

```

1 // joi/9/copy/copy1.java
2 /**
3 // Copyright 2003 Bill Campbell and Ethan Bolker
4
5 import java.io.*;
6
7 /**
8 * Simple read-a-char, write-a-char loop to exercise file I/O.
9 * Usage: java Copy1 inputfile outputfile
10 */
11
12
13 public class Copy1
14 {
15     private static final int EOF = -1; // end of file character rep.
16
17     /**
18      * All work is done here.
19      *
20      * @param args names of the input file and output file.
21      */
22
23
24     public static void main( String[] args )
25     {
26         FileReader inStream = null;
27         FileWriter outStream = null;
28         int ch;
29
30         try {
31             // open the files
32             inStream = new FileReader( args[0] );
33             outStream = new FileWriter( args[1] );
34
35             // copy
36             while ((ch = inStream.read()) != EOF) {
37                 outStream.write( ch );
38             }
39         }
40         catch ( IndexOutOfBoundsException e ) {
41             System.err.println(
42                     "usage: java Copy1 sourcefile targetfile" );
43         }
44         catch ( FileNotFoundException e ) {
45             System.err.println( e ); // rely on e's toString()
46         }
47         catch ( IOException e ) {
48             System.err.println( e );
49         }
50         finally {
51             // close the files
52             try {
53                 if (inStream != null) {
54                     inStream.close();
55                 }
56             }
57             catch (Exception e) {
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64             System.out.println("Unable to close input stream.");
65             try {
66                 if (outStream != null) {
67                     outStream.close();
68                 }
69             }
70             catch (Exception e) {
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```

Apr 15 21:52 2004 Listing 9.2 Copy2.java Page 1

```
1 // jo1/9/copy/Copy2.java
2 /**
3 /**
4 // Copyright 2003 Bill Campbell and Ethan Bolker
5 import java.io.*;
6
7 /**
8 * Simple read-a-line write-a-line loop to exercise file I/O.
9 *
10 * Usage: java Copy2 inputfile outputfile
11 */
12
13 public class Copy2
14 {
15     /**
16      * All work is done here.
17      *
18      * @param args names of the input file and output file.
19      */
20
21     public static void main( String[] args )
22     {
23         BufferedReader inStream = null;
24         BufferedWriter outStream = null;
25         String line;
26
27         try {
28             // open the files
29             inStream = new BufferedReader(new FileReader(args[0]));
30             outStream = new BufferedWriter(new FileWriter(args[1]));
31
32             // copy
33             while ((line = inStream.readLine()) != null) {
34                 outStream.write( line );
35                 outStream.newLine();
36             }
37
38         } catch (IndexOutOfBoundsException e) {
39             System.err.println(
40                     "usage: java Copy2 sourcefile targetfile" );
41         } catch (FileNotFoundException e) { // rely on e's toString()
42             System.err.println( e );
43         } catch (IOException e) {
44             System.err.println( e );
45         } finally { // close the files
46             try {
47                 if (inStream != null) {
48                     inStream.close();
49                 }
50             } catch (Exception e) {
51                 System.err.println("Unable to close input stream." );
52             }
53         }
54     }
55 }
```

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```
57
58     try {
59         if (outStream != null) {
60             outStream.close();
61         }
62     } catch (Exception e) {
63     }
64     System.out.println("Unable to close output stream.");
65 }
66
67 }
68 }
```

```

1 // joi/9/bank/Bank.java
2 /**
3 /**
4 // Copyright 2003 Bill Campbell and Ethan Bolker
5
6 import java.util.*;
7 import java.io.*;
8
9 /**
10 * A Bank object simulates the behavior of a simple bank/ATM.
11 * It contains a Terminal object and a collection of
12 * BankAccount objects.
13 *
14 * The visit method opens this Bank for business,
15 * prompting the customer for input.
16 * It is persistent: it can save its state to a file and read it
17 * back at a later time.
18 *
19 * To create a Bank and open it for business issue the command
20 * <code>java Bank</code> with appropriate arguments.
21 *
22 * @see BankAccount
23 *
24 * @version 9
25 */
26
27 public class Bank
28 implements Serializable
29 {
30     private String bankName;           // the name of this Bank
31     private transient Terminal atm;   // for communication with world
32     private int balance = 0;          // total cash on hand
33     private int transactionCount = 0; // number of Bank transactions
34     private Month month;            // the current month.
35     private Map accountList;         // mapping names to accounts.
36
37     private int checkFee = 2;          // cost for each check
38     private int transactionFee = 1;    // fee for each transaction
39     private int monthlyCharge = 5;    // monthly charge
40     private double interestRate = 0.05; // annual rate paid on savings
41     private int maxFreeTransactions = 3; // for savings accounts
42
43     // what the banker can ask of the bank
44
45     private static final String BANKER_COMMANDS =
46         "Banker commands: " +
47         "exit, open, customer, nextmonth, report, help.";
48
49     // what the customer can ask of the bank
50
51     private static final String CUSTOMER_TRANSACTIONS =
52         "Customer transactions: deposit, withdraw, transfer, \n" +
53         "balance, cash check, quit, help.";
54
55 /**
56 * Construct a Bank with the given name.

