

Take the following problems as seriously as you want to be taken. For many of them, there is no strict, one solution – and for some of them the solution is irrelevant. What is important is that we gain a glimpse into your problem solving method.

It is important to describe the solutions in as much detail as you deem useful – please do not return single word (or sentence) answers.

There is no time limit to the test, but the faster you finish (and the answers make sense), the more impressed we are likely to be. If there are any questions regarding the wording of the problems, feel free to ask them via email or Skype.

1. You are given a sphere with radius **R** and center point **C**. On its surface, you are given 3 more points: **P1**, **P2** and **P3**. Those points designate a spherical triangle (a triangle that is on the surface of a sphere). Write a program (or an algorithm) which for a given point **P** (also on the surface of the sphere) will determine if the point **P** is INSIDE the triangle defined as **P1P2P3**.

Hint: This is an algorithm for the 2D planar case – use it as a step in the right direction. Don't forget that the sphere's surface is a 3D object.

<http://www.gamedev.net/topic/295943-is-this-a-better-point-in-triangle-test-2d/>

2. Imagine a chessboard, made out of a single piece of tin, extruded in such a way that every field has a different height – so, a sort of a three-dimensional chessboard. Next, imagine you position the chessboard horizontally, and you start pouring water on it. The deeper fields will start filling up with water, and when the water reaches the edge of the chessboard, it just runs over and spills on the ground. Approximate the dimensions of a single field to be 1x1 centimeter. How will you calculate how many cubic centimeters will remain in the chessboard once water runs over from every side of it?
3. Given the following structure:

```
struct node
{
    struct node *next;
    struct node *reference;
    int value;
};
```

Reference is a pointer to an arbitrary node in the list.

Write a function that will return a copy of the list sent in as an argument which will have no dependencies on the original.

4. Write a short document in which you explain how to design a game that simulates an animal ecosystem. Assume that you need no more than 5 different types of animals. What properties will you need for the simulated animals? What properties will you need for the environment? The simulation should be self-sustaining for an indeterminate amount of time.