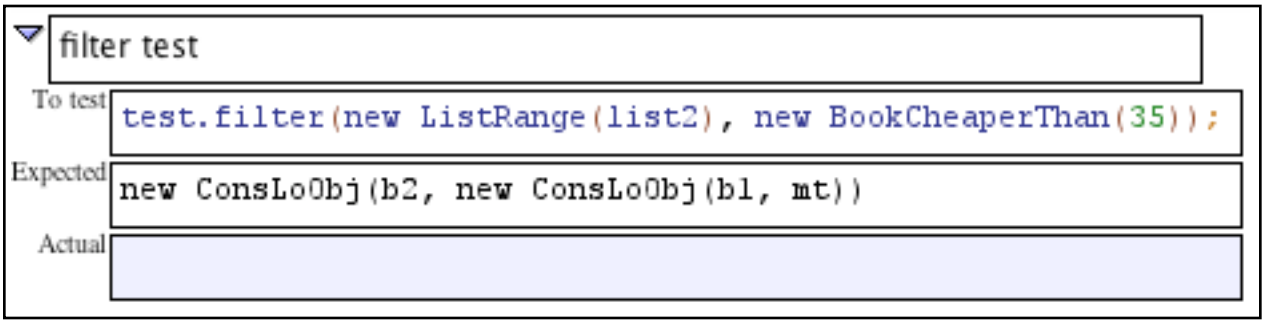
```
////////////////////////////////////////////////////////////////
// File lab6.java

// ---------------------------------------------------------------
// interface to represent a method from object to boolean
interface IObj2Bool{
  boolean select(Object obj);
}

// ---------------------------------------------------------------
//   Functional (External) Iterator Pattern
interface IRange {

    // move the cursor one forward, assuming it is not empty
    void next();

    // select the item to which the cursor points, assuming it is not empty
    Object current();

    // test whether there are more items in the range
    boolean hasMore();
}

// ---------------------------------------------------------------
// classes to represent an arbitrary list of objects
abstract class ALoObj{ }

class MTLoObj extends ALoObj{
  MTLoObj() {}
}

class ConsLoObj extends ALoObj{
  Object first;
  ALoObj rest;

  ConsLoObj(Object first, ALoObj rest){
    this.first = first;
    this.rest = rest;
  }
}

// ---------------------------------------------------------------
//   Functional (External) Iterator Pattern:
//        iterator for a list of objects

class ListRange implements IRange {
```

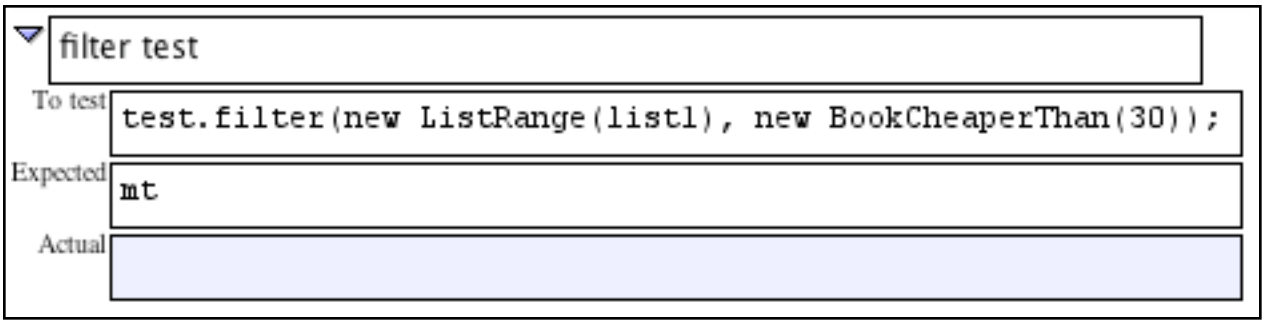
```
    // ---------------------------------------------------------
    // Member data
    ALoObj ptr; /* reference to this list */

    //---------------------------------------------------------
    // Constructor
    ListRange(ALoObj aList) { this.ptr = aList; }

    //---------------------------------------------------------
    // Methods to implement the IRange interface
    void next() {
        this.ptr = ((ConsLoObj)this.ptr).rest;
    }

    Object current() {
        return ((ConsLoObj)this.ptr).first;
    }

    boolean hasMore() {
        return (this.ptr instanceof ConsLoObj);
    }
}

// ---------------------------------------------------------------
// objects to keep in the list
class Book {
  String title;
  String author;
  int price;

  Book(String title, String author, int price) {
    this.title = title;
    this.author = author;
    this.price = price;
  }

}


// ---------------------------------------------------------------
// the client class that uses the list of objects, the iterator, and the
IObj2Bool interface
class TestClass{

  TestClass(){}
```

