QUEEN MARY, UNIVERSITY OF LONDON DCS128 ALGORITHMS AND DATA STRUCTURES

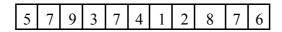
Class Test Monday 13th February 2006 11.05-12.35

	ease fill in your Examination Number here:		
	answers to this test should be written on the test king. Answer as many of the questions as you co		
1)	Suppose that in Java class DrinksMachine and Can there are public methods with the following signatures:		
	DrinksMachine methods:	Can methods:	
	<pre>void insert(int n) int getBalance() int getPrice() boolean cokesEmpty() Can pressCoke() void loadCoke(Can can) void setPrice(int p)</pre>	<pre>boolean isFull() void drink() int volume()</pre>	
		ch2 of type DrinksMachine, and c1 and c2 of nitialised to refer to objects of the appropriate type, the which has been initialised.	
	For each of the code fragments below, state who code which would cause a compiler error.	ether it is valid or invalid code, where invalid code is	
		Valid/Invalid	
a)	<pre>n = mach1.getPrice();</pre>		
b)	<pre>n = mach2.setPrice(n);</pre>		
C)	<pre>c1 = mach1.pressCoke(); if(c1.isFull()) c2 = mach2.pressCoke();</pre>	•••••	
d)	<pre>if(insert(n)) c2 = mach2.pressCoke()</pre>		
e)	<pre>while(c1.volume()>0) c1.drink();</pre>		
		[Question continued on next page]	
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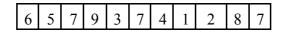
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f)
     while(mach1.cokesEmpty())
        mach1.loadCoke(mach2.pressCoke());
                                                    . . . . . . . . . . . . . . . . . . .
     n = mach1.pressCoke().volume();
g)
                                                    h)
     mach1.pressCoke();
     if(c1.isFull())
        c2 = mach2.pressCoke();
                                                    .....
i)
     if(mach1.getPrice()>n)
       mach1.setPrice() = n;
j)
     while(mach1.cokesEmpty())
         int p = mach2.getPrice();
         if(p>n)
             mach1.loadCoke(c1.volume());
        }
```

Use the space below for rough working

2) a) Write a Java static method slide which takes as its argument an array of integers and alters it destructively so that the last integer is put in the first place, and all other integers are moved up one place. So if the array starts off as:



it becomes:



b) Write in the space below a Java static method which performs the same operation as in part a), but does it constructively.

3) a) Write a Java static method which takes an arrayList and an object and returns an arrayList containing all items from the original arrayList which are not equal to the argument object in the reverse order to the one they had in the original arrayList.

For example, if the original arrayList contains Integer values as follows:



and the second argument is the Integer value 3, the arrayList that is returned is:

Your method should be generic to cover arrayLists of all base types.

b) Below is a Java method:

State in English what value this method returns:

4)	a)	Describe briefly the difference between a mutable and an immutable object.
	b)	Explain briefly what is meant by aliasing and why this may be a problem with mutable but not immutable objects.
	c)	Explain what the String method toUpperCase does.
	d)	Assuming str1 is set to a string, and ch is set to a character which we know occurs at least twice in the string, write a fragment of code which sets variable str2 to the portion of str1 between the first and last occurrence of ch. So if str1 is "hello world" and ch is 'o', it should set str2 to "o wo". You may use the String methods indexOf which takes a character as its argument and returns the position of the first occurrence of that character in the string it is called on, and lastIndexOf which is similar, but it returns the position of the last occurrence of the character.

- 5) Write static methods to implement the following operations on objects of the generic type LispList as described in the course notes and lectures:
 - a) addAfter takes a list and two items and returns the list obtained by adding the second item after all occurrences of the first item in the original list. So, for example, with [2,3,4,5,3,2,3,4,7] and 3 and 8, the result will be [2,3,8,4,5,3,8,2,3,8,4,7].

b) drop, takes a list and an item and returns a list consisting of all those items from the original list after the first occurrence of the item. So, for example, with [2,3,4,5,3,2,3,4,7] and 4 the result is [5,3,2,3,4,7].