Challenge
GIANT PENDULUM

Get inspired by Galileo and measure the height of a building... using a smartphone!
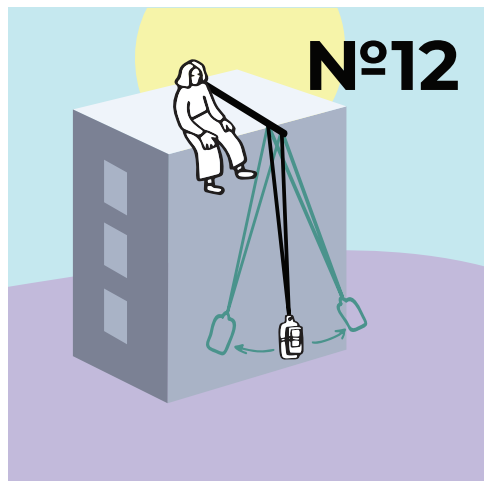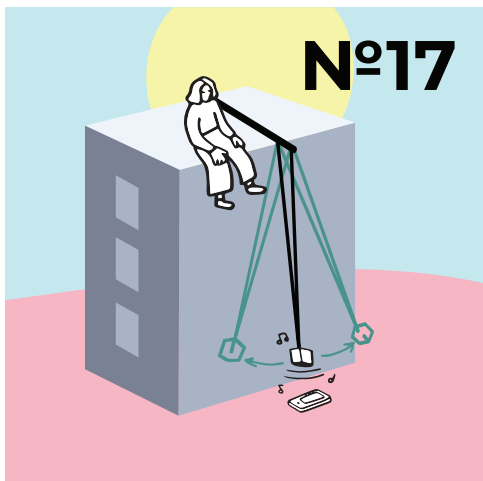
№10. Giant Pendulum Timed

