S=a+²

Some time ago, I received a call from a colleague who asked if I would be the referee on the grading of an examination question. He was about to give a student zero for his answer to a physics question, while the student claimed that he should get a perfect score and would do so if the system were not set up against the student. The instructor and the student agreed to submit this to an impartial arbiter, and I was elected.

I went to the colleague's office and read the examination question which was: "Show how it is possible to determine the height of a tall building with the aid of barometer."

The student's answer was: "Take the barometer to the top of the building, attach a long rope to it, lower the barometer to the street, and then bring it up measuring the length of the rope. The length of the rope is the height of the building."

I pointed out that the student really had a strong case for full credit, since he has answered the question completely and correctly. On the other hand, if full credit were given, it could well contribute to a high grade for the physic student in this physics course. A high grade is supposed to certify competence in physics, and the answer did not confirm this. I suggested that the student have another try at answering the question; I was not surprised that my colleague agreed, but I was surprised that the student did.

I gave the student six minutes to answer the question, with the warning that the answer should show some knowledge of physics. At the end of five minutes, he had not written anything. I asked if he wished to give up, but he said no. He had many answers to this problem; he was just thinking of the best one. I excused myself for interrupting him, and asked him to please go on. In the next minute he dashed off his answer, which was:

"Take the barometer to the top of the building and lean over the edge of the roof. Drop the barometer, timing its fall with a stop watch. Then, using the formula S equals 1/2 a+2, calculate the height of the building."

At this point I asked by colleague if he would give up and I gave the student almost full credit.

In leaving my colleague's office, I recalled that the student said he had other answers to the problem, so, I asked him what they were. "Oh yes," said the student. "There are many ways of getting the height of a tall building with the aid of a barometer. For example, you could tak the barometer out on a sunny day and measure the height of the barometer, the length of its shadow, and the length of the shadow of the building, and by the use of simple proportion, determine the height of the building."

"Fine," I said "And the others?"

"Yes", said the student. "There is a very basic measurement method that you will like. In this method you take the barometer and begin to walk up the stairs. As you climb the stairs, you mark off the length of the barometer along the wall. You then count the number of marks and this will give you the height of the building in barometer units. A very direct method.

"Of course, if you want a more sophisticated mwthod, you can tie the barometer to the end of a string, swing it as a pendulum, and determine the value of "g" at the street level and at the top of the building. From the difference between the two values of 'g' the height of the building can, in theory, be calculated."

Finally he concluded, there are many ways of solving the problem. "Probably the best," he said, "is to take the barometer to the basement and knock on the Superintendent's door. When the Superintendent answers you speak to him as follows: "Mr. Superintendent, here I have a fine barometer. If you will tell me the height of the building, I will give you this barometer."

At this point I asked the student if he really didn't know the answer to the problem. He admitted that he did, but he was so fed up with college professors trying to teach him how to think and to use the scientific method instead of showing him the structure of the subject matter, that he decided to take off on what he regarded mostly as a lark.

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