Interest Calculator Functional Requirements

Deliverable Functionality

- Account object with balance and interest rate properties, transaction history, overdraft and minimum balance information, and a list of recurring transactions.
- `InterestCalculator` class should have a `calculateSimpleInterest` method that computes (simple) interest over a given interval from the object's state.
- `InterestCalculator` should have a `calculateComplexInterest` method that computes complex interest over a given interval with a given compounding period (daily, monthly, annually, intermediate)
- If a ledger/account history is available, balance for interest calculations should be determined from the ledger instead of the current balance according to one of the following balance calculation rules (set on either the account or the calculator). Balances are calculated in the order that transactions take place:
  - Time of Credit - Calculate interest based on account balance at time of payment
  - Ex-Interest date - Calculate interest based on balance a set number of days prior to payment
  - Average - Calculate interest based on average balance over the interest bearing period
  - Maximum/minimum - Calculate interest based on maximum or minimum balance during the interest bearing period
  - Threshold max/min - Calculate interest based on the maximum or minimum balance that was maintained for at least x days during the interest bearing period
- Accounts with recurring transactions (debits or credits) should incorporate these into interest calculations.
  - Recurring transactions will be a fixed amount
  - Recurring transactions have a transaction date and a period over which they repeat. All recurring transactions are indefinite (they never stop repeating in the context of this application).
- Required Minimum Balance (RMB) - Accounts may have a set minimum balance and be subject to any of the following rules if a minimum balance is not maintained:
  - No interest received in periods where minimum balance isn't maintained
  - Interest rate is penalized during periods where minimum balance isn't maintained
  - Flat rate deduction when periods where minimum balance isn't maintained
    - Deduction is from interest earned
    - Overflow deduction may reduce account balance

- Accounts with a <$0 balance should:
    - Receive no interest (positive or negative)
    - Suffer the overdraw penalty set on the account/account type

Limitations of Scope

This module will not be used to directly support customer transactions. Account functionality such as deposits, withdrawals, balance checks and transfers are beyond the scope of this application. Those features, as well as scheduling recurring transactions and opening and closing accounts will be supported in other modules.

Domain Breakdown

Domain Objects and Behaviors

- Account
- Interest
- InterestCalculator

Workflow Diagram

«This section intentionally blank»

Class Diagram

Account
accountType : String balance : long interestRate : double overdraftPenalty : long requiredMinimumBalance : long isMinimumBalanceRequired : boolean recurringTransactions : List<RecurringTransaction>

InterestCalculator
calculateSimpleInterest(account, interval) : long calculateComplexInterest(account, interval, frequency) : long

RecurringTransaction
frequency : int amount : long

Environment Restrictions

This module will be deployed to a company-standard full-sized JVM. No special restrictions apply. The following standard environment restrictions apply:

- This module must not directly read/write files. Any persistent data must be stored in approved database instances
- This module must fail gracefully, exiting via exceptions if an erroneous situation occurs.

Legacy System Integration

The existing account servicing system requires the following function signatures. Your module will be placed into a testing environment with legacy account servicing components and run through system integration tests to confirm it provides the needed functionality. All `long` return values are earned interest represented as a number of pennies.

InterestCalculator::calculateSimpleInterest(account, interval) : long
InterestCalculator::calculateComplexInterest(account, interval, compoundingPeriod): long

Until the testing environment is available (approx 2 week setup time) functionality should be demonstrated via a REST-compliant application and automated testing scripts in Postman.

Validation

Testing Requirements

To ensure proper functionality, the following scenarios must be tested:

- Simple interest on an account with a normal balance (non-zero, no RMB)
- Simple interest on an account with a normal balance (non-zero, above RMB)
- Simple interest on an account below the minimum balance (non-zero)
- Simple interest on an account with a zero balance (no RMB)
- Simple interest on an account with a zero balance (below RMB)
- Simple interest on an account with a negative (overdrawn) balance (no RMB)
- Simple interest on an account with a negative (overdrawn) balance (below RMB)
- Complex interest on an account with a normal balance (non-zero, no RMB)
- Complex interest on an account with a normal balance (non-zero, above RMB)
- Complex interest on an account below the minimum balance (non-zero)
- Complex interest on an account with a zero balance (no RMB)

- Complex interest on an account with a zero balance (below RMB)
- Complex interest on an account with a negative (overdrawn) balance (no RMB)
- Complex interest on an account with a negative (overdrawn) balance (below RMB)
- Simple interest on an account with a normal balance and recurring deductions that **will not** exceed interest earned
- Simple interest on an account with a normal balance and recurring deductions that **will** exceed interest earned
- Complex interest on an account with a normal balance and recurring deductions that **will not** exceed interest earned
- Complex interest on an account with a normal balance and recurring deductions that **will** exceed interest earned
- Simple interest on an account below RMB with recurring contributions that **will not** bring the account above RMB
- Simple interest on an account below RMB with recurring contributions that **will** bring the account above RMB
- Complex interest on an account below RMB with recurring contributions that **will not** bring the account above RMB
- Complex interest on an account below RMB with recurring contributions that **will** bring the account above RMB
- Simple interest on a low-balance account that will become overdrawn with recurring contributions that **will not** bring the account above a $0 balance
- Simple interest on a low-balance account that will become overdrawn with recurring contributions that **will** bring the account above a $0 balance
- Complex interest on a low-balance account that will become overdrawn with recurring contributions that **will not** bring the account above a $0 balance
- Complex interest on a low-balance account that will become overdrawn with recurring contributions that **will** bring the account above a $0 balance
- Simple interest on an overdrawn account with recurring contributions that **will not** bring the account above a $0 balance
- Simple interest on an overdrawn account with recurring contributions that **will** bring the account above a $0 balance
- Complex interest on an overdrawn account with recurring contributions that **will not** bring the account above a $0 balance
- Complex interest on an overdrawn account with recurring contributions that **will** bring the account above a $0 balance

Regulatory and Security Concerns

This internal-only module will be utilized by other modules that incorporate regulatory and security compliance. No additional considerations are needed for this module.