

Give me a second (Pendulum)



Can you make a 1 second pendulum?

- ❖ What is the length of a 1 second pendulum?
- ❖ What is the best thing to make a bob from?
- ❖ Why are some pendulums better than others?

Estimated time: 30 minutes.

No previous experience required

Instructions

Watch the video ([YouTube: HUHwvpGPncM](https://www.youtube.com/watch?v=HUHWvpGPncM))

1. Tie the bob (the mass on the end of the pendulum) to one string end.
2. Tie the other string end to the rod and place the rod in the support. Try using a clip (e.g. clothes peg) to help rod end adjustments.
3. Lift your pendulum to one side so it's about 5 cm higher, gently let go and start the timer as it passes the lowest point.
4. Time 10 swings – to and fro counts as one swing. We suggest counting (from zero) as the bob passes the centre point (where its swinging the fastest) for the most accurate time readings.
5. If the timer reads more than 10 seconds, shorten the string, if less than 10 seconds, lengthen the string. Repeat until you get exactly 10 swings in 10 seconds., then check a couple of times.
6. **Solving problems, if:**
 - string needs to be longer than 50 cm – you are not counting 'to-and-fro', but each swing - halve your count rate.
 - pendulum swings sideways - lift less, let go and don't push.
 - pendulum stops too soon - lift more and use a heavier bob.
 - pendulum bounces - use non-stretchy string.
 - string flies – use a heavier bob and lift less.
7. Measure length from the pinion (where string meets rod) to the **centre** of the bob and (if you have weighing scales), the bob's mass.
8. Share your result with NPL using the web page

npl.co.uk/measurement-at-home/give-me-a-second

Pendulum length in cm	
Bob type, shape and size	
Bob mass in g (optional)	

#MeasurementAtHome
npl.co.uk/measurement-at-home

Equipment required

- A ruler or measuring tape
- A support – we used a book overhanging a worksurface
- A rod (e.g. pencil or chopstick), to hang the string from
- 50 cm length of string
- A weight (bob) e.g. holed stone or Lego.
- A timer – (e.g. stopwatch on phone or web).
- Paper and pencil to record result.
- Optional weighing scales to measure bob mass.

Risks

- ❖ Take care heavy bobs don't break the string or fall on your feet.

SI measurement units

- ❖ metre (m) for position
- ❖ second (s) for time
- ❖ kilogram (kg) for mass

Challenge Topics

Measurement Science, Maths, Physics.

Thoughts, tips and information

- ❖ Why does bob size affect how long the pendulum moves? Why does swing time remain the same regardless of height or bob mass/size?
- ❖ Although time can be measured more accurately than anything else, it's hard to say what time is.

Adult direction or supervision is required. All experiments are carried out at your own risk.
 For more experiments, visit [NPL Measurement at Home](https://npl.co.uk/measurement-at-home).