

Simple Pendulum Simulator

Classroom worksheet · Interactive simulation: <https://lkforge.com/tools/physics/simple-pendulum/>

Name: _____ Date: _____

Learning objectives

- Determine what the period of a pendulum depends on.
- Apply the small-angle period formula.
- Recognize the independence of period from mass and amplitude (small angles).

Variables to change

- Length
- Gravity
- Initial angle
- Mass

Procedure

1. Time the period at a fixed length and small angle.
2. Double the length and time the period again.
3. Change the mass (same length, small angle) and time the period.
4. Increase the starting angle to a large value and note any change.

Observations

Record the period for each length, mass, and starting angle.

Questions

1. What happened to the period when you doubled the length?

2. Did changing the mass change the period?
3. Write the small-angle period formula.
4. For small swings, does amplitude affect the period?
5. What happens to the period at large starting angles?

Answer key (instructors)

- **1.** It increased by a factor of $\sqrt{2}$, because $T \propto \sqrt{L}$.
- **2.** No — for a simple pendulum the period is independent of mass.
- **3.** $T = 2\pi \cdot \sqrt{L/g}$.
- **4.** Almost not at all; the small-angle approximation makes the period independent of amplitude.
- **5.** The period grows slightly longer than the small-angle formula predicts, because the approximation breaks down.

A simple pendulum's period $T = 2\pi\sqrt{L/g}$ depends on length and gravity, not mass, and is nearly independent of amplitude for small swings. At large angles the small-angle approximation fails and the period lengthens.