```
 1  // joi/4/bank/Bank.java
 2  //
 3  //
 4  // Copyright 2003 Bill Campbell and Ethan Bolker
 5
 6  // Lines marked "///" flag places where changes will be needed.
 7
 8  /// import java.util.??
 9
10  /**
11   * A Bank object simulates the behavior of a simple bank/ATM.
12   * It contains a Terminal object and a collection of
13   * BankAccount objects.
14   *
15   * Its public method visit opens this Bank for business,
16   * prompting the customer for input.
17   *
18   * To create a Bank and open it for business issue the command
19   * <code>java Bank</code>.
20   *
21   * @see BankAccount
22   * @version 4
23   */
24
25  public class Bank
26  {
27      private String bankName;           // the name of this Bank
28      private Terminal atm;              // for talking with the customer
29      private int balance = 0;           // total cash on hand
30      private int transactionCount = 0;  // number of Bank transactions don
31
32      private BankAccount[] accountList; /// collection of BankAccounts
33      /// omit next line when accountList is dynamic
34      private final static int NUM_ACCOUNTS = 3;
35
36      // what the banker can ask of the bank
37
38      private static final String BANKER_COMMANDS =
39      "Banker commands: " +
40          "exit, open, customer, report, help.";
41
42      // what the customer can ask of the bank
43
44      private static final String CUSTOMER_TRANSACTIONS =
45      "    Customer transactions: " +
46          "deposit, withdraw, transfer, balance, quit, help.";
47
48      /**
49       * Construct a Bank with the given name and Terminal.
50       *
51       * @param bankName the name for this Bank.
52       * @param atm  this Bank's Terminal.
53       */
54
55      public Bank( String bankName, Terminal atm )
56      {
```



```
57          this.atm      = atm;
58          this.bankName = bankName;
59          // initialize collection:
60          accountList   = new BankAccount[NUM_ACCOUNTS]; ///
61
62          /// When accountList is an array, fill it here.
63          /// When it's an ArrayList or a TreeMap, delete these lines.
64          /// Bank starts with no accounts, banker creates them with
65          /// the openNewAccount method.
66          accountList[0] = new BankAccount(  0, this);
67          accountList[1] = new BankAccount(100, this);
68          accountList[2] = new BankAccount(200, this);
69      }
70
71      /**
72       * Simulates interaction with a Bank.
73       * Presents the user with an interactive loop, prompting for
74       * banker transactions and in case of the banker transaction
75       * "customer", an account id and further customer
76       * transactions.
77       */
78
79      public void visit()
80      {
81          instructUser();
82
83          String command;
84          while (!(command =
85                   atm.readWord("banker command: ")).equals("exit")) {
86
87              if (command.startsWith("h")) {
88                  help( BANKER_COMMANDS );
89              }
90              else if (command.startsWith("o")) {
91                  openNewAccount();
92              }
93              else if (command.startsWith("r")) {
94                  report();
95              }
96              else if (command.startsWith( "c" ) ) {
97                  BankAccount acct = whichAccount();
98                  if ( acct != null )
99                      processTransactionsForAccount( acct );
100             }
101             else {
102                 // Unrecognized Request
103                 atm.println( "unknown command: " + command );
104             }
105         }
106         report();
107         atm.println( "Goodbye from " + bankName );
108     }
109
110
111     // Open a new bank account,
112     // prompting the user for information.
```

```
113
114     private void openNewAccount()
115     {
116         /// when accountList is a dynamic collection
117         /// remove the next two lines, uncomment and complete
118         /// the code between /* and */
119         atm.println(bankName + " is accepting no new customers\n");
120         return;
121
122         /*
123         // prompt for initial deposit
124         int startup = atm.readInt( "Initial deposit: " );
125
126         // create newAccount
127         BankAccount newAccount = new BankAccount( startup, this );
128
129         //  and add it to accountList
130         ???
131
132         // inform user
133         atm.println( "opened new account " + ??? /// name or number
134                         + " with $" + newAccount.getBalance());
135         */
136     }
137
138     // Prompt the customer for transaction to process.
139     // Then send an appropriate message to the account.