```

```

57     /*
58      * @param bankName the name for this Bank.
59      */
60
61     public Bank( String bankName )
62     {
63         this.atm = atm;
64         this.bankName = bankName;
65         accountList = new TreeMap();
66         month = new Month();
67     }
68
69     /**
70      * Simulates interaction with a Bank.
71      * Presents the user with an interactive loop, prompting for
72      * banker transactions and in the case of the banker
73      * transaction "customer", an account id and further
74      * customer transactions.
75
76     public void visit()
77     {
78         instructUser();
79
80         String command;
81         while ( !( command =
82             atm.readWord("banker command: ") ).equals("exit") ) {
83
84             if ( command.startsWith("h") ) {
85                 help( BANKER_COMMANDS );
86             }
87             else if ( command.startsWith("o") ) {
88                 openNewAccount();
89             }
90             else if ( command.startsWith("n") ) {
91                 newMonth();
92             }
93             else if ( command.startsWith("r") ) {
94                 report();
95             }
96             else if ( command.startsWith( "c" ) ) {
97                 report();
98                 BankAccount acct = whichAccount();
99                 if ( acct != null ) {
100                     processTransactionsForAccount( acct );
101
102                 }
103             }
104             else {
105                 // Unrecognized Request
106                 atm.println( "unknown command: " + command );
107             }
108             report();
109             atm.println( "Goodbye from " + bankName );
110
111     }
112

```

```

113 // Open a new bank account,
114 // prompting the user for information.
115
116 private void openNewAccount()
117 {
118     String accountName = atm.readWord( "Account name: " );
119     char accountType = atm.readChar( "Type of account (r/c/f/s): " );
120     atm.readChar( " " );
121     try {
122         int startup = readPosAmt( "Initial deposit: " );
123         BankAccount newAccount;
124         switch( accountType ) {
125             case 'c':
126                 newAccount = new CheckingAccount( startup, this );
127                 break;
128             case 'f':
129                 newAccount = new FeeAccount( startup, this );
130                 break;
131             case 's':
132                 newAccount = new SavingsAccount( startup, this );
133                 break;
134             case 'r':
135                 newAccount = new RegularAccount( startup, this );
136                 break;
137             default:
138                 atm.println( "invalid account type: " + accountType );
139                 return;
140             }
141             accountList.put( accountName, newAccount );
142             atm.println( "opened new account " + accountName
143             + " with $" + startup );
144         }
145         catch ( NegativeAmountException e ) {
146             atm.errPrintln(
147                 "You cannot open an account with a negative balance" );
148         }
149         catch ( InsufficientFundsException e ) {
150             atm.errPrintln( "Initial deposit doesn't cover fee" );
151         }
152     }
153     // Prompt the customer for transaction to process.
154     // Then send an appropriate message to the account.
155
156     private void processTransactionsForAccount( BankAccount acct )
157     {
158         help( CUSTOMER_TRANSACTIONS );
159
160         String transaction;
161
162         while ( !(transaction =
163             atm.readWord( " transaction: " )).equals("quit") ) {
164
165             try {
166                 if ( transaction.startsWith( "h" ) ) {
167                     help( CUSTOMER_TRANSACTIONS );
168
169             }
170
171             atm.println( " deposited " + acct.deposit( amount ) );
172
173             } else if ( transaction.startsWith( "d" ) ) {
174                 int amount = readPosAmt( " amount: " );
175                 atm.println( " deposited " + acct.deposit( amount ) );
176
177             } else if ( transaction.startsWith( "w" ) ) {
178                 int amount = readPosAmt( " amount: " );
179                 atm.println( " withdrew " + acct.withdraw( amount ) );
180
181             } else if ( transaction.startsWith( "c" ) ) {
182                 int amount = readPosAmt( " amount of check: " );
183                 atm.println( " cashed check for " +
184                     ((CheckingAccount) acct).honorCheck( amount ) );
185
186             } catch ( ClassCastException e ) {
187                 // if not a checking account, report error
188                 atm.errPrintln(
189                     " Sorry, not a checking account. " );
190
191             } else if ( transaction.startsWith( "t" ) ) {
192                 atm.print( " to " );
193                 BankAccount toacct = whichAccount();
194                 if ( toacct != null ) {
195                     int amount = readPosAmt( " amount to transfer: " );
196                     atm.println( " transferred " + toacct.deposit( actc.withdraw( amount ) ) );
197
198                 } else {
199                     atm.errPrintln( " toacct does not exist" );
200
201                 } else if ( transaction.startsWith( "b" ) ) {
202                     atm.println( " current balance " +
203                         + acct.requestBalance() );
204
205                 } else {
206                     atm.println( " sorry, unknown transaction" );
207
208                 } catch ( InsufficientFundsException e ) {
209                     atm.errPrintln( " Insufficient funds " +
210                         e.getMessage() );
211
212                 } catch ( NegativeAmountException e ) {
213                     atm.errPrintln( " Sorry, negative amounts disallowed. " );
214
215                 } atm.println();
216
217             }
218
219             // Prompt for an account name (or number), look it up
220             // in the account list. If it's there, return it;
221             // otherwise report an error and return null.
222
223             private BankAccount whichAccount()
224