Formula

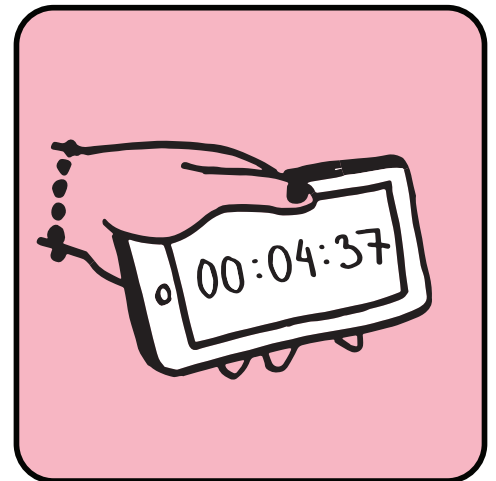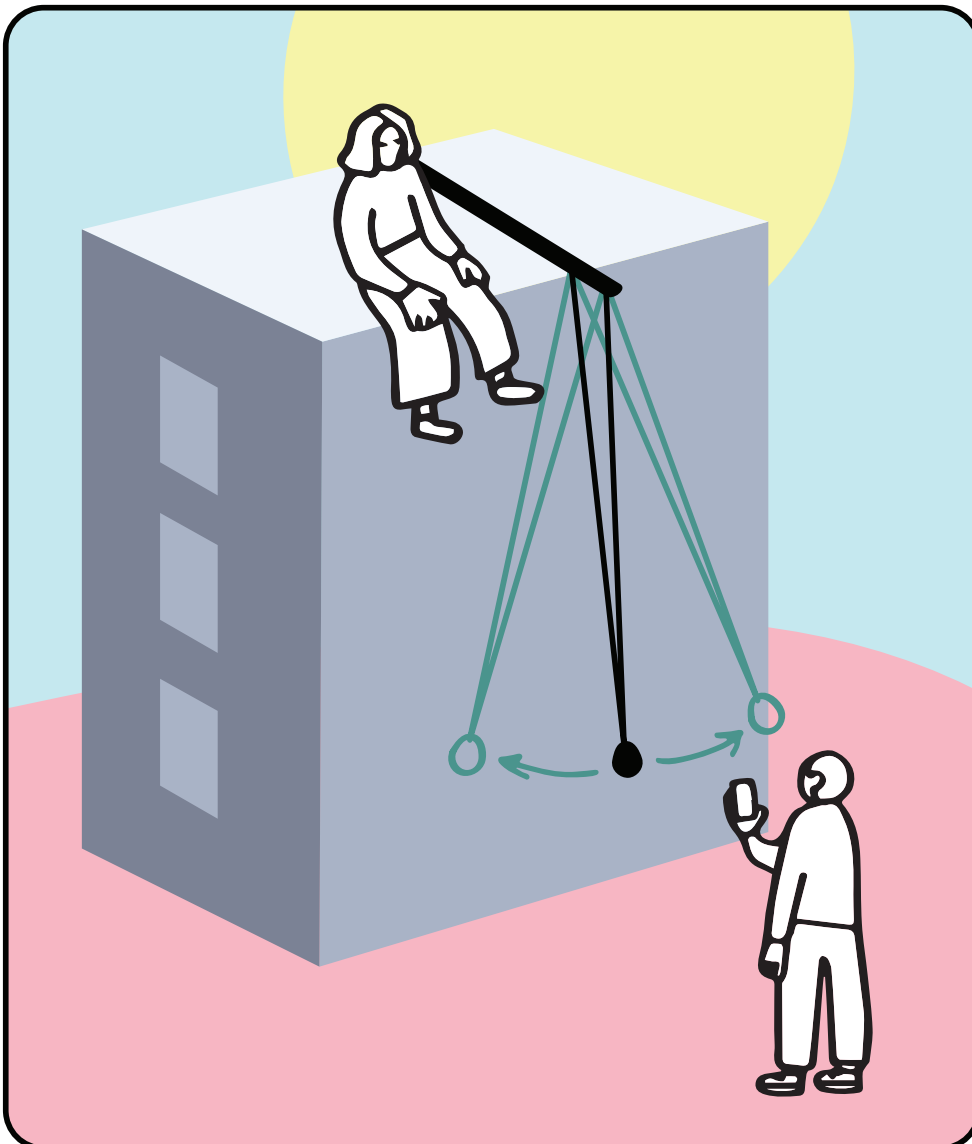$$H = g\left(\frac{T}{2\pi}\right)^2$$

Material

1 long rope

1 mass
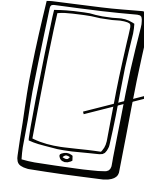
Sensor: **stopwatch**

1 smartphone

Make a giant pendulum the size of the building. Use the smartphone timer to determine the period.

T = pendulum period,
g = 9.8 ms^{-2}

The pendulum must not rotate in all directions, it must only swing.

