```
1   package Bags;
2
3   import java.io.*;
4   import static java.lang.Math.*;
5
6
7   /*This class provides an implementation of the Bag class.
8    *
9    * @see Bag
10   *
11   * @author S.Fenwick
12   *
13   * @version 1.0(March 19 2017)
    */
14
15  public class ConBag implements Bag {
16
17    private String[] aBag; //the bag
18    private String[] bBag; //the copy of aBag
19    private int  front;  // index of the front item
20    private int  rear;   // index of next available item
21    private int  counter;  // number of items in the bag
22    private int index; //index of what is being searched for in order to remove from
    bag
23
24
25    /*This constructor creates a new empty bag capable of holding 100 items. */
26
27    public ConBag(){
28
29      this(100);
30
31    } //constructor
32
33    /*This constructor creates a new empty bag capable of holding a particular number
    of items.
34     *
35     * @param size  max number of items in the bag. */
36
37    public ConBag(int size){
38
39      aBag = new String[size];
40      front = 0;
41      rear = 0;
42      counter = 0;
43
44    } //constructor
45
46    /*This constructor takes an array of Strings and copies it into an empty bag with
    capacity 100.
47     *
48     *@param aBag  array of Strings to be copied. */
49
50    public ConBag(String[] aBag){
51
52      bBag = new String[aBag.length];
53
54      for(int i = 0; i < aBag.length; i++){
55
56        bBag[i] = aBag[i];
57
58      }
59
60      front = 0;
61      rear = 0;
62      counter = 0;
63
64    } //constructor
65
66    public void add ( String item ){
```

```
67
68      if ( counter >= aBag.length ) {
69        throw new NoSpaceException();
70      }
71      else {
72        aBag[rear] = item;
73        rear = rear + 1;
74        counter = counter + 1;
75      };
76
77    } //add
78
79    public void remove ( String item ){
80
81      if ( counter <= 0 ) {
82        throw new NoItemException();
83      }
84      else{
85
86        for(int i = 0; i < aBag.length; i ++){
87
88          if(aBag[i] == item){
89
90            index = i;
91            break;
92          }
93
94        }
95
96        for(int i = index; i <= rear - 1; i ++){
97
98          aBag[i] = aBag[i + 1];
99
100       }
101       counter = counter - 1;
102       rear = rear - 1;
103     }
104
105   } //remove
106
107   public int cardinality ( ){
108
109     return counter;
110
111   } //cardinality
112
113   public boolean contains ( String item ){
114
115     boolean result = false;
116
117     for(int i = 0; i < aBag.length; i ++){
118
119       if(aBag[i] == item){
120         result = true;
121         break;
122       }
123       else{
124         result = false;
125       }
126     }
127
128     return result;
129
130   } //contains
131
132   public int count ( String item ){
133
134     int result = 0;
135
136     for(int i = 0; i < aBag.length; i ++){
```

```
137
138       if(aBag[i] == item){
139         result += 1;
140       }
141
142     }
143
144     return result;
145
146   } //count
147
148   public String draw ( ){
149
150     int i;
151     String item;
152
153     i = (int)((counter)*random()) + 0;
154     item = aBag[i];
155
156     if(counter <= 0){
157       throw new NoItemException();
158     }
159     else{
160       remove(item);
161     }
162     return item;
163
164   } //draw
165
166 } //ConBag
```