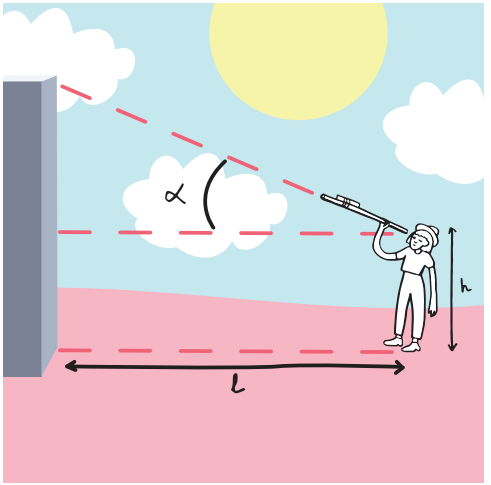
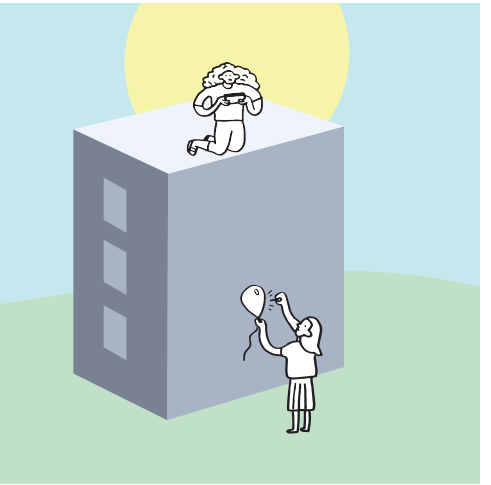
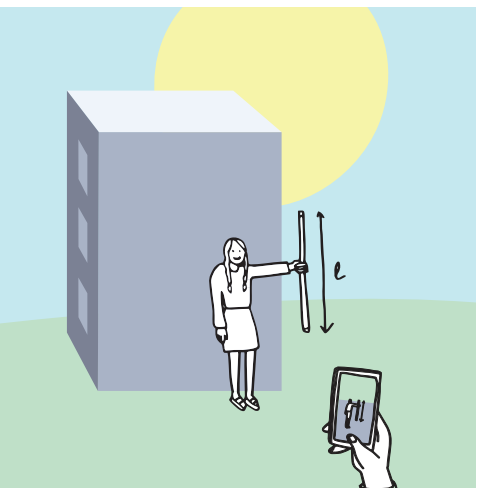


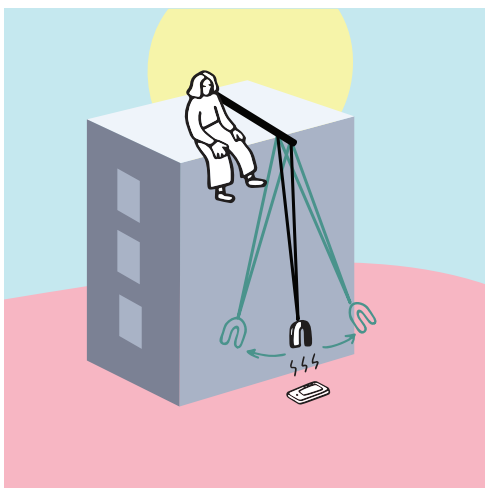


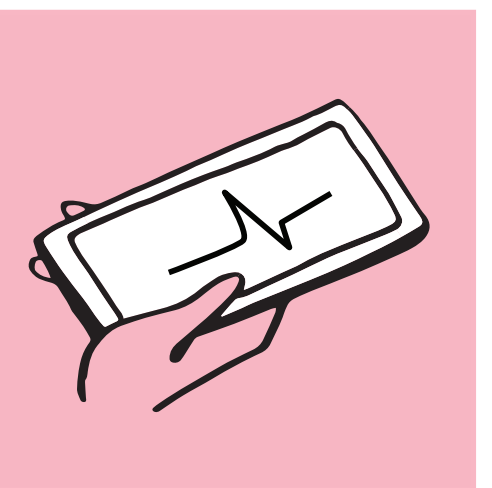
Theme:

BIZARRE

Methods that we do not necessarily think about.