№12. Giant Pendulum & Accelerometer

Formula

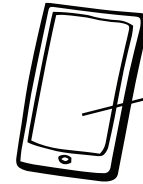$$H = g\left(\frac{T}{2\pi}\right)^2$$
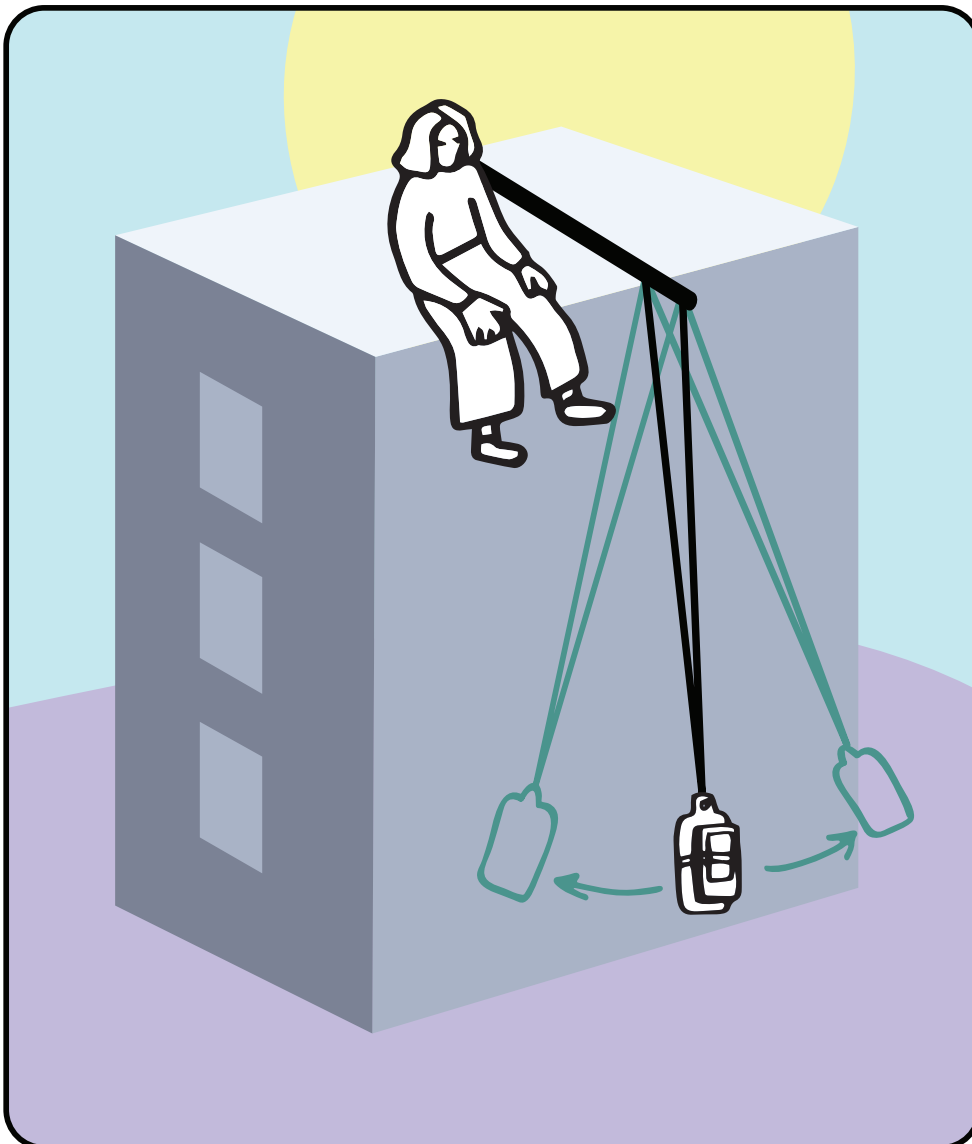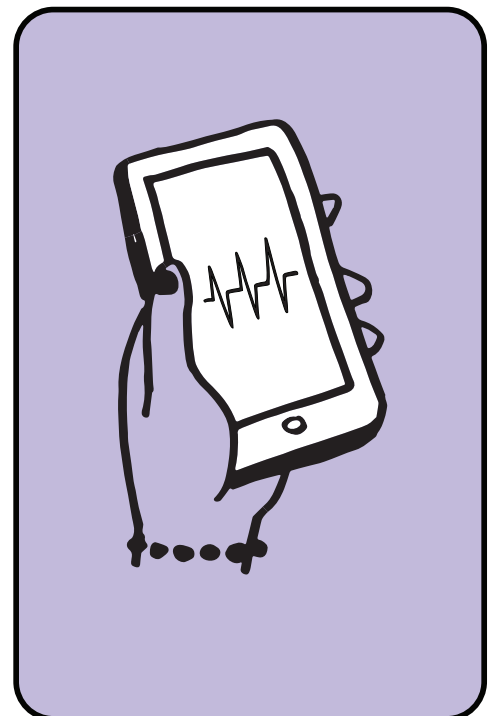
Material

1 long rope

1 mass

Sensor: **accelerometer**

1 smartphone

Make a giant pendulum the size of the building. Attach the smartphone to the pendulum, and use the accelerometer to determine the period.

T = pendulum period,
g = 9.8 ms^{-2}

The higher the building, the smaller the acceleration, and the harder the measure will be.

