ADVANCED PHYSICS CLUB
SEPTEMBER 29, 2024

USEFUL RESOURCES

The updates, homework assignments, and useful links for APC can be found on SchoolNova's web page:
    https://schoolnova.org/nova/classinfo?class_id=adv_phy_club&sem_id=ay2024

The practical information about the club and contacts can be found on the same web page.

TODAY'S MEETING

Today we solved a few estimate problems and began solving problems on kinematics of uniform motion.
    The second homework contains the remaining problems on kinematics of uniform motion and some new problems on motion with acceleration. Please solve the problems at home! During the club meeting we will only have time to discuss the solutions that you already have. You can also think in advance which problem(s) you may want to present at our the meeting.
    If you feel like you need clarification about the formulation of any problem, you are always welcome to email apc@schoolnova.org

HOMEWORK

1. An airplane full of skydivers flies horizontally with a constant speed. Skydivers jump out of the plane keeping the constant time interval after the previous skydiver. They very quickly reach constant (and same for all of them) terminal speed v and move with it until opening the parachute. After opening the parachute at some particular height their speed quickly becomes u (also the same for all of them). The arrangement of skydivers is shown on the figure. Assuming they move strictly vertically, find ratio of speeds $\dfrac{v}{u}$.
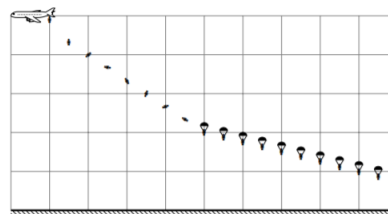
*2. A billiard table has length a and width b. A ball is launched from the middle of the side b at some angle α to that side. Find all α such that after several collisions the ball returns exactly to the initial point.

3. Upon entering an unpaved section of the road every car reduces its speed from v_1 to $v_2 < v_1$. The length of each car is l. What is the minimal distance between the cars that drivers should keep on the paved road to avoid collisions?

4. A speedometer on an old car looks like the one shown on the figure. The speed scale is 25 cm long and displays speed from 0 to 180 km/h. Find speed of the speed-indicator arrow when the car is moving with acceleration 2 m/s^2.

5. A body starts moving from some point A. At first it moves with the constant acceleration for a time t_0. Then it suddenly changes the direction of acceleration to the opposite one (the magnitute remains the same). How long after leaving point A will the body return to the point A?

*6. You are standing on a platform next to a train which is scheduled to depart at 12:00:00. It's exactly 12:00:00 by your watch and the second to last carriage already starts moving past you, and it goes

past you completely in 10 s. Then the last carriage goes past you in 8 s. The train has departed on time and it is moving with a constant acceleration. How much does your watch fall behind?

IMPORTANT: The next club's meeting is at 3:30pm, via Zoom, on Sunday, **October 6**.