Option D — Object-oriented programming

A hotel has 100 rooms and uses an OOP program to deal with allocating the rooms to clients when they arrive at the hotel. The program contains a `Client` class and a `Room` class. A user-defined `Dates` class is also used. Part of the `Client` class and `Dates` class are shown below.

```
public class Client
{ private int customerID;
  private String name;
  private Dates arrive;
  private Dates leave;
  private Room bedroom;

  public Client(int id, String c, Dates dateIn, Dates dateOut, Room r)
  { setCustomerID(id);
    setName(c);
    setArrive(dateIn);
    setLeave(dateOut);
    setBedroom(r);
  }
  public void setCustomerID(int id) {customerID = id;}
  public void setName(String c) {name = c;}
  public void setArrive(Dates dateIn) {arrive = dateIn;}
  public void setLeave(Dates dateOut) {leave = dateOut;}
  public void setBedroom(Room r) {bedroom = r;}

  public int getCustomerID() {return customerID;}
  public String getName() {return name;}
  public Dates getArrive() {return arrive;}
  public Dates getLeave() {return leave;}
  public Room getBedroom() {return bedroom;}

  public void bill()
  {... // method that calculates the bill for this client
  }
}

public class Dates
{ private int day;
  private int month;
  private int year;

  public Dates(int day, int month, int year)
  { this.day = day;
    this.month = month;
    this.year = year;
  }
  public int getDay() {return day;}
  public int getMonth() {return month;}
  public int getYear() {return year;}
  public static int StayDays(Dates x, Dates y)
  {... // method that calculates the number of nights between x and y
  }
}
```

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The `Room` class contains the following variables.

- `roomNumber` a value that identifies the room
- `beds` the number of beds in the room
- `price` the price of the room, per night
- `empty` indicating whether or not the room is occupied.

10. (a) State the relationship between `Client` and `Room`. [1]

(b) Construct a UML diagram for the `Room` class. [4]

(c) Outline **one** advantage of using a class to represent the dates. [2]

The `Room` objects are held in the array `allRooms[]` in ascending order of `roomNumber`. For example, the object for room 5 is held in `allRooms[4]`.

(d) Construct a method, `findRooms()`, that searches `allRooms[]` and returns the `roomNumber` of all empty rooms that have two beds. [6]

(e) Construct the method, `bill()`, in the `Client` class to calculate and output a bill for a client based on the price of the room per night and the number of nights spent in the hotel. The bill should include:
- the client's name
- the room number
- the date that they arrived
- the date that they are leaving
- the total number of nights they stayed
- the total cost. [8]

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11. The hotel accepts group bookings where many clients, such as tour groups, can be allocated rooms on arrival. The `Group` class contains the name of the group, the number of rooms used by the group and a method `bill()` that calculates the total bill for the group.

Part of the `Group` class is shown below.

```
public class Group
{
  private String name; // name of group
  private int number;  // number of rooms allocated to the group

  public Group(String name, int number)
  {
    this.name = name;
    this.number = number;
  }

  public String getName() {return name;}
  public int getNumber() {return number;}

  int[] gRooms = new int[number];
  // array to hold room numbers allocated to the group

  public double bill(int[] gRooms)
  {... // method that calculates the bill for the group
  }
}
```

The `GClient` class represents a client who is part of a group. It inherits all the class members of the `Client` class and also stores the name of the group.

(a) Construct the `GClient` class. [7]

(b) With reference to the objects, methods and parameters, describe the process of allocating rooms when a tour group called “Happy Travellers” arrives at the hotel and is allocated 15 rooms, each of which has two beds. [6]

(c) Construct the method, `bill(int[] gRooms)`, to calculate and output the total cost of the group’s rooms for one day. [5]

12. The company wishes to update this OOP program and sell it to other hotels. They hire a programmer to make appropriate changes to the program.

(a) Outline the responsibilities that the programmer has when updating the program. [2]

(b) Discuss the features of modern programming languages that enable the program to be sold in other countries. [4]

End of Option D