№14. Giant Pendulum & Magnet

Formula
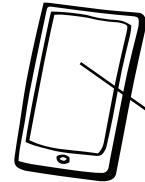
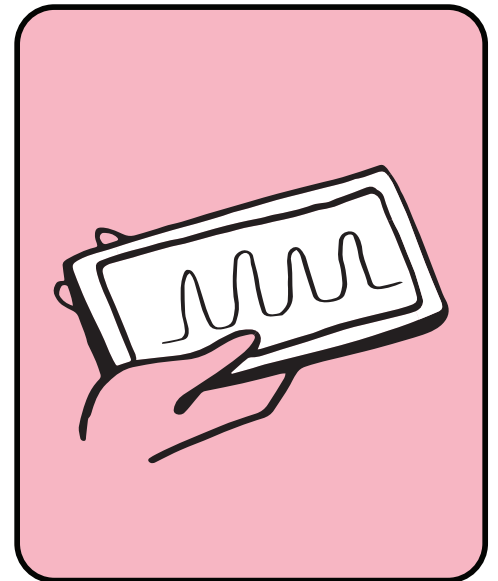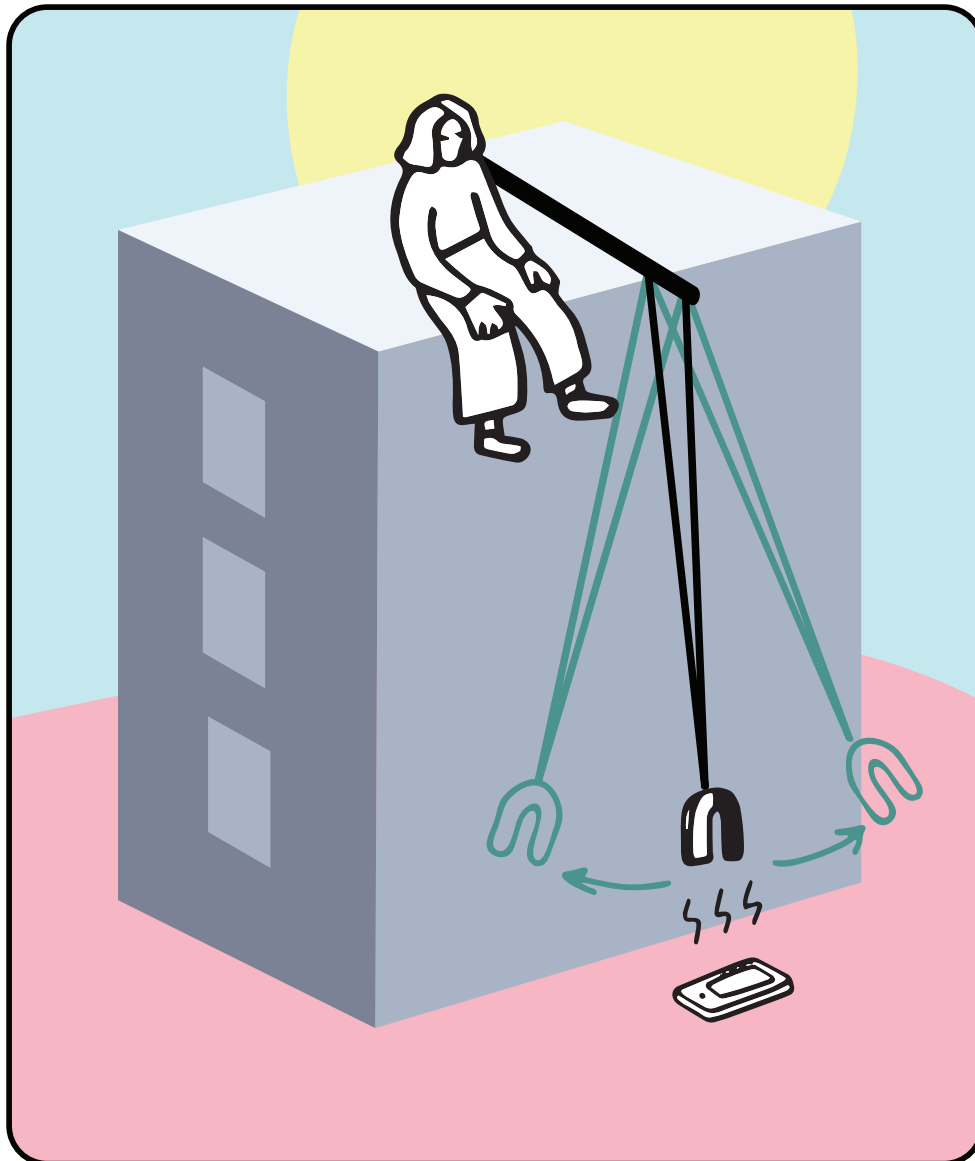$$H = g\left(\frac{T}{2\pi}\right)^2$$