140
141     private void processTransactionsForAccount( BankAccount acct )
142     {
143         help( CUSTOMER_TRANSACTIONS );
144
145         String transaction;
146         while (!(transaction =
147                  atm.readWord("    transaction: ")).equals("quit")) {
148
149             if ( transaction.startsWith( "h" ) ) {
150                 help( CUSTOMER_TRANSACTIONS );
151             }
152             else if ( transaction.startsWith( "d" ) ) {
153                 int amount = atm.readInt( "    amount: " );
154                 atm.println("    deposited " + acct.deposit( amount ));
155             }
156             else if ( transaction.startsWith( "w" ) ) {
157                 int amount = atm.readInt( "    amount: " );
158                 atm.println("    withdrew " + acct.withdraw( amount ));
159             }
160             else if (transaction.startsWith("t")) {
161                 atm.print( "    to ");
162                 BankAccount toacct = whichAccount();
163                 if (toacct != null) {
164                     int amount = atm.readInt("    amount to transfer: ");
165                     atm.println("    transfered " +
166                                 toacct.deposit(acct.withdraw(amount)));
167                 }
168             }
```



```
169             else if (transaction.startsWith("b")) {
170                 atm.println("    current balance " +
171                             acct.requestBalance());
172             }
173             else {
174                 atm.println("    sorry, unknown transaction" );
175             }
176         }
177         atm.println();
178     }
179
180     // Prompt for an account name (or number), look it up
181     // in the account list. If it's there, return it;
182     // otherwise report an error and return null.
183
184     private BankAccount whichAccount()
185     {
186         /// prompt for account name or account number
187         /// (whichever is appropriate)
188         int accountNumber = atm.readInt("account number: ");
189
190         /// look up account in accountList
191         /// if it's there, return it
192         /// else the following two lines should execute
193         if ( accountNumber >= 0 && accountNumber < NUM_ACCOUNTS ) {
194             return accountList[accountNumber];
195         }
196         else {
197             atm.println("not a valid account");
198             return null;
199         }
200     }
201
202     // Report bank activity.
203     // For each BankAccount, print the customer id (name or number),
204     // account balance and the number of transactions.
205     // Then print Bank totals.
206
207     private void report()
208     {
209         atm.println( "\nSummaries of individual accounts:" );
210         atm.println( "account  balance   transaction count" );
211         for (int i = 0; i < NUM_ACCOUNTS; i++ ) {             ///
212             atm.println(i + "\t" + accountList[i].getBalance() +     ///
213                         "\t" + accountList[i].getTransactionCount());///
214         }
215
216         atm.println( "\nBank totals");
217         atm.println( "open accounts: " + getNumberOfAccounts() );
218         atm.println( "cash on hand: $" + getBalance());
219         atm.println( "transactions:  " + getTransactionCount());
220         atm.println();
221     }
222
223
224     // Welcome the user to the bank and instruct her on
```

```
225      //  her options.
226
227      private void instructUser()
228      {
229          atm.println( "Welcome to " + bankName );
230          atm.println( "Open some accounts and work with them." );
231          help( BANKER_COMMANDS );
232      }
233
234      // Display a help string.
235
236      private void help( String helpString )
237      {
238          atm.println( helpString );
239          atm.println();
240      }
241
242      /**
243       * Increment bank balance by given amount.
244       *
245       * @param amount the amount increment.
246       */
247
248      public void incrementBalance(int amount)
249      {
250          balance += amount;
251      }
252
253      /**
254       * Increment by one the count of transactions,
255       * for this bank.
256       */
257
258      public void countTransaction()
259      {
260          transactionCount++;
261      }
262
263      /**
264       * Get the number of transactions performed by this bank.
265       *
266       * @return number of transactions performed.
267       */
268
269      public int getTransactionCount( )
270      {
271          return transactionCount ;
272      }
273
274      /**
275       * Get the current bank balance.
276       *
277       * @return current bank balance.
278       */
279
280      public int getBalance()
```



```
281      {
282          return balance;
283      }
284
285      /**
286       * Get the current number of open accounts.
287       *
288       * @return number of open accounts.
