ADVANCED PHYSICS CLUB

SEPTEMBER 23, 2018

Introduction

In the first meeting of the club we discussed few problems in mechanics and physics of fluids. The problems are given below.

For the next meeting

In the next meeting we will continue with fluids. You might find useful to look at the following web pages before next meeting:

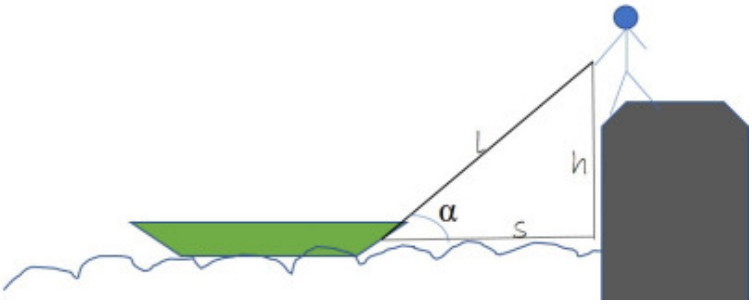
Static Fluid Pressure: `http://hyperphysics.phy-astr.gsu.edu/hbase/pflu.html#fp`
Archimedes' Principle: `https://en.wikipedia.org/wiki/Archimedes'_principle`

Discussed problems

1. It is known that a stone thrown upwards with initial velocity V reaches the maximal height H in time T. One stone is thrown upwards with initial velocity V from the ground level. At the same time the other stone is released without any initial velocity at the height H. Obviously, at some time t the stones will be at the same height h.
   (a) Is h bigger or smaller than $H/2$?
   (b) Is t bigger or smaller than $T/2$?

2. To transport heavy objects horizontally one can roll these objects mounted on tree trunks (see picture). If the object is moving with velocity V, what is the velocity of tree trunks?

3. A boat is pulled into a dock by a rope attached to the bow of the boat and passing through a pulley on the dock that is higher than the bow of the boat. If the rope is pulled in at a rate of 1 m/s, how fast is the boat approaching the dock when the rope makes an angle of $\alpha = 45$ degrees with the surface of the water?



4. Everybody knows that a cork released at the bottom of the vessel filled with water floats to the surface of the water. The cork is released at bottom of a cylinder shaped vessel filled with water. Simultaneously, the vessel itself is released at the top of the skyscraper and starts falling down. What will be the position of the cork at the moment when the vessel hits the ground?