Material

1 long rope

1 mass

1 magnet

1 smartphone

Sensor: **magne-tometer**

Make a giant pendulum the size of the building. Attach a magnet to the pendulum. Position the smartphone vertically to detect the passage of the magnet.

T = pendulum period,
g = 9.8 ms^{-2}

The Earth's magnetic field can be used in place of the magnet; the smartphone must then be fixed on the pendulum.

№15. Giant Pendulum & Light

Formula

$$H = g\left(\frac{T}{2\pi}\right)^2$$
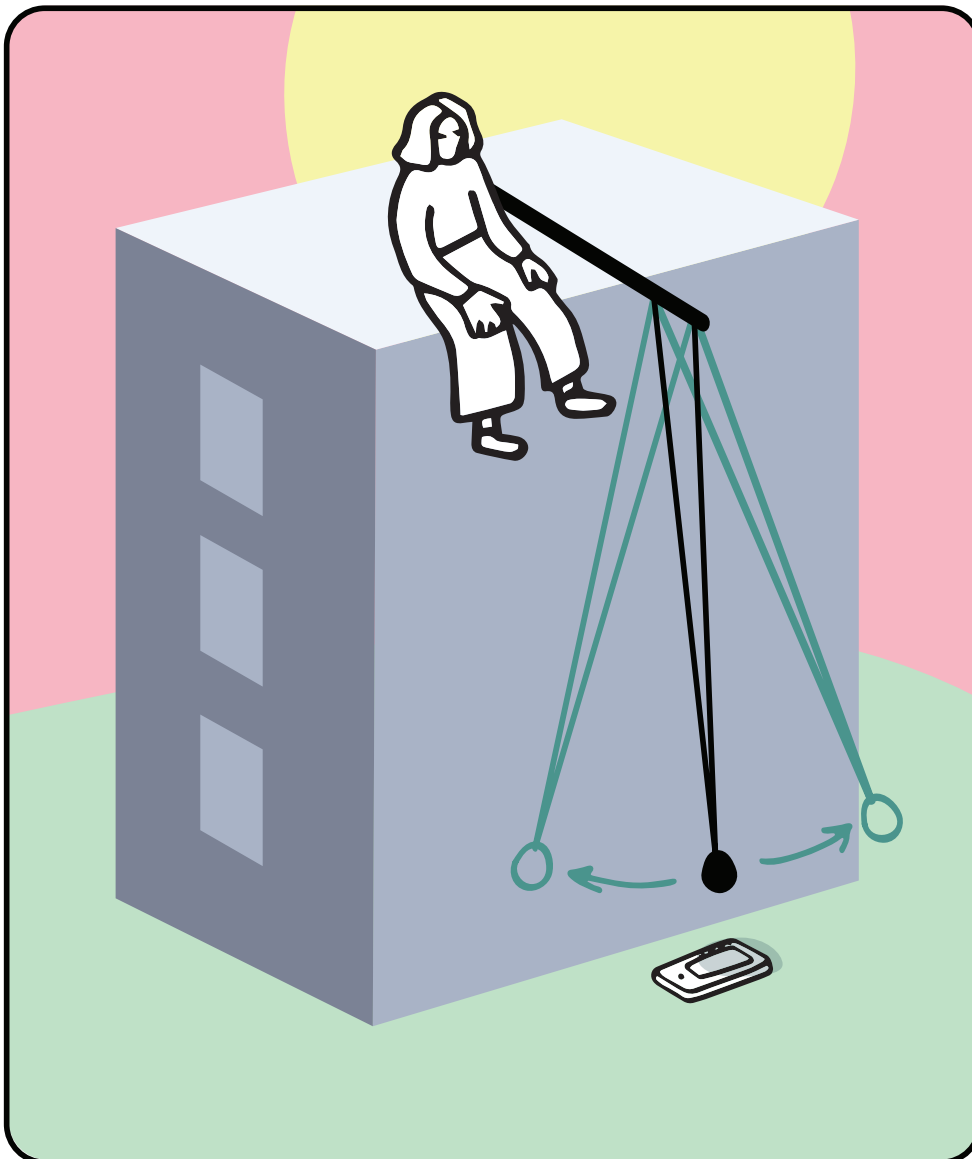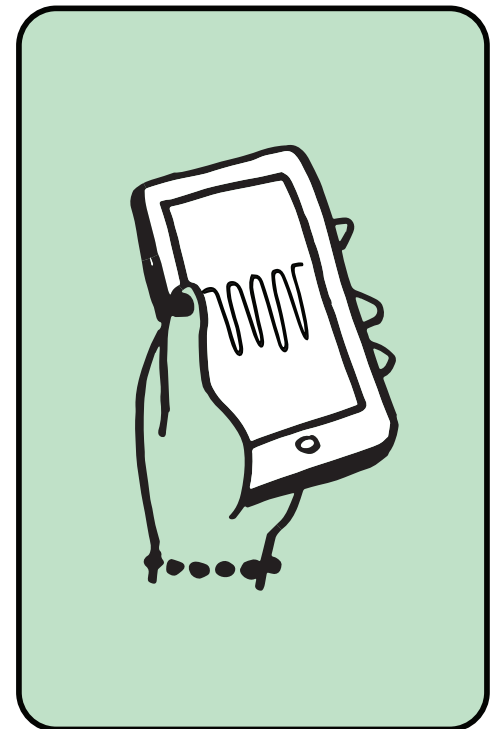
Material