Discover The Smartphone Physics Challenge at VULGARISATION.FR

«Physics Reimagined» team (Paris-Saclay University)

Precision: maximum

Difficulty: minimum

№31. Length of Rope

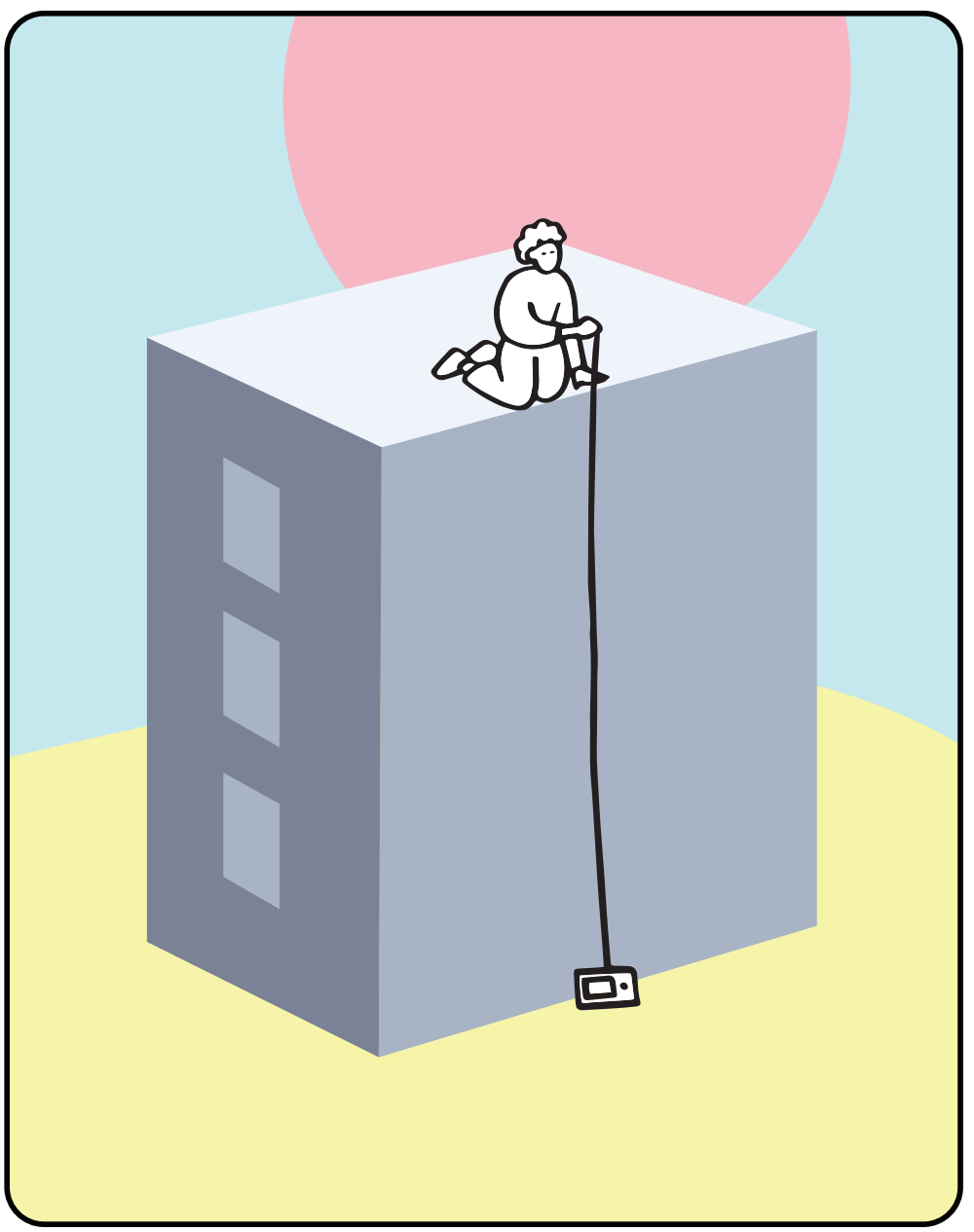
Formula

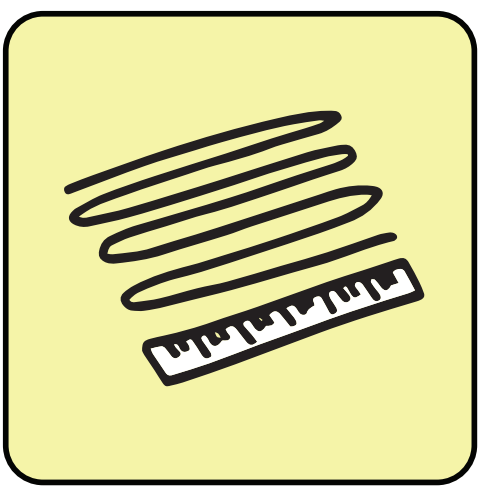
$$H = H$$

Material

1 long rope

1 smartphone





Weight the rope with your smartphone. Hang the rope from the top until the smartphone touches the floor. Then measure the length of rope with a meter.

