# The Pendulum

Okay, here we go. We are gonna start moving pretty quick from now on so be prepared to keep up.

Before we set this up, let's think again about what a pendulum is and what we need to know about it.

**Define: Pendulum**

**Define: Period**

Alright, that's done, now the questions.

1) Does the mass at the end of the pendulum affect the period? In other words will a bowling ball swing slower or faster than a marble if they are both hanging from a 1 meter string?

**Which one has the shortest period?**
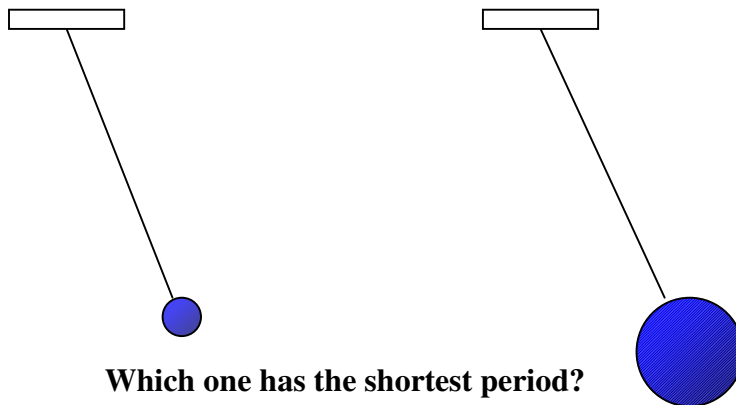
2) Does the angle you pull back on the mass affect the period? In other words, if I hold a bowling ball high up and let it go vs. down low and let it go, will one have a shorter period?

**Which one has the shortest period?**
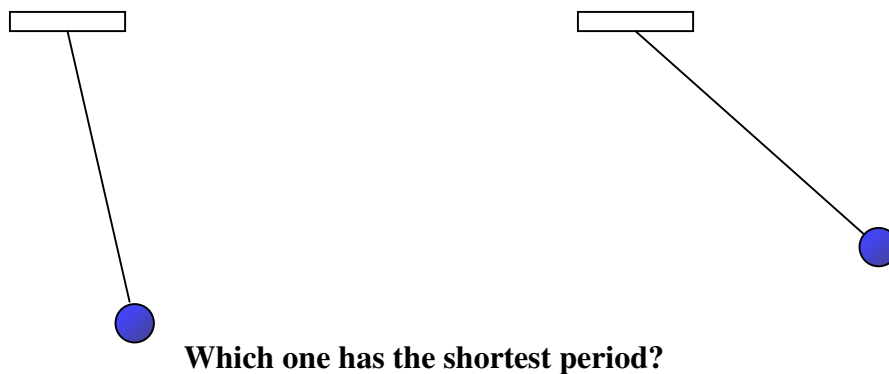
3) Does the length of the string affect the period? So if I take a bowling ball and swing it from a 1 meter string, does it have a different period than the same bowling ball swinging from a 2 meter string?
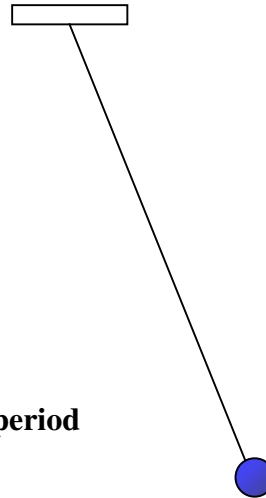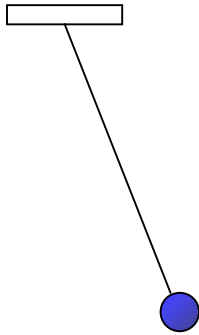
**Which one has the shortest period**

## Changing the Mass

Decide what angle you will use to set the pendulum swinging. Mark it on the paper behind the release point.

Set up the pendulum with a length of string, and tie one weight to the end. **Record the length of string in your lab book.** Leave enough extra string below the tie point so that you can attach more weights later without changing the length of string above the weight(s).