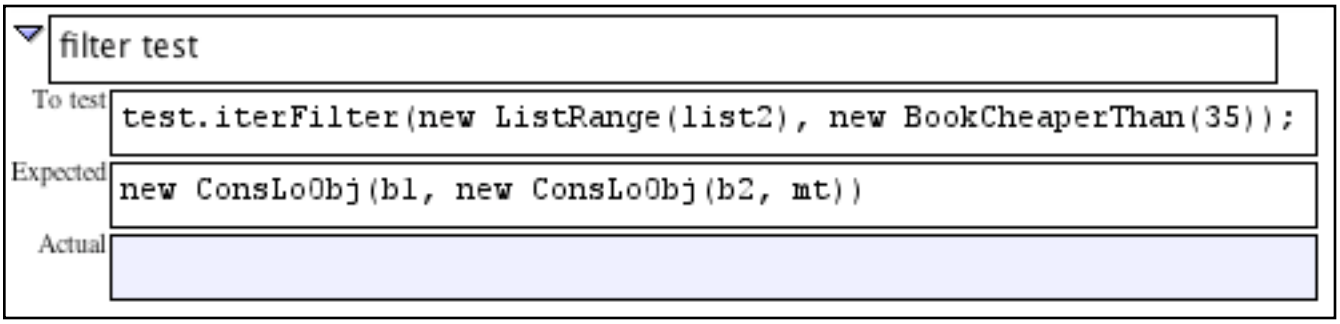
```
  // externally defined recursive filter
  ALoObj filter(IRange it, IObj2Bool io2b){

    // not empty?
    if (it.hasMore()){
      // remember local value and advance the iterator
      Object obj = it.current();
      it.next();

      // select this item?, add it and go on
      if (io2b.select(obj))
        return new ConsLoObj(obj, filter(it, io2b));

      // not selected, go on
      else
        return filter(it, io2b);
    }
    // empty clause
    else
      return new MTLoObj();
  }

  // external iterative filter
  ALoObj iterFilter(IRange it, IObj2Bool io2b){

    // empty clause
    ALoObj result = new MTLoObj();

    // traverse the list
    for (IRange r = it; r.hasMore(); r.next()){
      if (io2b.select(r.current()))
        result = new ConsLoObj(r.current(), result);
    }

    // return the result - note that it is in reverse order
    return result;
  }

}

// book selector by price: cheaper than given price
class BookCheaperThan implements IObj2Bool{
  int price;

  BookCheaperThan(int price){
```

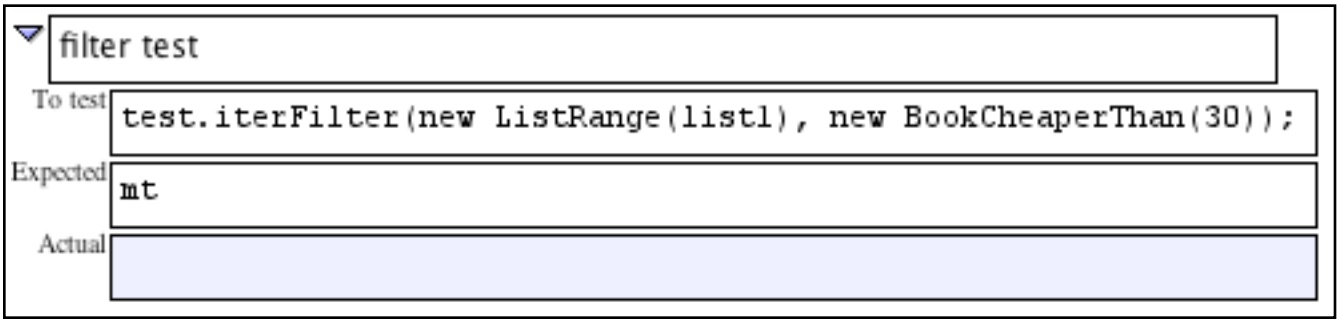
```
    this.price = price;
  }

  // select Book object with cheaper price that this.price
  boolean select(Object obj){
    return (((Book)obj).price) < this.price;
  }
}
```

```
Book b1 = new Book("1", "2", 34);

Book b2 = new Book("3", "4", 32);

Book b3 = new Book("HtDP", "mf", 60);

ALoObj mt = new MTLoObj();

ALoObj list1 = new ConsLoObj(b1, mt);

ALoObj list2 = new ConsLoObj(b2, new ConsLoObj(b3, list1));

TestClass test = new TestClass();

test.filter(new ListRange(list2), new BookCheaperThan(35));

test.filter(new ListRange(list1), new BookCheaperThan(30));

test.iterFilter(new ListRange(list2), new BookCheaperThan(35));

test.iterFilter(new ListRange(list1), new BookCheaperThan(30));
```




filter test
To test
test.filter(new ListRange(list1), new BookCheaperThan(30));
Expected
mt
Actual


filter test
To test
test.iterFilter(new ListRange(list2), new BookCheaperThan(35));
Expected
new ConsLoObj(b1, new ConsLoObj(b2, mt))
Actual


filter test
To test
test.iterFilter(new ListRange(list1), new BookCheaperThan(30));
Expected
mt
Actual