

5.

a. Hippopotamus Statistics.

The National League of Hippopotamologists has compiled a file containing the names and weights of all the hippopotamusses ever observed by any of its members. The file is thousands of lines long, the first three lines are these.

Henrietta	5102
Humberto	4821
Hamburger	3639
Heloise	3861

Names never have spaces in them, and the weights are measured in pounds. The name of the file is `nlhdata.txt`.

Write a function that reads the entire file, and when it has finished, reports the minimum, average, and maximum of all the recorded weights. The output should look something like this.

Min=1776, Avg=3542, Max=7024.

b. Censorship.

A state agency believes that young people are exposed to too much vulgar language, and want a program that does something about it.

Write a program (using standard libraries) that reads a text file called `naughty.txt`, and creates another text file called `nice.txt` that is exactly the same, except for one thing: every word that begins with the letter 'F' or 'f' has been replaced by a string of stars. The string of stars must be the same length as the removed word, so that nobody will notice the change.

A word is considered to be any sequence of letters that follow a space or are at the start of a line.

Example: if the input file contains

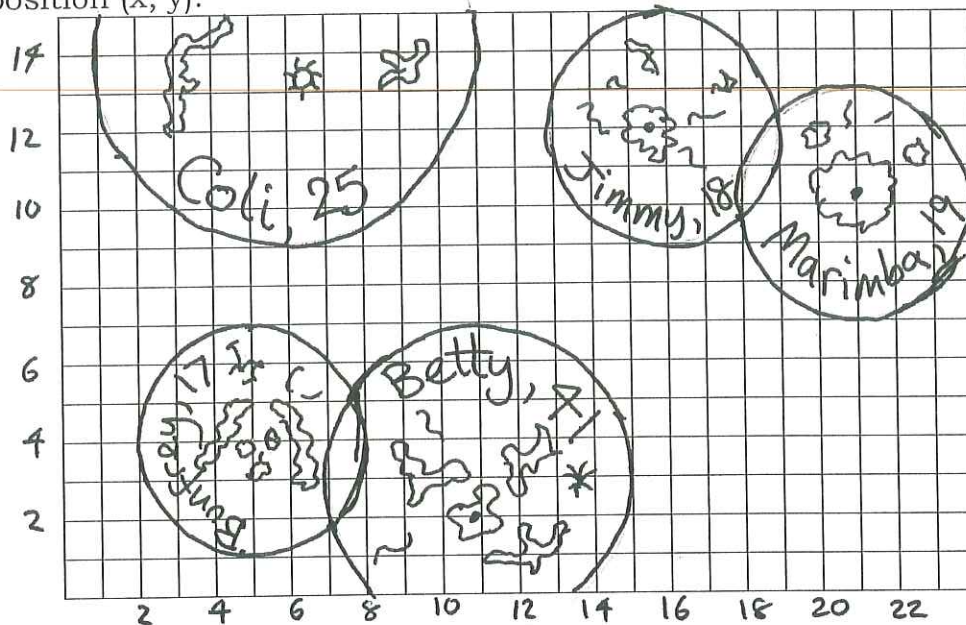
```
Dear web log, today my friends Jane and Frank came
round and we fried some fish and ate it. It was awful.
Jane never liked fried food, and she suffered badly. I
don't think we will ever fry fish together again.
```

Then the output file should contain

```
Dear web log, today my ***** Jane and ***** came
round and we ***** some ***** and ate it. It was awful.
Jane never liked ***** *****, and she suffered badly. I
don't think we will ever *** ***** together again.
```

6. Amœbæ. A word that uses both Œ and Æ. You may be more familiar with it as “amebas”, which I think is ugly.

Amœbæ, for our purposes, are perfectly circular microbes that live in a flat world that looks a lot like a sheet of graph paper. The only things known about an amœba are its name, age, radius, and position (x, y).



a.

Define a struct suitable for representing everything that is known about an individual amœba. Also write a set function and a suitable print function that could be used in this way:

```
{ amoeba a, b, c;
  set(a, "Marimba", 19, 3, 21, 10);
  set(b, "Jimmy", 18, 3, 16, 12);
  set(c, "Betty", 17, 4, 11, 3);
  set(d, "Bunfrey", 17, 3, 5, 4);
  set(e, "Coli", 25, 5, 6, 14);
  print(a);
  print(b); .....
```

b.

To combat under-age happiness, it is illegal for two amœbæ to overlap if they are both under the age of 21. (e.g. Jimmy and Marimba in the diagram are in trouble).

Write a function that takes two amoeba objects as its parameters, and returns true if they are behaving illegally, false if they are not.

continued...

c.

Two amœbæ are able to marry if three conditions are met: they must be of different sizes, they must overlap, and at least one of them must be aged 21 or over.

Amœba marriage is a horrible thing. The larger of the two completely absorbs the smaller, leaving it in its original position but with a radius of zero. The larger also stays in its original position, but grows so that its area is equal to the total of the couple's original areas.

Write a `marry` function that takes two amoeba objects as its parameters. If the two are not able to marry, the function has no effect. If the two are permitted to marry it must change the two objects in the way described above.

notes:

In the context of the example, `marry(a, b)` would have no effect, `marry(c, e)` would have no effect, but `marry(c, d)` would make poor little Bunfrey get absorbed by Betty.

If you're unsure about detecting overlap, think about how far apart their centres are.

7.

a.

In a `main()` function, create two arrays of strings called `first` and `second`, both capable of storing 10,000 strings.

b.

Write a function that reverses the order of the strings in an array. So that if the array originally contains "ant", "bat", "cat", it will result in the array containing "cat", "bat", "ant".

Assuming that somebody else has already put some number of strings in `first`, show how your `main()` function would call this new function to reverse `first`.

c.

Write a function that searches an array of strings to see if a particular string is in it. The function should take at least two parameters: the array of strings to be searched, and the single string to be searched for. It should return `true` or `false` accordingly.

d.

Making use of your answer to part c, add to your `main()` function C++ code that would result in the array `second` containing all of the strings that appear in `first`, but with no repetitions.

For example, if `first` contains (the, big, fat, cat, sat, on, the, big, big, mat, with, the, fat, dog) then `second` should contain (the, big, fat, cat, sat, on, mat, with, dog).

8.

Draw a picture of Henrietta the Hippopotamus.