H = length of the rope

Precision: intermediate

Difficulty: intermediate

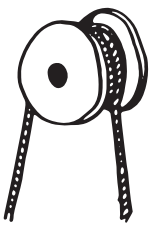
№32. Length of Rope & Gyroscope

Formula

$$H = 2\pi R \int \dot{\theta}\, dt$$

Material

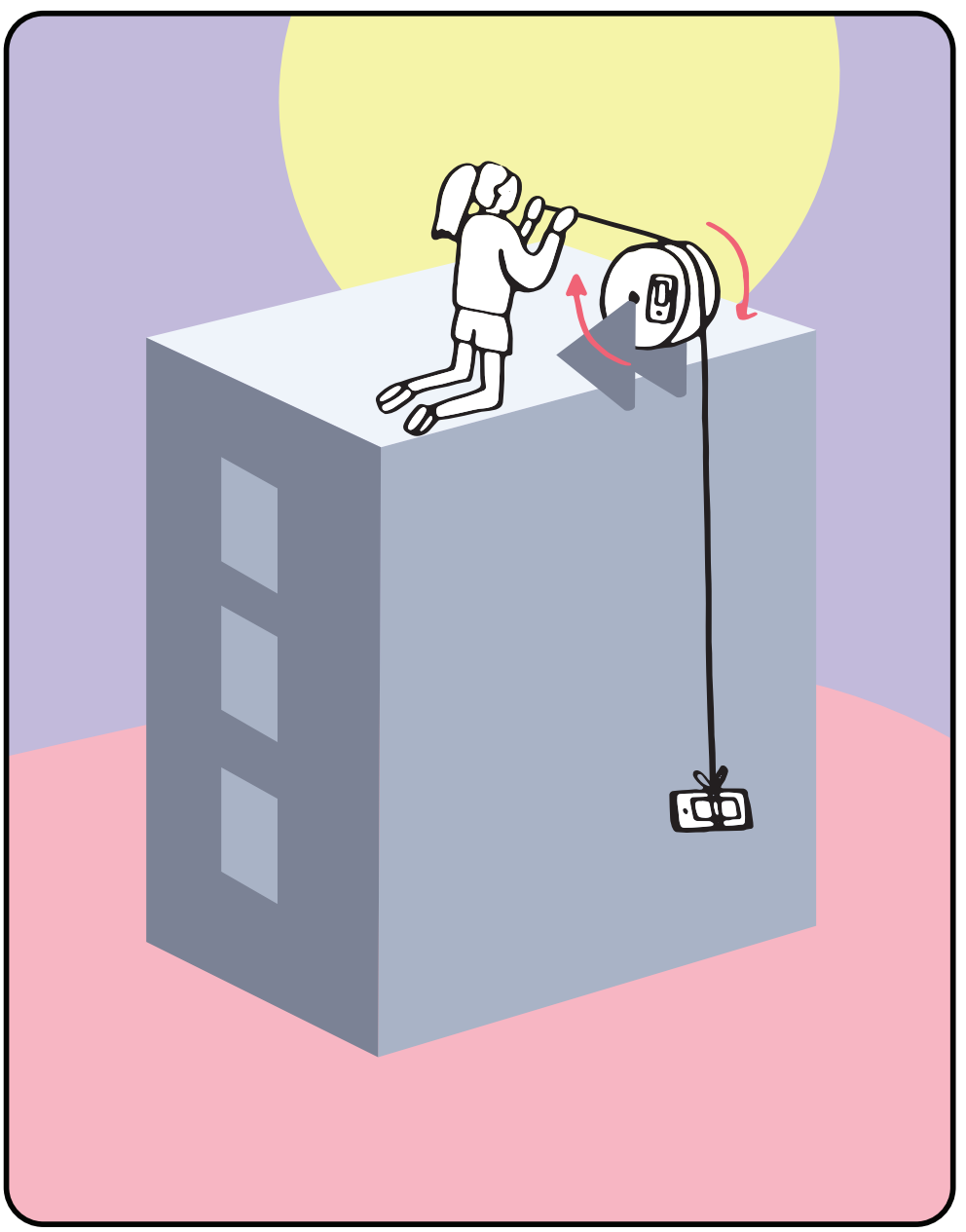
1 long rope



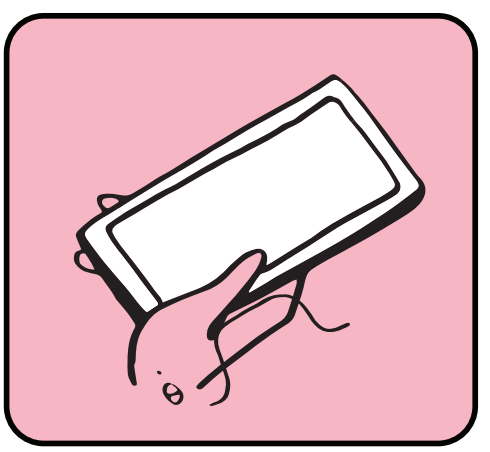
1 pulley

Sensor: **gyroscope**

2 smartphones



Weight the rope with your smartphone. Install the pulley at the top of the building, and attach it a second smartphone. Pass the rope through the pulley and let it slide to the ground. Integrate the gyroscope signal to know the number of turns of the pulley, and thus the length of rope.



