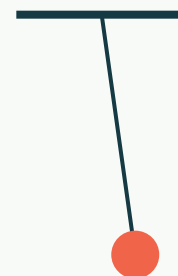


Predict the longer swing

Student investigation / 20 minutes / model results

01 / Predict

At the same gravity, which takes longer: a 1 m or 4 m pendulum? Explain before moving the controls.



Pivot → bob centre

02 / Test one variable

Hold $g=9.81 \text{ m/s}^2$ and $\text{mass}=0.20 \text{ kg}$ fixed. Change length. Record a complete oscillation, not a one-way swing.

Length (m)	$g \text{ (m/s}^2\text{)}$	Mass (kg)	Period (s)
1.00	9.81	0.20	
4.00	9.81	0.20	

03 / Explain the pattern

Use $T=2\pi\sqrt{L/g}$. What changed in the period? Now change mass alone: what changes in the picture and what stays fixed?

Prediction 2 min · Explore 8 · Compare 5 · Explain 3 · Exit 2

Model: 8° amplitude, ideal string, no drag or damping. A sketch or spoken explanation can replace written sentences.

A teacher's review checklist

Open the actual output. Mark the checks you performed.

☐ **The science agrees**

At 1 m and $g=9.81$, $T\approx 2.006$ s. At 4 m, $T\approx 4.012$ s.

☐ **Mass leaves the period fixed**

Test a second bob mass. The bob size can change; the period cannot.

☐ **The controls work**

Try Pause/Resume, Reset, a keyboard slider and reduced motion.

☐ **The sources stay distinct**

App values are model outputs. The stopwatch-style practice table is fictional.

☐ **The activity fits the room**

Timing adds to 20 minutes. Supply curriculum expectations and class-specific supports.

☐ **The revised files agree**

After a follow-up prompt, inspect every changed page and the answer key.

One correction I made

Three questions to keep

Student quiz / Answers are on a separate teacher page

01 / Explain

At fixed gravity, length changes from 1 m to 4 m. How does the ideal period change? Explain the factor.

02 / Explain

Why should changing bob mass leave the displayed period unchanged? Name one effect the ideal model leaves out.

03 / Explain

How is a simulated model result different from a physical observation? Which type is our separate practice table?

Use words, a labelled sketch or a spoken explanation.

The teacher's answer key

Separate answer page / small-angle model

01 / Four times length → twice period

T depends on $\sqrt{L}$. At $g=9.81$, it changes from about 2.006 s to 4.012 s. Changing length by a factor of four doubles the ideal period.

02 / Mass is absent from this equation

$T=2\pi\sqrt{L/g}$ contains no bob mass. This ideal model also omits damping, drag, friction and the large-angle correction. A drawn larger bob is a visual change.

03 / A model is not a new measurement

The app calculates values using coded assumptions. A physical observation comes from a real experiment. Our stopwatch-style practice table is invented, so it remains labelled fictional.

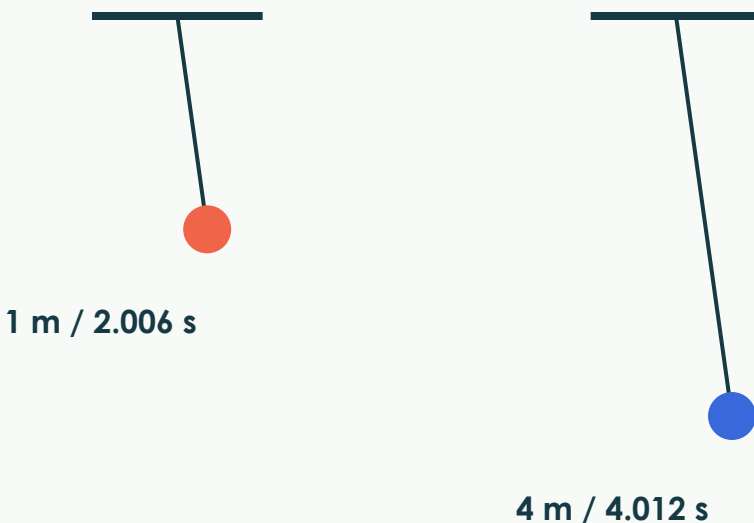


Diagram compares lengths schematically; both use the same gravity.