1 long rope

1 mass
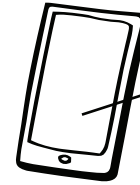
1 smartphone

Sensor: **light sensor**

Make a giant pendulum the size of the building. Position the smartphone vertically to detect the shadow of the pendulum.

T = pendulum period,
g = 9.8 ms^{-2}

The pendulum must not rotate in all directions, it must only swing.

№17. Giant Pendulum with Sound

Formula

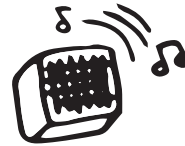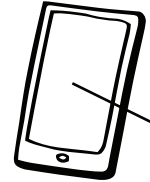$$H = g\left(\frac{T}{2\pi}\right)^2$$
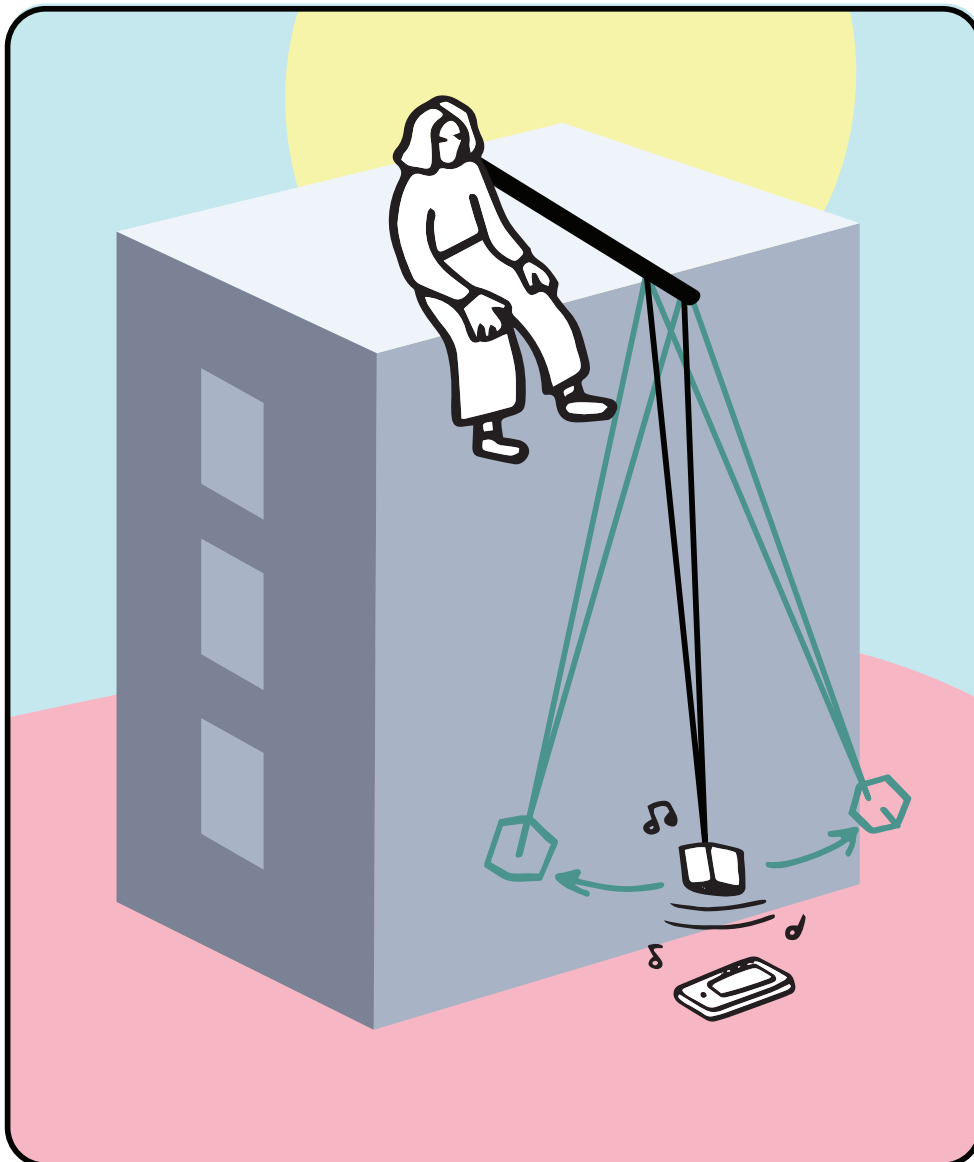
Material

1 long rope