R = radius of the pulley, $\dot{\Theta}$ = angular velocity

Precision: maximum

Difficulty: minimum

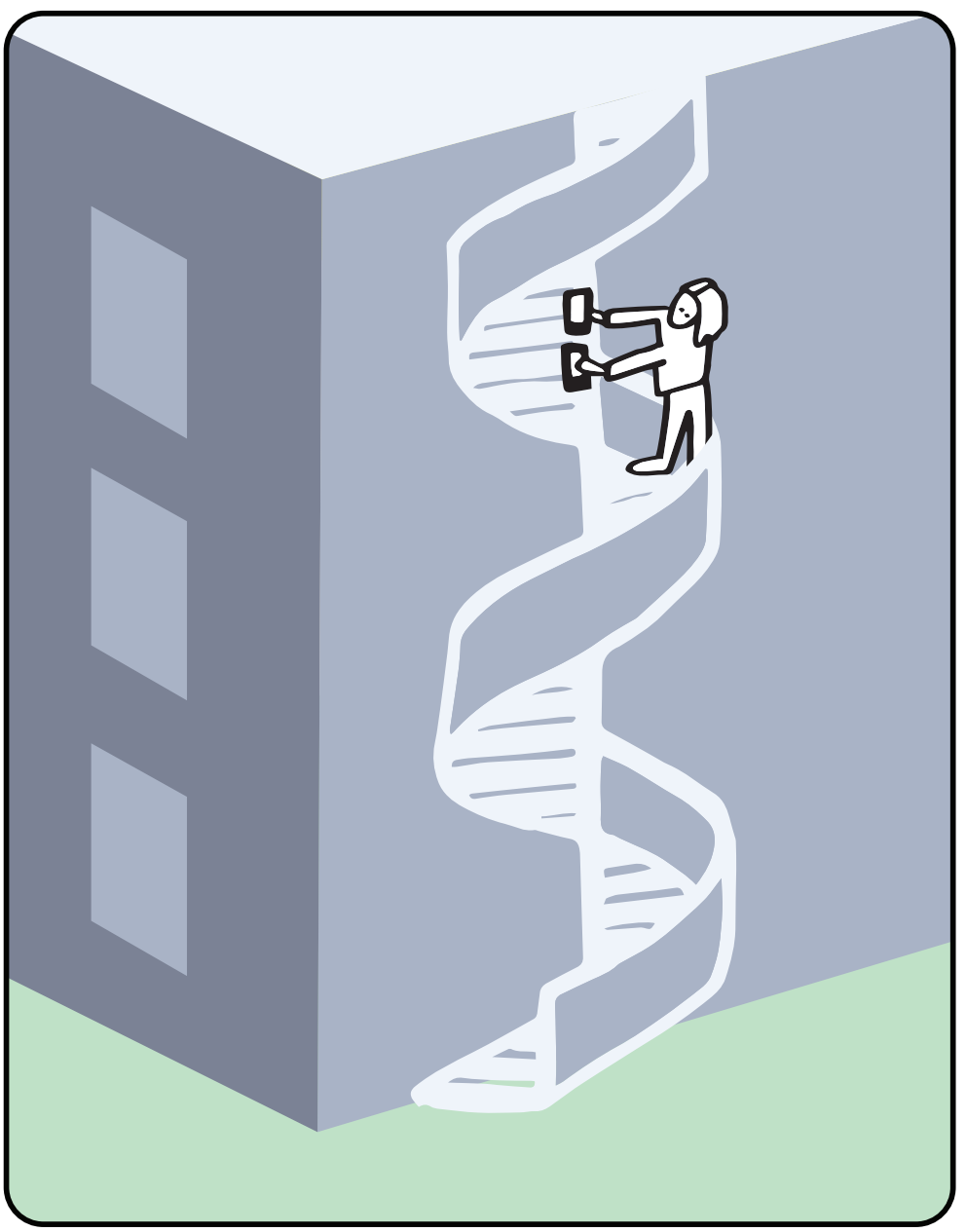
№34. Number of Smartphones

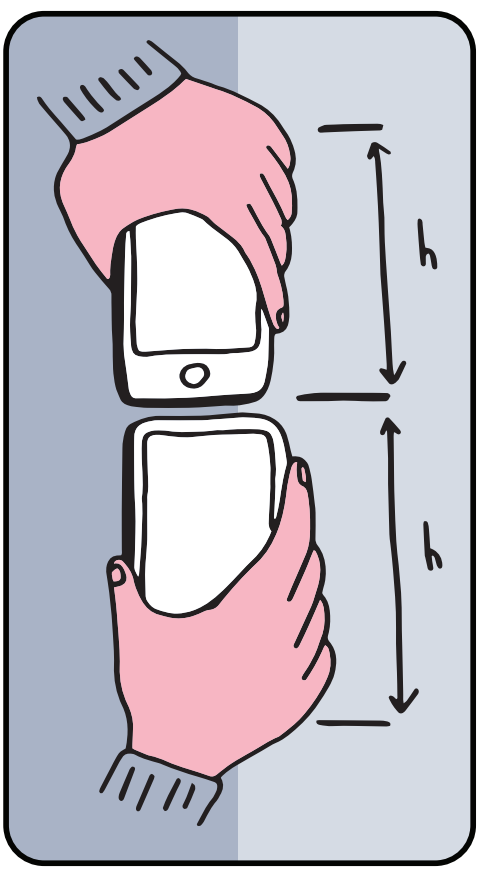
Formula

$H = Nh$

Material

2 identical smartphones





Using the outside emergency staircase, count the number of smartphones that must be stacked to reach the top of the building.

