)    ..................... 1
            total += arBag[i].getWeight();..................... 1

          return total; ..................... 1
        }

        public Baggage getHeaviestBaggage(){
          if (nbBag == 0) return null;     ..................... 0.

          Baggage result = arBag[0]; ..................... 1
          for (int i=1; i < nbBag; i++) ..................... 1
            if (arBag[i].getWeight() > result.getWeight())  ..................... 1
              result = arBag[i];     ..................... 1

          return result; ..................... 1
        }
}
```

Exercise 2:

Let's consider the same class ***Passenger*** described in exercise 1.


Flight
-flightNo : String
-from : String
-to : String
+Flight(in id : String, in from : String, in to : String, in size : int)
+countBusiness() : int
+addPassenger(in p : Passenger)
+getBusinessPassengers(in n : int, in bagWeight : double) : Passenger [ ]
+saveIntoFile(in fileName : String)
1
-arPas
*
Passenger
-passNo : String
-name : String
+Passenger(in passNo : String, in name : String)
+addBaggage(in b : Baggage) : Boolean
+getTotalWeight() : double
+getHeaviestBaggage() : Baggage

Flight class***:***

- Attributes:
  - ***flightNo:*** the flight number.
  - ***from***: the name of the departure airport.
  - ***to: the*** name of the arrival airport.
- Methods:
  - ***Flight (id: String, from: String, to: String, size: int)***: constructor. The parameter ***size*** defines the maximum number of passengers in the flight.
  - ***countBusiness*** (): this method returns the number of business passengers in the flight.
  - ***addPassenger*** (***p: Passenger***)**:** this method adds the passenger ***p*** to the flight *if possible*. There are exactly 10 seats for business passengers on each flight. If adding a passenger is not possible, this method raises an exception with the following message "***No available seats***".
  - ***getBusinessPassengers***(***n: int, bagWeight: double***)**:** this method returns an array containing all Business passengers having reward points less than ***n***, and total baggage weight exceeding ***bagWeight***.

- ***saveIntoFile(filename: String):*** this method stores all passenger objects of the flight in a file named ***filename***.

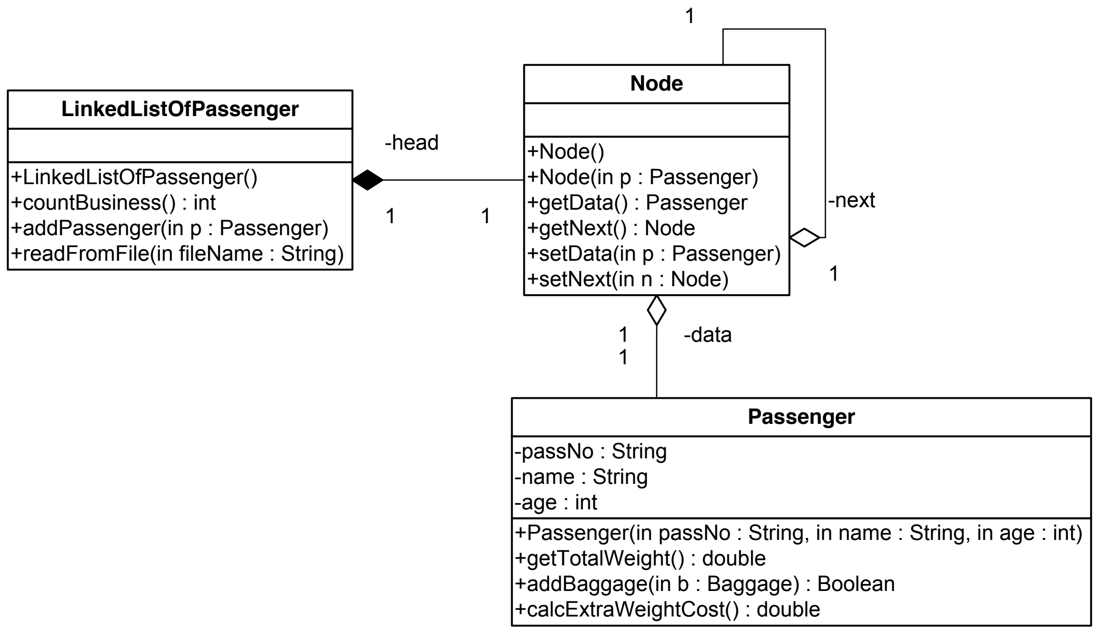
QUESTION: Translate into Java code the class ***Flight.***

Answer:

