

EEN218
First Test
28th October 2010

Behave Nicely,
Don't Shout at Each Other,
No Spitting.

Who are you ?

What is your student number?

"I have neither given nor accepted any aid in this examination": Sign

Make no marks in these boxes				
Question	1	2	3	4
Value	33%	33%	33%	1%
Score				

1.

A string is a lot like a vector (or resizable array) of characters. Imagine that strings do not exist in C++, and you have to create them. You would need to:

A.

Define a suitable class or struct for representing a string of characters, realising that strings can have any length whatsoever, from zero up.

B.

Define a constructor that sets up an initially empty string.

C.

Create a method that allows a single character to be added to the end of one of your strings.

D.

Create a method that allows one string to be added to the end of another.

E.

Create a function that will compare two strings to tell you whether they are the same, ignoring the difference between capital and little letters (so that “CAT” is considered to be the same as “cat”).

Do those things.

As an aid to understanding, here is a possible use of your creations:

```
MyString one, two, three;
one.add('c');
one.add('a');
two.add('C');
two.add('A');
two.add('T');
one.add('t');
three.add(two);
three.add('-');
three.add(one);
three.add(two);
if (same(one, two))
    cout << "Yes.";
if (!same(two, three))
    cout << "No.";
```

That should cause “Yes.No.” to be printed, and at the end one would hold “cat”, two would hold “CAT”, and three would hold “CAT-catCAT”.

2.

An object representing a person has already been fully implemented, like this:

```
struct person
{ string name;
  char sex;           // 'F' for female, 'M' for male.
  int age;
  string favouritecolour; };
```

You need to implement a special linked list for storing pointers to person objects. What's special about this linked list is that it is very polite, and always obeys the "ladies first" rule.

Define the structs or classes necessary for the linked lists, together with appropriate constructors. Then define an add method that takes a pointer to a person as its parameter, and adds her to the beginning of the list if she is female, but the end if he is male.

3.

Show calculations, use human-oriented units (e.g. days, months, years rather than vast numbers of seconds).

Remembering that bubble sort is quadratic $O(n^2)$, binary chop search is logarithmic $O(\log n)$, and linked-list search is linear $O(n)$:

A.

If an implementation of bubble sort on a particular computer is found to take 1 second to sort 10,000 items:

- i. How long would you expect it to take to sort 20,000 items?
- ii. How long would you expect it to take to sort 1,000 items?
- iii. How long would you expect it to take to sort 1,000,000 items?
- iv. How long would you expect it to take to sort 1,000,000,000 items?

B.

If an implementation of binary chop search on a particular computer is found to take 1 micro-second to search through 1,000 items:

- v. How long would you expect it to take to search 2,000 items?
- vi. How long would you expect it to take to search 1,000,000 items?

C.

If an implementation of linked-list search on a particular computer is found to take 1 second to search through a list of 1,000,000 items:

- vii. Approximately how long would you expect binary chop search to take to search the same data?
- viii. Approximately how long would you expect bubble sort to take to sort that data so that a binary chop search could work properly?

D.

If an implementation of bubble sort on a particular computer is found to take 1 second to sort 10,000 items:

- ix. How long would you expect merge-sort to take to sort the same data?

4.

Draw a picture of a typically evil puppy.

Her name is irrelevant, probably Glenda or something like that.