```

```

169             int amount = readPosAmt( " amount: " );
170             atm.println( " deposited " + acct.deposit( amount ) );
171
172             } else if ( transaction.startsWith( "w" ) ) {
173                 int amount = readPosAmt( " amount: " );
174                 atm.println( " withdrew " + acct.withdraw( amount ) );
175
176             } else if ( transaction.startsWith( "c" ) ) {
177                 int amount = readPosAmt( " amount of check: " );
178                 atm.println( " cashed check for " +
179                     ((CheckingAccount) acct).honorCheck( amount ) );
180
181             } catch ( ClassCastException e ) {
182                 // if not a checking account, report error
183                 atm.errPrintln(
184                     " Sorry, not a checking account. " );
185
186             } else if ( transaction.startsWith( "t" ) ) {
187                 atm.print( " to " );
188                 BankAccount toacct = whichAccount();
189                 if ( toacct != null ) {
190                     int amount = readPosAmt( " amount to transfer: " );
191                     atm.println( " transferred " + toacct.deposit( actc.withdraw( amount ) ) );
192
193                 } else {
194                     atm.errPrintln( " toacct does not exist" );
195
196                 } else if ( transaction.startsWith( "b" ) ) {
197                     atm.println( " current balance " +
198                         + acct.requestBalance() );
199
200                 } else {
201                     atm.println( " sorry, unknown transaction" );
202
203                 } catch ( InsufficientFundsException e ) {
204                     atm.errPrintln( " Insufficient funds " +
205                         e.getMessage() );
206
207                 } catch ( NegativeAmountException e ) {
208                     atm.errPrintln( " Sorry, negative amounts disallowed. " );
209
210                 } atm.println();
211
212             }
213
214             atm.errPrintln( " Sorry, negative amounts disallowed. " );
215
216             } atm.println();
217
218
219             // Prompt for an account name (or number), look it up
220             // in the account list. If it's there, return it;
221             // otherwise report an error and return null.
222
223             private BankAccount whichAccount()
224