289       */
290
291      public int getNumberOfAccounts()
292      {
293          return NUM_ACCOUNTS; /// needs changing ...
294      }
295
296      /**
297       * Run the simulation by creating and then visiting a new Bank.
298       * <p>
299       * A -e argument causes the input to be echoed.
300       * This can be useful for executing the program against
301       * a test script, e.g.,
302       * <pre>
303       *   java Bank -e < Bank.in
304       * </pre>
305       *
306       * @param args the command line arguments:
307       *          <pre>
308       *          -e echo input.
309       *          bankName any other command line argument.
310       *          </pre>
311       */
312
313      public static void main( String[] args )
314      {
315          // parse the command line arguments for the echo
316          // flag and the name of the bank
317
318          boolean echo    = false;        // default does not echo
319          String bankName = "River Bank"; // default bank name
320
321          for (int i = 0; i < args.length; i++ ) {
322              if (args[i].equals("-e")) {
323                  echo = true;
324              }
325              else {
326                  bankName = args[i];
327              }
328          }
329          Bank aBank = new Bank( bankName, new Terminal(echo) );
330          aBank.visit();
331      }
332  }
```

```
// joi/4/bank/BankAccount.java
//
//
// Copyright 2003 Bill Campbell and Ethan Bolker

/**
 * A BankAccount object has private fields to keep track
 * of its current balance, the number of transactions
 * performed and the Bank in which it is an account, and
 * and public methods to access those fields appropriately.
 *
 * @see Bank
 * @version 4
 */

public class BankAccount
{
    private int  balance = 0;          // Account balance (whole dollars)
    private int  transactionCount = 0; // Number of transactions performe
    private Bank issuingBank;          // Bank issuing this account

    /**
     * Construct a BankAccount with the given initial balance and
     * issuing Bank. Construction counts as this BankAccount's
     * first transaction.
     *
     * @param initialBalance the opening balance.
     * @param issuingBank the bank that issued this account.
     */

    public BankAccount( int initialBalance, Bank issuingBank )
    {
        this.issuingBank = issuingBank;
        deposit( initialBalance );
    }

    /**
     * Withdraw the given amount, decreasing this BankAccount's
     * balance and the issuing Bank's balance.
     * Counts as a transaction.
     *
     * @param amount the amount to be withdrawn
     * @return amount withdrawn
     */

    public int withdraw( int amount )
    {
        incrementBalance( -amount );
        countTransaction();
        return amount ;
    }

    /**
     * Deposit the given amount, increasing this BankAccount's
     * balance and the issuing Bank's balance.
     * Counts as a transaction.
```



```
     *
     * @param amount the amount to be deposited
     * @return amount deposited
     */

    public int deposit(int amount)
    {
        incrementBalance( amount);
        countTransaction();
        return amount ;
    }

    /**
     * Request for balance. Counts as a transaction.
     *
     * @return current account balance
     */

    public int requestBalance()
    {
        countTransaction();
        return getBalance() ;
    }

    /**
     * Get the current balance.
     * Does NOT count as a transaction.
     *
     * @return current account balance
     */

    public int getBalance()
    {
        return balance;
    }

    /**
     * Increment account balance by given amount.
     * Also increment issuing Bank's balance.
     * Does NOT count as a transaction.
     *
     * @param amount the amount increment.
     */

    public void incrementBalance( int amount )
    {
        balance += amount;
        this.getIssuingBank().incrementBalance( amount );
    }

    /**
     * Get the number of transactions performed by this
     * account. Does NOT count as a transaction.
     *
     * @return number of transactions performed.
     */
```

```
   113
   114      public int getTransactionCount()
   115      {
   116          return transactionCount;
   117      }
   118
   119      /**
   120       * Increment by 1 the count of transactions, for this account
   121       * and for the issuing Bank.
   122       * Does NOT count as a transaction.
   123       */
   124
   125      public void countTransaction()
   126      {
   127          transactionCount++;
   128          this.getIssuingBank().countTransaction();
   129      }
   130
   131      /**
   132       * Get the bank that issued this account.