N = number of smartphones,
h = height of a smartphone

Precision: maximum

Difficulty: minimum

№35. Number of Steps

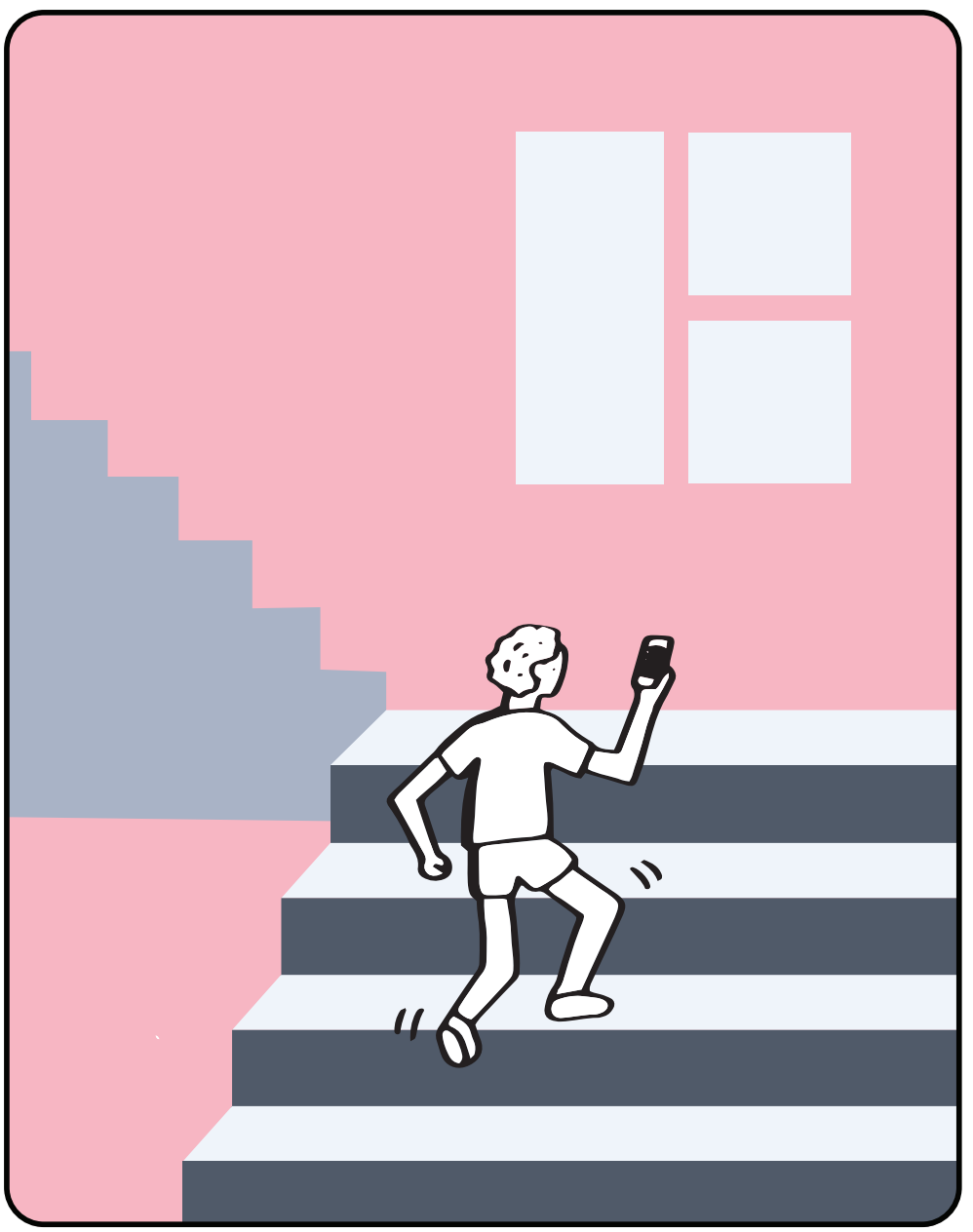
Formula

$$H = Nh$$

Material

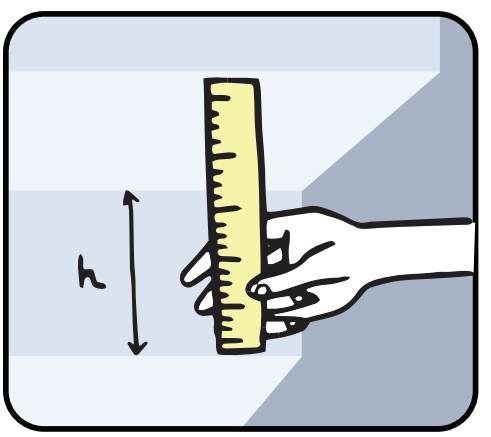
Sensor:
accelerometer

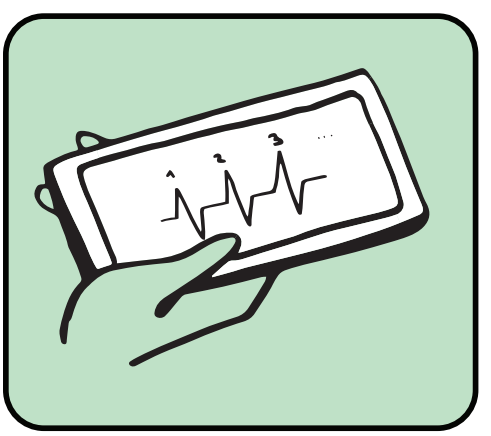
1 smartphone



Using the accelerometer, count the number of stair steps to the top of the building.