```

```

225     String accountName = atm.readWord( "account name: " );
226     BankAccount account = (BankAccount) accountList.get(accountName);
227     if (account == null) {
228         atm.println( "not a valid account" );
229     }
230     return account;
231 }

232 // Action to take when a new month starts.
233 // Update the month field by sending a next message.
234 // Loop on all accounts, sending each a newMonth message.
235
236 private void newMonth()
237 {
238     month.next();
239     Iterator i = accountList.keySet().iterator();
240     while ( i.hasNext() ) {
241         String name = (String) i.next();
242         BankAccount acct = (BankAccount) accountList.get( name );
243         try {
244             acct.newMonth();
245         }
246         catch (InsufficientFundsException exception) {
247             atm.errPrintln( "Insufficient funds in account \\" + name + "\\\' for monthly fee" );
248         }
249     }
250 }
251
252 }

253 // Report bank activity.
254 // For each BankAccount, print the customer id (name or number),
255 // account balance and the number of transactions.
256 // Then print Bank totals.
257
258
259 private void report()
260 {
261     atm.println( bankName + " report for " + month );
262     atm.println( "\nSummaries of individual accounts:" );
263     atm.println( "account balance transaction count" );
264     for ( Iterator i = accountList.keySet().iterator();
265          i.hasNext(); ) {
266         String accountName = (String) i.next();
267         BankAccount acct = (BankAccount) accountList.get(accountName);
268         atm.println( accountName + "\t$" + acct.getBalance() + "\t" +
269                     acct.getTransactionCount() );
270     }
271     atm.println( "\nBank totals" );
272     atm.println( "open accounts: " + getNumberOfAccounts() );
273     atm.println( "cash on hand: $" + getBalance() );
274     atm.println( "transactions: " + getTransactionCount() );
275     atm.println();
276 }
277
278 // Welcome the user to the bank and instruct her on
279 // her options.
280

```

```

281     private void instructUser()
282     {
283         atm.println( "Welcome to " + bankName );
284         atm.println( "Open some accounts and work with them. " );
285         atm.println( "Help( BANKER_COMMANDS )");
286
287     }
288
289     // Display a help string.
290
291     private void help( String helpString )
292     {
293         atm.println( helpString );
294         atm.println();
295     }
296
297     // Read amount prompted for from the atm.
298     // Throw a NegativeAmountException if amount < 0
299     private int readPosAmt( String prompt )
300     throws NegativeAmountException
301     {
302         int amount = atm.readInt( prompt );
303         if (amount < 0) {
304             throw new NegativeAmountException();
305         }
306     }
307
308     return amount;
309 }
310
311 /**
312 * Increment bank balance by given amount.
313 *
314 * @param amount the amount increment.
315 */
316 public void incrementBalance( int amount )
317 {
318     balance += amount;
319 }
320
321 /**
322 * Increment by one the count of transactions,
323 * for this bank.
324 */
325
326 public void countTransaction()
327 {
328     transactionCount++;
329 }
330
331 /**
332 * Get the number of transactions performed by this bank.
333 *
334 * @return number of transactions performed.
335 */
336

```

```

337
338     public int getTransactionCount( )
339     {
340         return transactionCount ;
341     }
342
343     /**
344      * The charge this bank levies for cashing a check.
345      * @return check fee
346      */
347
348     public int getCheckFee( )
349     {
350         return checkFee ;
351     }
352
353     /**
354      * The charge this bank levies for a transaction.
355      * @return the transaction fee
356      */
357
358     public int getTransactionFee( )
359     {
360         return transactionFee ;
361     }
362
363     /**
364      * The charge this bank levies each month.
365      * @return the monthly charge
366      */
367
368     public int getMonthlyCharge( )
369     {
370
371         return monthlyCharge ;
372     }
373
374     }
375
376     /**
377      * The current interest rate on savings.
378      */
379     /**
380      */
381
382     public double getInterestRate( )
383     {
384         return interestRate;
385     }
386
387     /**
388      * The number of free transactions per month.
389      */
390     /**
391      */
392

```

```

393     public int getMaxFreeTransactions( )
394     {
395         return maxFreeTransactions;
396     }
397
398     /**
399      * Get the current bank balance.
400      */
401     /**
402      * @return current bank balance.
403      */
404     public int getBalance( )
405     {
406         return balance;
407     }
408
409     /**
410      * Get the current number of open accounts.
411      */
412     /**
413      * @return number of open accounts.
414      */
415     public int getNumberOfAccounts( )
416     {
417         return accountList.size();
418     }
419
420     /**
421      * Set the atm for this Bank.
422      */
423     /**
424      * @param atm the Bank's atm.
425      */
426     public void setAtm( Terminal atm ) {
427         this.atm = atm;
428     }
429
430
431     /**
432      * Run the simulation by creating and then visiting a new Bank.
433      */
434     /**
435      * A -e argument causes the input to be echoed.
436      */
437     /**
438      */
439     /**
440      */
441     /**
442      */
443     /**
444      */
445     /**
446      */
447     /**
448      */

```

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504

    public static void main( String[] args )
    {
        boolean echo          = false;
        String bankFileName   = null;
        String bankName       = "persistent Bank";
        Bank theBank           = null;