```
public class Flight {  ..................... /33
        private String flightNo, from, to;

        private Passenger[] arPas;   ..................... 1
        private int nbSeats;         ..................... 1

        public Flight(String id, String from, String to, int size){
          flightNo = id;    this.from = from;       this.to = to;
          arPas = new Passenger[size];     ..................... 1
          nbSeats = 0;                     ..................... 1
        }

        public int countBusiness(){
          int n = 0;     ..................... 1

          for (int i=0; i < nbSeats; i++) ..................... 1
            if (arPas[i] instanceof Business)    ..................... 1
                  n++;  ..................... 1

          return n;      ..................... 1
        }

        public void addPassenger(Passenger p) throws Exception{ ............... 1
            if (nbSeats == arPas.length)
                        throw new Exception("No available seats");

            if (p instanceof Business && countBusiness() == 10) ............ 1 + 1
                        throw new Exception("No available seats"); ......... 0.5

            if (p instanceof Economy &&  ..................... 1
                  ((nbSeats - countBusiness()) == (arPas.length - 10))) ...... 1
                        throw new Exception("No available seats"); ...... 0.5

           arPas[nbSeats++] = p; ..................... 1 + 1
        }


        public Passenger[] getBusinessPassengers(int n, double bagWeight){
          int nbB = countBusiness();
          Passenger[] result = new Passenger[nbB]; ..................... 1 + 1
          int j = 0; ..................... 1
          for (int i=0; i < nbSeats; i++) ..................... 1
            if (arPas[i] instanceof Business && ..................... 1
                arPas[i].getTotalWeight() >= bagWeight && ..................... 1
                ((Business)arPas[i]).getRewardPoints() < n) ............... 1 + 1
                        result[j++] = arPas[i]; ..................... 1 + 1
          return result; ..................... 1
        }


      public void saveIntoFile(String fileName) throws Exception{ ............ 0.5
          File f = new File(fileName);    ............ 0.5
          FileOutputStream fos = new FileOutputStream(f); ..................... 0.5
          ObjectOutputStream oos = new ObjectOutputStream(fos); ............ 0.5

          for (int i=0; i < nbSeats; i++) ..................... 1
            oos.writeObject(arPas[i]); ..................... 1

          oos.close();..................... 1
        }
  }
```

Exercise 3:

Let's consider the same class ***Passenger*** described in exercise 1.



LinkedListOfPassenger
+LinkedListOfPassenger()
+countBusiness() : int
+addPassenger(in p : Passenger)
+readFromFile(in fileName : String)
-head
1
1
Node
+Node()
+Node(in p : Passenger)
+getData() : Passenger
+getNext() : Node
+setData(in p : Passenger)
+setNext(in n : Node)
1
-next
1
1
1
-data
Passenger
-passNo : String
-name : String
-age : int
+Passenger(in passNo : String, in name : String, in age : int)
+getTotalWeight() : double
+addBaggage(in b : Baggage) : Boolean
+calcExtraWeightCost() : double

LinkedlistOfPassenger class***:***

- Methods:
  - ***LinkedlistOfPassenger()***: constructor.
  - ***countBusiness***(): this method returns the number of business passengers in the list.
  - ***addpassenger(p: Passenger):*** this method inserts the passenger ***p*** at the back of the list.
  - ***readFromFile(filename: String):*** this method reads all passenger objects stored in the file named ***filename*** and adds them to the list.

QUESTION: Translate into Java code the class ***LinkedListOfPassenger.***

Answer:

```
public class LinkedListOfPassenger {                    ..................... /26
        private Node head;      ..................... 1

        public LinkedListOfPassenger(){
          head = null;  ..................... 1
        }

        public int countBusiness(){
          int n = 0;            ..................... 1
          Node p = head;        ..................... 1

          while(p != null){     ..................... 1
            if (p.getData() instanceof Business)        ..................... 1
                   n++;  ..................... 1

            p = p.getNext();    ..................... 1
          }
          return n;     ..................... 1
        }

        public void addPassenger(Passenger p){
          Node nn = new Node(p); ..................... 1
          //Node nn = new Node(); nn.setData(p);

          if (head == null) ..................... 1
            head = nn; ..................... 1
          else {
            Node tail = head; ..................... 1
            while (tail.getNext() != null) ..................... 1
              tail = tail.getNext();       ..................... 1

            tail.setNext(nn);       ..................... 1
          }
        }

        public void readFromFile(String fileName) throws Exception{ ......... 0.5
          File f = new File(fileName); ..................... 0.5
          FileInputStream fis = new FileInputStream(f); ..................... 1
          ObjectInputStream ois = new ObjectInputStream(fis); ..................... 1

          try { ..................... 1
            while (true){ ..................... 1
              Passenger p = (Passenger)ois.readObject();..................... 1 + 1
              addPassenger(p); ..................... 1
            }
          } catch (EOFException e) {} ..................... 1
          ois.close(); ..................... 1
        }
}
```