

AP® Computer Science A
2005 Free-Response Questions

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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.

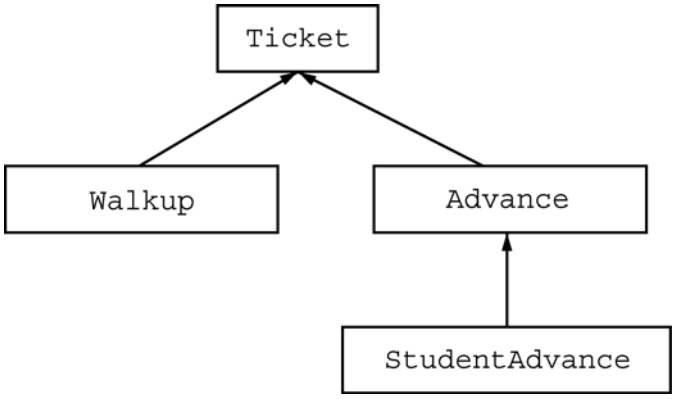
Notes:

- 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.

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2. A set of classes is used to handle the different ticket types for a theater. The class hierarchy is shown in the following diagram.



All tickets have a serial number and a price. The class `Ticket` is specified as an `abstract` class as shown in the following declaration.

```
public abstract class Ticket
{
  private int serialNumber;   // unique ticket id number


  public Ticket()
  {  serialNumber = getNextSerialNumber();  }


  // returns the price for this ticket
  public abstract double getPrice();


  // returns a string with information about the ticket
  public String toString()
  {
    return "Number: " + serialNumber + "\nPrice: " + getPrice();
  }


  // returns a new unique serial number
  private static int getNextSerialNumber()
  {  /* implementation not shown */  }
}
```

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Each ticket has a unique serial number that is assigned when the ticket is constructed. For all ticket classes, the `toString` method returns a string containing the information for that ticket. Three additional classes are used to represent the different types of tickets and are described in the table below.

Class	Description	Sample `toString` Output
`Walkup`	These tickets are purchased on the day of the event and cost 50 dollars.	`Number: 712` `Price: 50`
`Advance`	Tickets purchased ten or more days in advance cost 30 dollars. Tickets purchased fewer than ten days in advance cost 40 dollars.	`Number: 357` `Price: 40`

`StudentAdvance`	These tickets are a type of `Advance` ticket that costs half of what that `Advance` ticket would normally cost.	`Number: 134`
		`Price: 15`
		`(student ID required)`

Using the class hierarchy and specifications given above, you will write complete class declarations for the `Advance` and `StudentAdvance` classes.

(a) Write the complete class declaration for the class `Advance`. Include all necessary instance variables and implementations of its constructor and method(s). The constructor should take a parameter that indicates the number of days in advance that this ticket is being purchased. Tickets purchased ten or more days in advance cost $30; tickets purchased nine or fewer days in advance cost $40.

(b) Write the complete class declaration for the class `StudentAdvance`. Include all necessary instance variables and implementations of its constructor and method(s). The constructor should take a parameter that indicates the number of days in advance that this ticket is being purchased. The `toString` method should include a notation that a student ID is required for this ticket. A `StudentAdvance` ticket costs half of what that `Advance` ticket would normally cost. If the pricing scheme for `Advance` tickets changes, the `StudentAdvance` price should continue to be computed correctly with no code modifications to the `StudentAdvance` class.

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