

## Activity: Pendulum

On SCOPE's [DIY Science](#) episode, high school students Maddy and Genna experimented with a pendulum. Here's how they did it:



### What you need:

Pen  
String  
Tape  
Weights (e.g. large metal nuts)  
Table  
Friend  
Stopwatch  
Paper and pen to record results

### What to do:

1. Tape the pen to the top of the table so that half the pen is sticking over the edge.
2. Cut a piece of string about 1m long.
3. Tie one end of the string to the pen.
4. Tie the other end of the string to the weight, leaving enough extra string below to add more weights later on.
5. Test out the pendulum to make sure it swings freely without hitting anything. If it does, you might need to shorten the string.

#### 1<sup>st</sup> TEST WEIGHT

6. Pull the pendulum back towards you about 50cm.
7. Ask your friend to stick a piece of paper behind the pendulum and mark the starting position of the string.
8. Let the pendulum go and ask your friend to time how long it takes the pendulum to complete 5 periods (a period is the time it takes for the pendulum to swing forward and back once).
9. Write down the results.
10. Repeat the test but this time add more weight.

#### 2<sup>nd</sup> TEST STARTING POSITION

11. Go back to a single weight.
12. Pull the pendulum back to a different starting position and ask your friend to mark the starting position on the piece of paper.
13. Let the pendulum go and ask your friend to time how long it takes the pendulum to complete 5 periods.
14. Write down your results.
15. Repeat the test from another starting position.

### 3<sup>rd</sup> TEST STRING LENGTH

16. Keep the same weight but cut the string so the pendulum is shorter.
17. Pull the pendulum back to the original starting position.
18. Let the pendulum go and time how long it takes the pendulum to complete 5 periods.
19. Write down your results.
20. Make the string even short then repeat the test.

### Results table

#### 1<sup>st</sup> Test- Weight

Trial	No. of Weights	Time (seconds)
1 <sup>st</sup>		
2 <sup>nd</sup>		
3 <sup>rd</sup>		

#### 2<sup>nd</sup> Test – Starting Position

Trial	Starting Position (highest/lowest)	Time (seconds)
1 <sup>st</sup>		
2 <sup>nd</sup>		
3 <sup>rd</sup>		

#### 3<sup>rd</sup> Test – String Length

Trial	String Length (shortest/longest)	Time (seconds)
1 <sup>st</sup>		
2 <sup>nd</sup>		
3 <sup>rd</sup>		

### What's happening?

A pendulum is any mass that swings from a fixed point. Once started, pendulums swing forwards and backwards repeatedly thanks to the law of conservation of energy.

By looking at your results you should find that by changing the pendulum weight the period isn't affected. The period also doesn't change when you change the starting position. The only thing that changes the period is the length of the string.

Why is that? Well, changing the weight makes no difference because the effect of gravity on the downswing is counteracted by the effect of gravity on the upswing. The starting position also doesn't have an impact because the longer distance travelled is compensated by a faster swing. But by cutting the string shorter, you make the distance the pendulum travels a lot shorter without slowing down the weight, so it swings a lot faster.

Pendulums can be found in many everyday things like clocks, machinery and even the playground – a swing is a pendulum!