N = number of steps,
h = height of a step





Precision: high

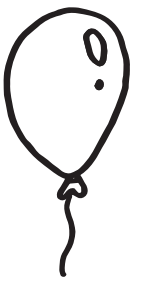
Difficulty: low

№43. Slow Motion

Formula

$$H = vt$$

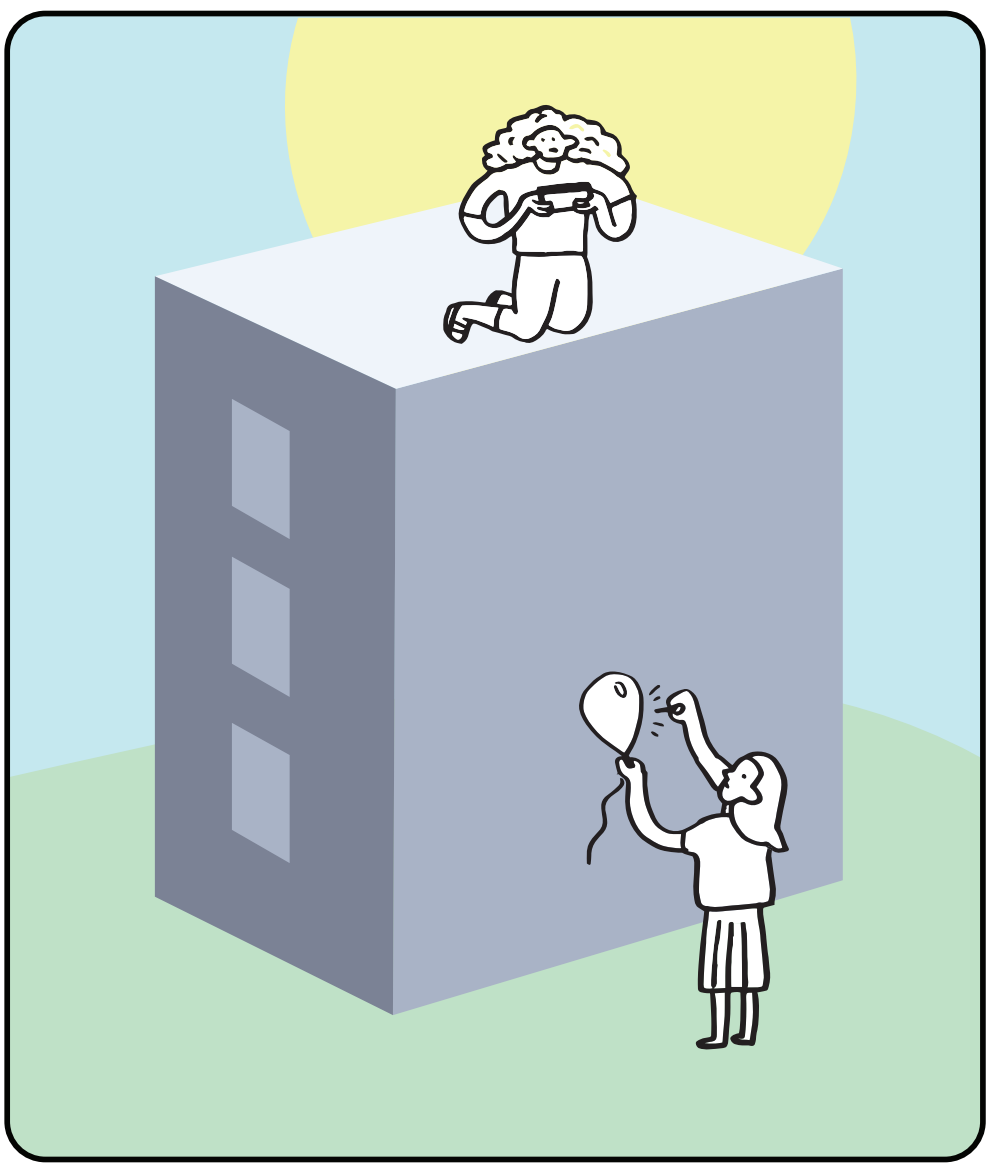
Material

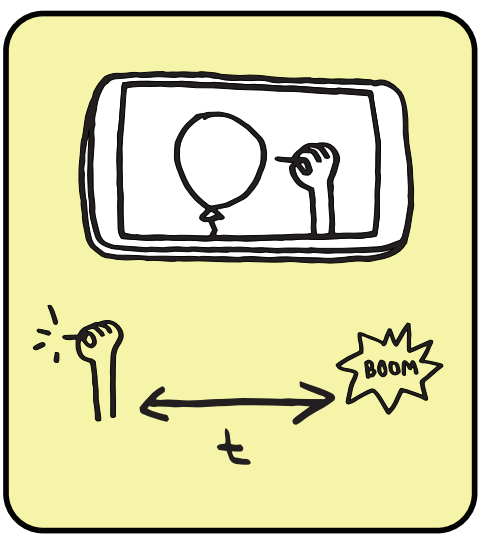


1 balloon

Sensors:
camera, microphone

1 smartphone with slow motion





From the top of the building, film in "slow motion" the bursting of a balloon at the bottom of the building. Measure the time elapsed between the image and the sound of the exploding balloon.

v = speed of sound, t = delay between pop image and pop sound

Some smartphones do not record sound in slow motion.

