EEN218
So Many Tests
18th April 2013

Use Good Programming Practice.
That means don't take the lazy way out.

Who are you?

What is your student number?

Did you cheat on this test?

Sign that statement.

Don't make any marks in my boxes.
These are my boxes.

Question	5	6	7	8
Out of	33	33	33	1
Grade				

5

For this question, the information known about a person is:

- First name
- Last name
- Age (in days)

a.

Define structs or classes suitable for representing people and linked lists of people; give each one a suitable constructor.

b.

Define a method for adding a person to a linked list.

c.

Define a method that finds, and returns as its result, the oldest person in a linked list.
Read part d before writing your solution.

d.

Define a method that finds, and returns as its result, the oldest person in a linked list, and which also removes that person from the linked list.
If you wrote your solution to part c clearly, and left suitable spaces in it, you may save time by writing this answer as additions to the previous one. Make sure I can still tell which part is which.

e.

Using your previous work, define a method that sorts a linked list of people so that they appear in order of increasing age.

6

a.

Using a template, define a function that could be used to find the average of all the numbers in an array, regardless of what type of numbers (int, double, etc) they are.

b.

Define a function that could be used to apply any int-to-int function to every item in a linked list of ints.

For example

if the linked list `L` contains the numbers 4, 2, 7, 9, 3
and square is defined thus

```
int square(int x)
{ return x*x; }
```

then after saying

```
map(square, L);
```

`L` would contain the numbers 16, 4, 49, 81, 9.

c.

Define a function that could be used to reduce a linked list of ints to a single int by giving it three parameters:

- the linked list,
- any function that has two int parameters and an int result,
- an int to act as the seed

For example

if the linked list `L` contains the numbers 4, 2, 7, 1, 3
and add and multiply are defined thus

```
int add(int x, int y)
{ return x+y; }

int multiply(int x, int y)
{ return x*y; }
```

then the value of

```
reduce(L, add, 0)
```

would be 17, because 0+4+2+7+1+3 = 17, and the value of

```
reduce(L, multiply, 100)
```

would be 16800, because 100×4×2×7×1×3 = 16800.

7

a.

Define struct(s) or class(es) suitable for implementing a Binary Search Tree which contains only integers.

b.

Define a function (or method) that would add another integer to an existing tree.

c.

Define a function (or method) that would find, and return as its result, the smallest integer in a tree.

d.

Define a function (or method) that is given an integer as a parameter, and searches the tree to see if that integer is present. If it is, it should print “Yes”, and if it isn’t, it should print “No”.

8

What would happen if a cat got stuck in a binary tree?
You may answer with a diagram or a poem or a mathematical proof, but do not sing.