

AP® Computer Science A
2005 Free-Response Questions

The College Board: Connecting Students to College Success

The College Board is a not-for-profit membership association whose mission is to connect students to college success and opportunity. Founded in 1900, the association is composed of more than 4,700 schools, colleges, universities, and other educational organizations. Each year, the College Board serves over three and a half million students and their parents, 23,000 high schools, and 3,500 colleges through major programs and services in college admissions, guidance, assessment, financial aid, enrollment, and teaching and learning. Among its best-known programs are the SAT®, the PSAT/NMSQT®, and the Advanced Placement Program® (AP®). The College Board is committed to the principles of excellence and equity, and that commitment is embodied in all of its programs, services, activities, and concerns.

Copyright © 2005 by College Board. All rights reserved. College Board, AP Central, APCD, Advanced Placement Program, AP, AP Vertical Teams, Pre-AP, SAT, and the acorn logo are registered trademarks of the College Entrance Examination Board. Admitted Class Evaluation Service, CollegeEd, Connect to college success, MyRoad, SAT Professional Development, SAT Readiness Program, and Setting the Cornerstones are trademarks owned by the College Entrance Examination Board. PSAT/NMSQT is a registered trademark of the College Entrance Examination Board and National Merit Scholarship Corporation. Other products and services may be trademarks of their respective owners. Permission to use copyrighted College Board materials may be requested online at: http://www.collegeboard.com/inquiry/cbpermit.html.

Visit the College Board on the Web: www.collegeboard.com.
AP Central is the official online home for the AP Program and Pre-AP: apcentral.collegeboard.com.

COMPUTER SCIENCE A

SECTION II

Time—1 hour and 45 minutes

Number of questions—4

Percent of total grade—50

Directions: SHOW ALL YOUR WORK, REMEMBER THAT PROGRAM SEGMENTS ARE TO BE WRITTEN IN Java.

Notes:

- Assume that the classes listed in the Quick Reference found in the Appendix have been imported where appropriate.
- Unless otherwise noted in the question, assume that parameters in method calls are not `null` and that methods are called only when their preconditions are satisfied.
- In writing solutions for each question, you may use any of the accessible methods that are listed in classes defined in that question. Writing significant amounts of code that can be replaced by a call to one of these methods may not receive full credit.

Copyright © 2005 by College Entrance Examination Board. All rights reserved.
Visit apcentral.collegeboard.com (for AP professionals) and www.collegeboard.com/apstudents (for AP students and parents).

GO ON TO THE NEXT PAGE.

1. In this question, you will implement two methods for a class `Hotel` that is part of a hotel reservation system. The `Hotel` class uses the `Reservation` class shown below. A `Reservation` is for the person and room number specified when the `Reservation` is constructed.

```
public class Reservation
{
  public Reservation(String guestName, int roomNumber)
  { /* implementation not shown */ }

  public int getRoomNumber()
  { /* implementation not shown */ }

  // private data and other methods not shown
}
```

An incomplete declaration for the `Hotel` class is shown below. Each hotel in the hotel reservation system has rooms numbered 0, 1, 2, . . . , up to the last room number in the hotel. For example, a hotel with 100 rooms would have rooms numbered 0, 1, 2, . . . , 99.

```
public class Hotel
{
  private Reservation[] rooms;
    // each element corresponds to a room in the hotel;
    // if rooms[index] is null, the room is empty;
    // otherwise, it contains a reference to the Reservation
    // for that room, such that
    // rooms[index].getRoomNumber() returns index

  private ArrayList waitList;
    // contains names of guests who have not yet been
    // assigned a room because all rooms are full


  // if there are any empty rooms (rooms with no reservation),
  // then create a reservation for an empty room for the
  // specified guest and return the new Reservation;
  // otherwise, add the guest to the end of waitList
  // and return null
  public Reservation requestRoom(String guestName)
  { /* to be implemented in part (a) */ }


  // release the room associated with parameter res, effectively
  // canceling the reservation;
  // if any names are stored in waitList, remove the first name
  // and create a Reservation for this person in the room
  // reserved by res; return that new Reservation;
  // if waitList is empty, mark the room specified by res as empty and
  // return null
  // precondition:  res is a valid Reservation for some room
  //                in this hotel
  public Reservation cancelAndReassign(Reservation res)
  { /* to be implemented in part (b) */ }

  // constructors and other methods not shown
}
```

Copyright © 2005 by College Entrance Examination Board. All rights reserved.
Visit apcentral.collegeboard.com (for AP professionals) and www.collegeboard.com/apstudents (for AP students and parents).

(a) Write the `Hotel` method `requestRoom`. Method `requestRoom` attempts to reserve a room in the hotel for a given guest. If there are any empty rooms in the hotel, one of them will be assigned to the named guest and the newly created reservation is returned. If there are no empty rooms, the guest is added to the end of the waiting list and `null` is returned.

Complete method `requestRoom` below.

```
// if there are any empty rooms (rooms with no reservation),
// then create a reservation for an empty room for the
// specified guest and return the new Reservation;
// otherwise, add the guest to the end of waitList
// and return null
public Reservation requestRoom(String guestName)
```

(b) Write the `Hotel` method `cancelAndReassign`. Method `cancelAndReassign` releases a previous reservation. If the waiting list for the hotel contains any names, the vacated room is reassigned to the first person at the beginning of the list. That person is then removed from the waiting list and the newly created reservation is returned. If no one is waiting, the room is marked as empty and `null` is returned.

In writing `cancelAndReassign` you may call any accessible methods in the `Reservation` and `Hotel` classes. Assume that these methods work as specified.

Complete method `cancelAndReassign` below.

```
// release the room associated with parameter res, effectively
// canceling the reservation;
// if any names are stored in waitList, remove the first name
// and create a Reservation for this person in the room
// reserved by res; return that new Reservation;
// if waitList is empty, mark the room specified by res as empty and
// return null
// precondition:  res is a valid Reservation for some room
//                in this hotel
public Reservation cancelAndReassign(Reservation res)
```

Copyright © 2005 by College Entrance Examination Board. All rights reserved.
Visit apcentral.collegeboard.com (for AP professionals) and www.collegeboard.com/apstudents (for AP students and parents).