

# Physics 207 - Lab 4 - Centripetal Motion

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## Introduction

For a mass to move in a circular motion, there must be a force acting on the mass that is always pointing towards the center of the motion. In the case of the ball on a string going around in a circle, this force was the tension of the string. For a planet in orbit around the sun, this force is the gravitational force. We were able to relate the center-directed force (aka a *centripetal* force) to the speed and radius of the motion, by considering the centripetal acceleration,  $a_c = v^2/r$ :

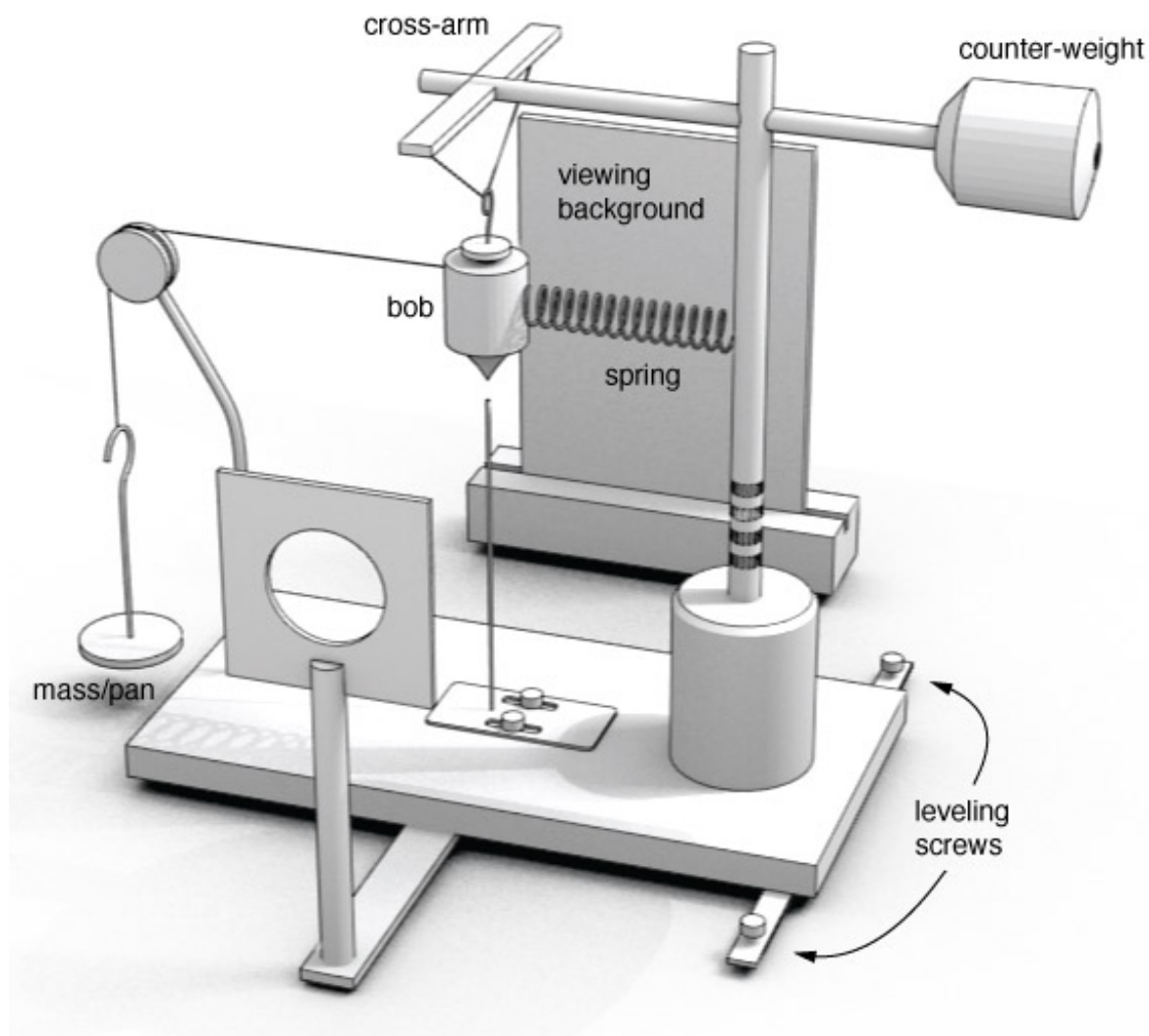
$$F = ma_c = \frac{mv^2}{r}$$

The goal of the lab will be to experimentally verify this relationship. Your task, design an experiment using the apparatus that shows that for an object rotating in uniform circular motion, the centripetal force applied is equal to  $mv^2/r$ .

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## Planning your experiment

On the bench is the apparatus you will use. You can see that it contains a *bob* that is attached to a rotating structure. A spring is attached to the rotating bob.



Some things to consider:

1. What is the centripetal force pulling the bob towards the center?
2. How will you measure the  $F_C$ ?
3. Where is the center of the circle that the bob is traveling around?
4. How will you measure  $r$ ?
5. How will you measure  $v$ ?
6. Can making multiple measurements help?

Discuss your plans with your partner and your lab instructor. When you have agreed on a plan, write down a short proposal that captures the essence of what you will do, and how you will do it. Be more specific than just saying "we're going to measure centripetal force." After you have formulated a plan, perform the experiment. Your lab report will consist of the proposal, the experimental protocol you followed, the data you took, and the verification (or falsification) of the relation above.

Enter your experimental plans in the box below.

**You must be logged in to enter responses.**

Since time is limited during these labs, if more than 45 minutes has passed, and you have not entered a lab procedure, speak with your TA to help figure one out.

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## Done?

Go here ([centripetal-worksheet.php](#)) to print out your worksheet.