

**Problems for SF 4**  
**3rd IYNT 2015**

**21. Horizontal Level**

A red dot is marked on a wall in your Science Fight room. Put a blue dot on another wall at exactly same horizontal level.

**22. Pouring Water Out**

Compare several methods to empty a bottle of water and indicate the fastest method.

**23. Granulated Sugar**

Determine an experimental distribution of sizes of particles of granulated sugar.

**24. Chemistry**

A list of four compounds includes  $\text{CuSO}_4$ ,  $\text{K}_2\text{Cr}_2\text{O}_7$ ,  $\text{MgCl}_2$ ,  $\text{NaCl}$ . Three of those are in three marked test tubes. Determine the contents of each test tube.

**25. Non-Linear Vial**

You are given a vial loaded with metal nuts and closed with a cap. The vial floats on water if immersed vertically with the cap upside. However it sinks if put in water with the cap downside. Investigate and explain this behavior.

**26. Bitmap**

Several bitmap files have the same size and contain look-alike images. These is however a particular variance between the images. Identify and parameterize this variance.

Essential equipment for the problems is provided. Teams can use any own equipment. The organizers can further provide the following equipment: one microscope, one electronic balance up to 2 kg, 3 m tape measure, tweezers, alcohol lamps, piece of thread, rulers, laser pointers, scissors, lighters, rubber gloves, metal pins, PVC hose (8 mm diameter, 7 m length), PVC hose (15 mm diameter, 40 cm length), plastic beakers and bottles, paper filters, chemical beakers (100 mL), chemical beakers (250 mL), chemical beakers (500 mL), glass test tubes, Pasteur pipettes, chemical spoons, funnels.