        // parse the command line arguments
        for (int i = 0; i < args.length; i++ ) {
            if (args[i].equals("-e")) { // echo input to output
                echo = true;
                continue;
            }
            if (args[i].equals("-f")) { // read/write Bank from/to file
                bankFileName = args[++i];
                continue;
            }
        }

        // create a new Bank or read one from a file
        if (bankFileName == null) {
            theBank = new Bank( bankName );
        }
        else {
            theBank = readBank( bankName, bankFileName );
        }

        // give the Bank a Terminal, then visit
        theBank.setAtm(new Terminal(echo));
        theBank.visit();

        // write theBank's state to a file if required
        if (bankFileName != null) {
            writeBank(theBank, bankFileName);
        }
    }

    /**
     * Read a Bank from a file (create it if file doesn't exist).
     */
    /**
     * @param bankName      the name of the Bank
     * @param bankFileName  the name of the file containing the Bank
     */
    @return the Bank
    */

    private static Bank readBank(String bankName, String bankFileName)
    {
        File file = new File( bankFileName );
        if (!file.exists()) {
            return new Bank( bankName );
        }
        ObjectInputStream inStream = null;
        try {
            inStream = new ObjectInputStream(

```

```

505     Bank bank = (Bank)inStream.readObject();
506     System.out.println(
507         "Bank state read from file " + bankFileName);
508     return bank;
509 }
510
511     catch (Exception e) {
512         System.err.println(
513             "Problem reading " + bankFileName );
514         System.out.println(e);
515         System.exit(1);
516     }
517     finally {
518         try {
519             inStream.close();
520         }
521         catch (Exception e) {
522         }
523     }
524     return null; // you can never get here
525
526
527
528     // Write a Bank to a file.
529
530     // @param bank the Bank
531     // @param fileName the name of the file to write the Bank to
532
533     private static void writeBank( Bank bank, String fileName)
534     {
535         ObjectOutputStream outStream = null;
536
537         try {
538             outStream = new ObjectOutputStream(
539                 new FileOutputStream( fileName ) );
540             outStream.writeObject( bank );
541             System.out.println(
542                 "Bank state written to file " + fileName);
543         }
544         catch (Exception e) {
545             System.out.println(
546                 "Problem writing " + fileName );
547         }
548     }
549
550     try {
551         outStream.close();
552     }
553
554     }
555 }
```

```

1 // joi/9/bank/BankAccount.java
2 /**
3 /**
4 // Copyright 2003 Bill Campbell and Ethan Bolker
5
6 import java.io.Serializable;
7
8 /**
9 * A BankAccount object has private fields to keep track
10 * of its current balance, the number of transactions
11 * performed and the Bank in which it is an account, and
12 * and public methods to access those fields appropriately.
13 *
14 * @see Bank
15 * @version 9
16 */
17
18 public abstract class BankAccount
19 {
20
21     private int balance = 0;           // Account balance (whole dollars)
22     private int transactionCount = 0; // Number of transactions performed
23     private Bank issuingBank;        // Bank issuing this account
24
25     /**
26     * Construct a Bankaccount with the given initial balance and
27     * issuing Bank. Construction counts as this BankAccount's
28     * first transaction.
29     *
30     * @param initialBalance the opening balance.
31     * @param issuingBank the bank that issued this account.
32     */
33     * @exception InsufficientFundsException when appropriate.
34
35     protected BankAccount( int initialBalance, Bank issuingBank )
36     throws InsufficientFundsException
37     {
38
39         this.issuingBank = issuingBank;
40
41     }
42
43     /**
44     * Get transaction fee. By default, 0.
45     * Override this for accounts having transaction fees.
46     */
47
48     /**
49     * @return the fee.
50
51     */
52     return 0;
53
54     /**
55
56     * The bank that issued this account.

```

