CS211 - OBJECT-ORIENTED SOFTWARE DEVELOPMENT

Review Exercises on Fundamental OO Concepts

Given the following class hierarchy, and a reasonable understanding of the reality it represents, answer the following questions. Assume that the following rules apply:

• One can withdraw money from a checking account at any time by writing a check or visiting an ATM.

• One can only withdraw money from a passbook account by coming into the bank with the passbook during business hours. Passbook accounts pay interest, and all passbook accounts pay interest at the same rate.

• One can only withdraw money from a time account (e.g. a certificate of deposit) without paying a substantial penalty after a specified period of time has elapsed (e.g. 6 months, 1 year - these are the only terms offered). Time accounts pay interest at a higher rate, which may be different for different terms, but is the same for all time accounts of a given term.
Matching (mark all that apply; each answer will be used at least once and may be used more than once)

_______ 1. BankAccount
_______ 2. CheckingAccount
_______ 3. TimeAccount
_______ 4. Anthony Aardvark’s checking account
_______ 5. The current balance in Anthony Aardvark’s checking account
_______ 6. The variable that holds the social security number of the owner of a bank account is declared private.
_______ 7. The method that creates a new checking account.
_______ 8. The method that handles depositing money into a checking account
_______ 9. The actual amount of money being deposited into someone’s checking account is a ____ of the method referred to above.
_______ 10. The method that gets the current balance in someone’s checking account.
_______ 11. The interest rate paid by all passbook accounts. (Same for all passbook accounts, but may be changed from time to time.)
_______ 12. The method that changes the interest rate paid by all passbook accounts.
_______ 13. Gets created when Anthony Aardvark withdraws money from his passbook account at the bank.
_______ 14. The fact that the software enforces the rule that one can deposit money to a checking or passbook account at any time - but cannot deposit money to a time account once it has been created is an example of ________.
_______ 15. The SixMonth CD class records the fact that its term is 180 days, and the OneYearCd class records the fact that its term is 365 days.

A. Abstract Class
B. Accessor
C. Base Class
D. Class constant
E. Class (static) Field
F. Class (static) Method
G. Concrete Class
H. Constructor
I. Derived Class
J. Encapsulation
K. Instance Field
L. Instance Method
M. Message
N. Mutator.
O. Object
P. Parameter
Q. Polymorphism
R. Super Class
S. Sub Class.
16. One of the classes in the diagram probably should be abstract rather than concrete. Which one? Why?

17. What change(s) would need to be made to the diagram if this class were made abstract?

18. Suppose the bank decided to create a new type of “high balance” passbook account that has the same rules as ordinary passbook accounts, with two exceptions:

   • These accounts have a minimum balance of $10,000
   • They pay a higher rate of interest than ordinary savings accounts

   (Ordinary passbook accounts are not affected by this change.)

   To handle this, a new class HighBalancePassbookAccount is added, and made a subclass of PassbookAccount. Should PassbookAccount become an abstract class as a result? Why or why not?

Matching (mark all possibilities consistent with good software design practice; each answer will be used at least once and may be used more than once)

_______ 18. The method that creates a new checking account.  
           A. private  
           B. protected  
           C. public

_______ 19. The variable that holds the current balance in a BankAccount. (Note that the methods of each subclass need to access this.)

_______ 20. The variable that holds the number of the ATM card used to access a particular checking account. (Note that only checking accounts can be accessed from this bank’s ATMs).
Suppose that people at Gordon College are described by a class hierarchy like the following:

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Person

Employee       Student

Staff          Faculty
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Indicate in which class each of the following features would be defined (assuming they have the meaning obviously implied by their names) (There should be just one answer for each)

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21. advisees (an array or list)
   - A. Person
   - B. Employee
   - C. Student
   - D. Faculty
   - E. Staff

22. calculatePayCheckAmount()
   - A. Person
   - B. Employee
   - C. Student
   - D. Faculty
   - E. Staff

23. dateHired
   - A. Person
   - B. Employee
   - C. Student
   - D. Faculty
   - E. Staff

24. getAddress()
   - A. Person
   - B. Employee
   - C. Student
   - D. Faculty
   - E. Staff

25. getCoursesTeaching()
   - A. Person
   - B. Employee
   - C. Student
   - D. Faculty
   - E. Staff

26. gpa
   - A. Person
   - B. Employee
   - C. Student
   - D. Faculty
   - E. Staff

27. lastName
   - A. Person
   - B. Employee
   - C. Student
   - D. Faculty
   - E. Staff

28. officePhoneExtension
   - A. Person
   - B. Employee
   - C. Student
   - D. Faculty
   - E. Staff

29. recordCourseTaken()
   - A. Person
   - B. Employee
   - C. Student
   - D. Faculty
   - E. Staff

30. vacationDaysTakenThisYear *
   - A. Person
   - B. Employee
   - C. Student
   - D. Faculty
   - E. Staff

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* Staff have a fixed number of days of vacation per year, but faculty do not.