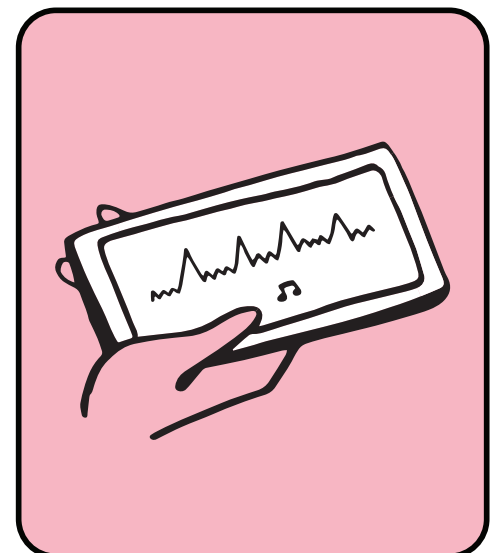
1 mass

1 bluetooth speaker

Sensor: **micro-phone**

1 smartphone

Make a giant pendulum the size of the building. Attach the speaker to the pendulum, and send a constant sound. Position the smartphone vertically, and use the variation in the amplitude of the recorded sound to determine the period.

T = pendulum period, g = 9.8 ms^{-2}

The pendulum must not rotate in all directions, it must only swing.

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

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