QUEEN MARY, UNIVERSITY OF LONDON
DCS/128 ALGORITHMS AND DATA STRUCTURES

Class Test Monday 18th February 2002 11.05-11.55

Please fill in your Examination Number here: ----------

Student Number here: ----------

All answers to this test should be written on the test sheet, but you may use spare paper for rough working, or the space on the back page if you cannot fit your answers into the space provided. Answer as many of the questions as you can.

1) Explain in the space below why binary search for a particular number in an ordered array of integers is more efficient than linear search of an ordered array. Your explanation should mention the order of the two algorithms using the "big-O" notation.

2)

a) Write in the space below a static method which takes as its argument an array of integers and returns an array consisting of every other integer from the argument array. For example, if the argument array is:

5	7	9	3	1	4	8	6	11	0	2

the array returned will be:

7	3	4	6	0

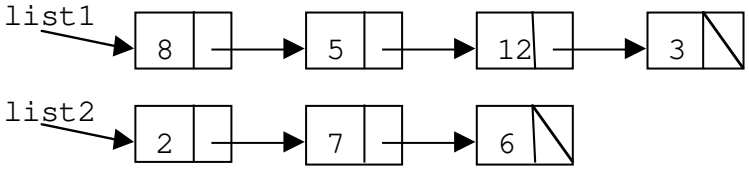
b) Write in the space below a static method which takes an integer and an array of integers as arguments, and returns `true` if the integer occurs exactly twice in the array, `false` otherwise.

3) Assume we have the following definition of class Cell:

```
class Cell
{
 int first;
 Cell next;

 Cell(int f, Cell n)
 {
  first=f;
  next=n;
 }
}
```

Assume also we have variables `list1`, `list2` and `ptr` of type `Cell`. For each part below, assume the situation starts as in the following cells and pointers diagram, and sketch the cells and pointers diagram that would result from executing the code fragment given.



a) `list1.next.next = list2.next;`

b)
```
for(ptr=list2; ptr.next!=null; ptr=ptr.next);
ptr.next=list1.next;
list1.next.first = 4;
```

c)
```
for(ptr=list2; ptr!=null; ptr=ptr.next)
   list1.first = list1.first+ptr.first;
```

4) In this question, assume the same `Cell` class as used in question 3

a) Write a static method which takes a linked list of integers and an integer `n` as arguments and multiplies all the integers in the linked list by `n`.

b) Write a static method which performs the same operation as in part a), but does it constructively, that is returns a new list representing the change without changing the arguments list.

Use the space below if you need any additional space to answer any of the questions.