**Trial 1:**

Draw the weight back to the release point, and allow it to swing for five full periods (over and back, 5 times).
Time how long it takes to do this.
Then divide your answer by five, to get the time for one full period.

Repeat this twice more. Don't forget to divide by five each time ... we want the time for one period.
Now average your three answers. **Record your answer in your lab book:**

**Trial 2:**

Add a weight, so that two are tied to the string. Don't change the length of string above the weight(s).
Draw the weights back to the release point, and allow them to swing for five full periods (over and back, 5 times).
Time how long it takes to do this.
Then divide your answer by five, to get the time for one full period.

Repeat this twice more. Don't forget to divide by five each time ... we want the time for one period.
Now average your three answers. **Record your answer in your lab book:**

**Trial 3:**

Add a weight, so that three are tied to the string. Don't change the length of string above the weight(s).
Draw the weights back to the release point, and allow them to swing for five full periods (over and back, 5 times).
Time how long it takes to do this.
Then divide your answer by five, to get the time for one full period.

Repeat this twice more. Don't forget to divide by five each time ... we want the time for one period.
Now average your three answers. **Record your answer in your lab book:**

**By now you should have data that will lead you to a conclusion. You might want to write your conclusion in your lab book.**

# Changing the Angle

Set up a length of string with one weight on the end.

### Trial 1:

Draw the weight back to a steep angle (around 90°) and allow it to swing for five full periods (over and back, 5 times).
Time how long it takes to do this.
Then divide your answer by five, to get the time for one full period.

Repeat this twice more. Don't forget to divide by five each time ... we want the time for one period.

Now average your three answers. **Record your** BIG ANGLE **answer in your lab book:**

### Trial 2:

Draw the weight back to a less steep angle (around 45°) and allow it to swing for five full periods (over and back, 5 times).
Time how long it takes to do this.
Then divide your answer by five, to get the time for one full period.

Repeat this twice more. Don't forget to divide by five each time ... we want the time for one period.

Now average your three answers. **Record your** NORMAL ANGLE **answer in your lab book:**


### Trial 3:

Draw the weight back to a small angle (around 20°) and allow it to swing for five full periods (over and back, 5 times).
Time how long it takes to do this.
Then divide your answer by five, to get the time for one full period.

Repeat this twice more. Don't forget to divide by five each time ... we want the time for one period.

Now average your three answers. **Record your** SMALL ANGLE **answer in your lab book:**


**By now you should have data that will lead you to a conclusion. Write your conclusion in your Lab book.**

## Changing the Length

Decide what angle you will use to set the pendulum swinging. Mark it on the paper behind the release point.
Set up the full length of string with one weight on the end.

### Trial 1:

Draw the weight back to the marked angle and allow it to swing for five full periods (over and back, 5 times).
Time how long it takes to do this.
Then divide your answer by five, to get the time for one full period.

Repeat this twice more. Don't forget to divide by five each time ... we want the time for one period.

Now average your three answers. **Record your** LONG STRING **answer in your lab book:**

### Trial 2:

Retie the string at the top so it is about a third shorter.
Draw the weight back to the marked angle and allow it to swing for five full periods (over and back, 5 times).
Time how long it takes to do this.
Then divide your answer by five, to get the time for one full period.

Repeat this twice more. Don't forget to divide by five each time ... we want the time for one period.

Now average your three answers. **Record your** MEDIUM STRING **answer in your lab book:**

### Trial 3:

Retie the string at the top so it is half as long as the previous trial.
Draw the weight back to the marked angle and allow it to swing for five full periods (over and back, 5 times).
Time how long it takes to do this.
Then divide your answer by five, to get the time for one full period.

Repeat this twice more. Don't forget to divide by five each time ... we want the time for one period.

Now average your three answers. **Record your** SHORT STRING **answer in your lab book:**

**By now you should have data that will lead you to a conclusion. Write your conclusion in your lab book.**

### Challenge

Determine the length of string needed to make a pendulum that has a period of 1 second.

# Write your conclusions in your lab book.