   133       * Does NOT count as a transaction.
   134       *
   135       * @return issuing bank.
   136       */
   137
   138      public Bank getIssuingBank()
   139      {
   140          return issuingBank;
   141      }
   142  }
```

```
 1  open
 2  1000
 3  open
 4  2000
 5  help
 6  report
 7  open
 8  3000
 9  customer
10  0
11  balance
12  deposit
13  9999
14  balance
15  quit
16  customer
17  1
18  transfer
19  9
20  transfer
21  2
22  45
23  quit
24  exit
```

```
Welcome to River Bank
Open some accounts and work with them.
Banker commands: exit, open, customer, report, help.

banker command: open
Initial deposit: 1000
opened new account 0 with $1000
banker command: open
Initial deposit: 2000
opened new account 1 with $2000
banker command: help
Banker commands: exit, open, customer, report, help.

banker command: report

Summaries of individual accounts:
account  balance   transaction count
0       $1000           1
1       $2000           1

Bank totals
open accounts: 2
cash on hand: $3000
transactions:  2

banker command: open
Initial deposit: 3000
opened new account 2 with $3000
banker command: customer
account number: 0
    Customer transactions: deposit, withdraw, transfer, balance, quit, he

    transaction: balance
    current balance 1000
    transaction: deposit
    amount:9999
    deposited 9999
    transaction: balance
    current balance 10999
    transaction: quit

banker command: customer
account number: 1
    Customer transactions: deposit, withdraw, transfer, balance, quit, he

    transaction: transfer
    to account number: 9
not a valid account
    transaction: transfer
    to account number: 2
    amount to transfer: 45
    transfered 45
    transaction: quit

banker command: exit

```



```
Summaries of individual accounts:
account  balance   transaction count
0       $10999          4
1       $1955           2
2       $3045           2

Bank totals
open accounts: 3
cash on hand: $15999
transactions:  8

Goodbye from River Bank
```

```
 1  open
 2  groucho
 3  1000
 4  customer
 5  harpo
 6  open
 7  harpo
 8  2000
 9  help
10  report
11  open
12  chico
13  3000
14  customer
15  groucho
16  balance
17  deposit
18  9999
19  balance
20  quit
21  customer
22  harpo
23  transfer
24  chico
25  45
26  quit
27  exit
```

```
 1  Welcome to River Bank
 2  Open some accounts and work with them.
 3  Banker commands: exit, open, customer, report, help.
 4
 5  banker command: open
 6  Account name: groucho
 7  Initial deposit: 1000
 8  opened new account groucho with $1000
 9  banker command: customer
10  account name: harpo
11  not a valid account
12  banker command: open
13  Account name: harpo
14  Initial deposit: 2000
15  opened new account harpo with $2000
16  banker command: help
17  Banker commands: exit, open, customer, report, help.
18
19  banker command: report
20
21  Summaries of individual accounts:
22  account  balance   transaction count
23  groucho $1000           1
24  harpo   $2000           1
25
26  Bank totals
27  open accounts: 2
28  cash on hand: $3000
29  transactions:  2
30
31  banker command: open
32  Account name: chico
33  Initial deposit: 3000
34  opened new account chico with $3000
35  banker command: customer
36  account name: groucho
37      Customer transactions: deposit, withdraw, transfer, balance, quit, he
38
39      transaction: balance
40      current balance 1000
41      transaction: deposit
42      amount:9999
43      deposited 9999
44      transaction: balance
45      current balance 10999
46      transaction: quit
47
48  banker command: customer
49  account name: harpo
50      Customer transactions: deposit, withdraw, transfer, balance, quit, he
51
52      transaction: transfer
53      to account name: chico
54      amount to transfer: 45
55      transfered 45
56      transaction: quit
```



```
57
58  banker command: exit
59
60  Summaries of individual accounts:
61  account  balance   transaction count
62  chico   $3045           2
63  groucho $10999          4
64  harpo   $1955           2
65
66  Bank totals
67  open accounts: 3
68  cash on hand: $15999
69  transactions:  8
70
71  Goodbye from River Bank
```