PROBLEM OF THE MONTH:
October 2012

MATHEMATICS

One fine day in SigmaCamp Mark came to the chemistry lab where he held semilab for the campers. He was unhappily surprised by a frog jumping out at him from the test tube box. Now all the test tubes were contaminated and unfit for the experiment he had in mind. Unless someone washes them really well... So Mark decided to appoint this task to the guilty party. He knew that only the members of his semilab (α-camper, γ-camper, τ-camper, ε-camper) and the helping counselor had access to the lab.
When questioned, each of them made three allegations:

Counselor:
- I didn't do it.
- I have never touched a frog in my life.
- τ-camper did it.

α-camper:
- I didn't put a frog in the test tube box.
- I am 12 and my frog-playing days are long behind me now.
- ε-camper knows who did it.

γ-camper:
- I didn't do it.
- I didn't know ε-camper before coming to the SigmaCamp.
- τ-camper did it.

τ-camper:
- I am not guilty.
- ε-camper did it.
- γ-camper is lying when he says I put the frog into the test tube box.

ε-camper:
- I didn't put the frog in the box.
- α-camper is guilty.
- γ-camper can vouch for me because we take the same classes in SchoolNova.

Later, each suspect said that two of his/her allegations were true and one was false.
Assuming they didn't lie this time, which of them put the frog in the box and will now spend his evening washing all the test tubes?

PHYSICS

In deep outer space, where gravity can be ignored, *Hegemon* – the rebel spacecraft, moves towards *Peace* station with a constant velocity of 500 m/s. When the distance to *Hegemon* is 14.5 km Peace opens fire with small nuclear balls at a rate of 1 ball per second. The muzzle speed of each ball is 1500 m/s. *Hegemon* turns-on its protective shield, and the balls **elastically** bounce off. Assume that the bounced nuclear balls do not interact with the incoming ones, instead they pass through and go directly back to *Peace*.

i) How long will it take the first ball to reach *Peace,* counting from the moment when the first nuclear ball was fired?

ii) Starting from the moment when the first ball returns and hits *Peace* station, how long will it take until the second ball hits *Peace*?

CHEMISTRY

You are given two metal cubes of equal size. One cube is made of gold, while the other is made of aluminum.

Which of the two cubes contains a greater number of atoms?

How many times greater?

Can you comment on your answer?

BIOLOGY

There are spring-blooming and fall-blooming plants (the former bloom only in the spring and the latter bloom only in the fall).

Why don't the spring-blooming plants usually bloom again in the fall when the temperature outside is the same as it was in the spring?

How would you explain the fact that sometimes plants make a mistake and do bloom? (we are not talking about indoor plants).