

Tough Test

The graduate class was asked the following question as part of the final exam paper in Copenhagen University: “How will you find the height of a skyscraper using a barometer?” One student answered: “From the top of the building I will hang the barometer with a long rope. Once the barometer touches the ground, I will measure the length of the rope. I will add the height of the barometer to the length of the rope to determine the height of the sky scraper.”

The examiner felt almost offended after reading this very original solution. He got very angry and failed the student. The aggrieved student appealed to the University and pleaded that his answer was correct and if any proof was required it could be tested. The University was in a fix. It appointed an external, neutral examiner to objectively and dispassionately unravel the truth. After a deep probe the external examiner gave his verdict: “Though the student’s answer is correct it does not reflect any deep understanding of physics.”

So it was decided to call the student for a six-minute interview to test his basic understanding and grasp of the basic principles of physics. During the interview, the student sat absolutely silent with his head hung low for the first five minutes. When the examiner reminded him of the time limit the student replied, “Sir, I know of several elegant solutions. But I am unable to decide on the most appropriate one!” On being coaxed by the examiner the boy gave a quick reply: “Well, you can drop the barometer from the top of the skyscraper. Measure the period ‘t’ of fall. Then using the equation $H = 0.5gt^2$, calculate the height of the building. In this experiment the barometer, of course, will get smashed to pieces.”

“Or else, if it is a sunny day, then you can first measure the actual height of the barometer and the length of its shadow. Next you measure the length of the shadow cast by the skyscraper. Later, using simple arithmetic and the principle of similar triangles you can find the height of the skyscraper.” “But if you wish to use a very precise scientific method then tie the barometer to the end of a short string and swing it like a pendulum - first on ground and then on the roof of the building. The height of the skyscraper can then

be determined by using the simple equation for finding the time period of a simple pendulum.

“ But if the skyscraper has an emergency staircase then the task will be much easier. While climbing up the stairs keep measuring the height of the building using the barometer like a scale. Later you can add them up to calculate the height of the sky scraper.” “But if you wish to adopt a very conventional and boring way then using the barometer you can measure the difference in the atmospheric pressure on the ground and the top of the building. This difference in air pressure given in “milli bars” can later be converted into feet to give the height of the building.”

“But students are always asked to use their own original and independent ideas to learn science. So the best solution would undoubtedly be to go to the security guard of the building and tell him, “Here, you can have this brand new barometer, but first you will have to tell me the height of the building!”

The name of this student was Neils Bohr - the first and only person from Denmark to win a Noble Prize in Physics.

Contributed by: Arvind Gupta