

Problems for the 5th IYNT 2017

If I have seen further it is by standing on the shoulders of giants.
Isaac Newton

1. Invent Yourself: Good guesses

In 1906, Francis Galton observed a contest where 800 farmers guessed an animal's weight. To his surprise, the median of the guesses was within 0.8% of the true measured weight. What is the chance of obtaining such a good match by coincidence? Select an interesting and important parameter, measure it directly, and give a group of human observers the task to guess the value of the parameter. Discuss the results of your experiments.

2. Invent Yourself: Time-lapse videos

Propose a very slow physical, biological, or chemical phenomenon that can be studied and visualized using time-lapse photography. Produce and demonstrate such a video.

3. Invent Yourself: Curved mirrors

Suggest and demonstrate interesting experiments in which large concave mirrors can be used to heat up or cool down various objects.

4. Invent Yourself: Language barriers

Speakers of related but different languages or dialects can sometimes understand each other, without any prior intentional study. Propose an interesting study of such a mutual intelligibility. Investigate it experimentally for the pairs of dialects or languages of your choice. Introduce and determine quantitative parameters.

5. Invent Yourself: IYNT grades

An upwards of four thousand grades that Jurors have given in Science Fights of previous four IYNTs can reveal properties and hidden regularities of the IYNT grading. Suggest an interesting hypothesis that concerns the IYNT grades and test it with real data from previous IYNTs.

6. Apples

Why do apple slices turn brown after being cut? Investigate the speed of this process and test methods to prevent browning of apple slices.

7. Growing through asphalt

Can a little plant grow straight up through concrete or asphalt?

8. Tonic water in UV light

Tonic water glows brightly when exposed to an ultraviolet black light bulb. It is however easy to quench the glow of tonic water by adding salt. Investigate this effect. What other common substances glow under UV light and how can one influence their glow?

9. Salt production

Solar evaporation of seawater or salt mining are common methods to produce common salt (NaCl). Propose a method to extract salt from a natural source and determine both productive capacity of your method and purity of the product. Demonstrate an amount of salt produced by your method.

10. Rijke's tube

If air inside a vertical cylindrical tube open at both ends is heated, the tube produces sound. Study this effect.

11. Grow light

Investigate how different types of artificial lights affect plant growth. What is the role of light spectrum?

12. Milk

Develop simple methods allowing determination of some of the important properties of milk. Suggest an investigation requiring comparison of various milk samples.

13. Allometry

How do length and thickness of bones scale with overall size and weight of animal?

14. Routers and garden cress

In 2013, five young students claimed a sensational discovery that garden cress (*Lepidium sativum*) won't germinate when placed near two Wi-Fi routers. Reproduce their experiments under controlled conditions to support or dismiss their conclusions.

15. Water from the air

Design and construct a device allowing collection of water by condensing moisture from air. Determine if the water obtained with your device is suitable for drinking. What amount of water is possible to collect during one Science Fight?

16. Paper wrinkles

When a piece of paper dries after being wet, it can get wrinkled. Investigate and explain this phenomenon.

17. Tornado machine

Build a machine to produce an indoor air tornado. Investigate the properties and stability of the tornado. Is the machine portable enough to be demonstrated at a Science Fight room of the 5th IYNT?

The problems are authored by Andrei Klishin, Ilya Martchenko, and Evgeny Yunosov. Selected, prepared, and edited by Ilya Martchenko and Evgeny Yunosov. This official set of problems for the 5th IYNT 2017 is approved by General Council of the IYNT and can be used only at the events endorsed by the General Council of the IYNT.

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