

The Niels Bohr legend

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Background Imagine a nice and sunny day, say the 20th of March, in Copenhagen. Although Copenhagen lies about 6200km north of the equator the day is not only sunny, but also pleasantly warm (20°C). You brought your deck chair to the rooftop of the physics department and enjoy your midday break with a good cup of coffee and the view of the coastline. Suddenly you realise that you have no clue how high this building actually is.

Luckily, you brought your gadget bag, as usual containing a barometer, a cord (1m long), your stopwatch, a thermometer, your camping stove with sufficient fuel and lighter, the almanac of substance properties, and, of course, pencil and paper.¹ Since you usually only acquire high quality devices you may assume extraordinarily high precision when performing measurements. Moreover, you are of course free to leave the rooftop in order to perform the measurements.

- a) [8 points] *Describe 4 different ways to determine the height of the building using the equipment you brought with you. Give a formula for each method, which expresses the height of the building as function of the measurement results.*
- b) [2 points] *Can you tell the radius of the earth from your measurement results or with an additional measurement involving the height of the building? How?*

¹Also, you haven't emptied the coffee yet – could the coffee be of any use in order to come to a conclusion?