```

57     *
58     * @return the Bank.
59 */
60
61     protected Bank getIssuingBank()
62     {
63         return issuingBank;
64     }
65
66     /**
67     * Withdraw the given amount, decreasing this BankAccount's
68     * balance and the issuing Bank's balance.
69     */
70     *
71     * @param amount the amount to be withdrawn
72     * @return amount withdrawn
73     */
74     * @exception InsufficientFundsException when appropriate.
75
76     public int withdraw( int amount )
77     throws InsufficientFundsException
78     {
79         incrementBalance( -amount - getTransactionFee() );
80
81         return amount;
82     }
83
84     /**
85     * Deposit the given amount, increasing this BankAccount's
86     * balance and the issuing Bank's balance.
87     */
88     *
89     * @param amount the amount to be deposited
90
91     * @return amount deposited
92     */
93     * @exception InsufficientFundsException when appropriate.
94
95
96     public int deposit( int amount )
97     throws InsufficientFundsException
98     {
99
100        incrementBalance( amount - getTransactionFee() );
101
102        countTransaction();
103
104        /**
105        * Request for balance. Counts as a transaction.
106
107        * @return current account balance.
108
109        */
110
111        * @exception InsufficientFundsException when appropriate.
112
113
114        public int requestBalance()

```

```

113     throws InsufficientFundsException
114 {
115     incrementBalance( - getTransactionFee() );
116     countTransaction();
117     return getBalance();
118 }
119 /**
120 * Get the current balance.
121 * Does NOT count as a transaction.
122 * @return current account balance
123 */
124
125
126 public int getBalance()
127 {
128     return balance;
129 }
130
131
132 /**
133 * Increment account balance by given amount.
134 * Also increment issuing Bank's balance.
135 * Does NOT count as a transaction.
136 *
137 * @param amount the amount of the increment.
138 *
139 * @exception InsufficientFundsException when appropriate.
140 */
141
142 public final void incrementBalance( int amount )
143 throws InsufficientFundsException
144 {
145     int newBalance = balance + amount;
146     if (newBalance < 0) {
147         throw new InsufficientFundsException(
148             "For this transaction" );
149     }
150     balance = newBalance;
151     getIssuingBank().incrementBalance( amount );
152 }
153
154 /**
155 * Get the number of transactions performed by this
156 * account. Does NOT count as a transaction.
157 *
158 * @return number of transactions performed.
159 */
160
161 public int getTransactionCount()
162 {
163     return transactionCount;
164 }
165
166 /**
167 * Increment by 1 the count of transactions, for this account
168 * and for the issuing Bank.

```

```

169 * Does NOT count as a transaction.
170 *
171 * @exception InsufficientFundsException when appropriate.
172 */
173 public void countTransaction()
174 throws InsufficientFundsException
175 {
176     transactionCount++;
177     this.getIssuingBank().countTransaction();
178 }
179
180 /**
181 * Action to take when a new month starts.
182 *
183 * @exception InsufficientFundsException thrown when funds
184 * on hand are not enough to cover the fees.
185 */
186
187 public abstract void newMonth()
188 throws InsufficientFundsException;
189 }
190

```

```

1 // joi/9/bank/class Month
2 /**
3 // Copyright 2003 Bill Campbell and Ethan Bolker
4 //
5 import java.io.*;
6 import java.util.Calendar;
7
8 /**
9 * The Month class implements an object that keeps
10 * track of the month of the year.
11 *
12 * @version 9
13 */
14
15 public class Month
16 implements Serializable
17 {
18     private static final String[] monthName =
19         {"Jan", "Feb", "Mar", "Apr", "May", "Jun",
20          "Jul", "Aug", "Sep", "Oct", "Nov", "Dec"};
21
22     private int month;
23
24     private int year;
25
26     /**
27      * Month constructor constructs a Month object
28      * initialized to the current month and year.
29     */
30
31     public Month()
32     {
33         Calendar rightNow = Calendar.getInstance();
34         month = rightNow.get( Calendar.MONTH );
35         year = rightNow.get( Calendar.YEAR );
36
37         /**
38          * Advance to next month.
39         */
40
41     }
42
43     public void next()
44     {
45         month = (month + 1) % 12;
46         if (month == 0) {
47             year++;
48         }
49
50         /**
51          * How a Month is displayed as a String -
52          * for example, "Jan, 2003".
53
54         * @return String representation of the month.
55     }

```

```

57     public String toString()
58     {
59         return monthName[month] + ", " + year;
60     }
61
62     /**
63      * For unit testing.
64     */
65     public static void main( String[] args )
66     {
67         Month m = new Month();
68         for (int i=0; i < 14; i++, m.next()) {
69             System.out.println(m);
70
71             for (int i=0; i < 3; i++, m.next()); // no loop body
72             System.out.println( "three years later: " + m );
73             for (int i=0; i < 120; i++, m.next()); // no loop body
74             System.out.println( "ten years later: " + m );
75         }
76     }
77 }

```