Precision: awfully bad

Difficulty: minimum

№60. General Relativity

Formula

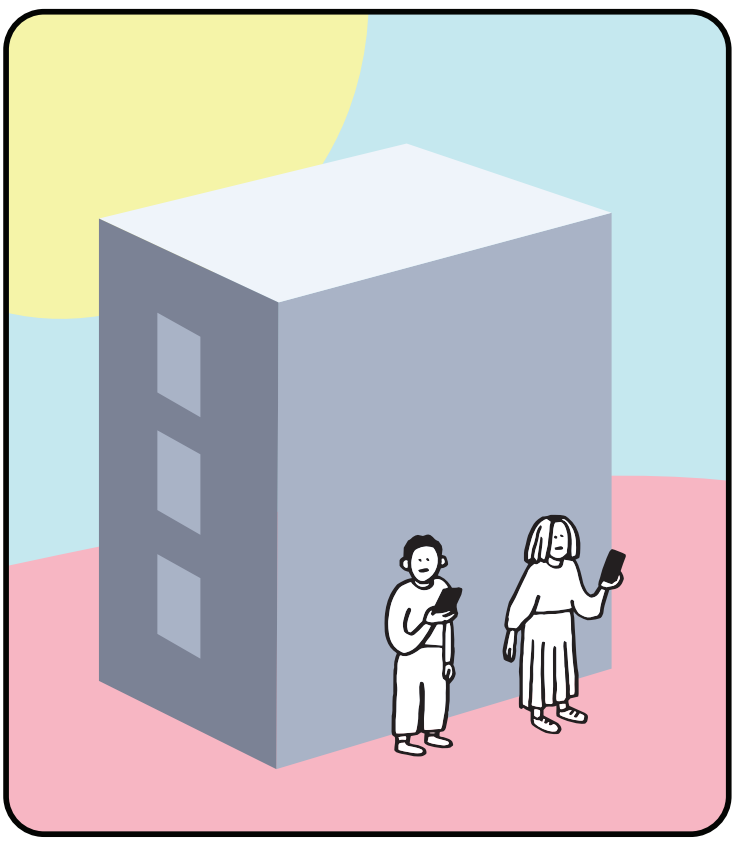
$$H = \frac{c^2}{g}\,\frac{\delta t}{t}$$

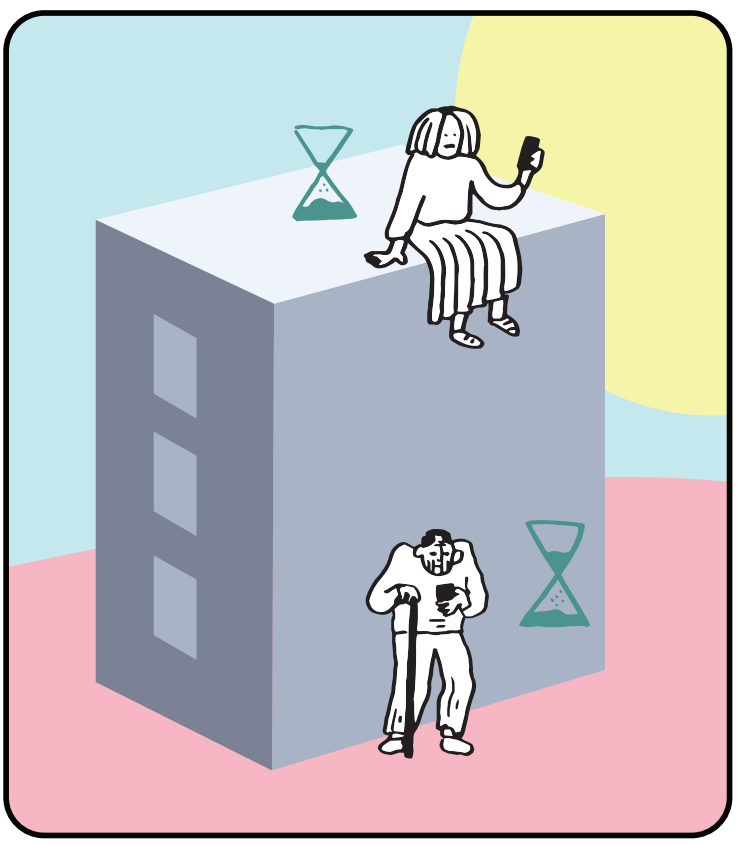
Material

Sensor: **stopwatch**

2 smartphones

At the bottom of the building, start both chronometers, then go to the top of the building with one of the smartphones. Wait for a while, then go down again. Measure the delay (due to general relativity) between the two chronometers.





c = speed of light, g = gravity, δt = difference between the two chronometers, t = duration of the experiment

The effect of velocity (twin paradox) is negligible in front of the effect of altitude in this situation.

Precision: maximum

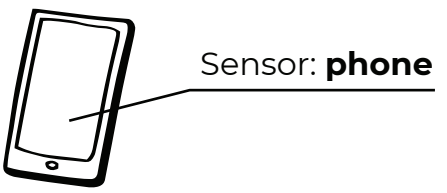
Difficulty: minimum

№61. The Architect

Formula

$$H=H$$

Material



1 smartphone

Call the building architect, and ask him.

This project was imagined by Frédéric Bouquet (Paris-Saclay University) and Giovanni Organtini (Sapienza Università di Roma, Italy).

Physics: Frédéric Bouquet, Giovanni Organtini, Julien Bobroff

Videos, photos, gifs: Amel Kolli

Graphic design and illustrations: Anna Khazina

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