

Up The Middle

What is this about?

Why do some bats feel right and others not so much? There are several design features of a baseball bat in addition to its mass and length. They are the center of mass (CM), the center of oscillation (CO), the center of percussion (CP), the moment of inertia (MOI), and the vibrational nodes (VN). All of these affect the feel and effectiveness of a bat. After this activity, you will understand the center of mass (CM) and how to find it for a bat.

What do I need?

You need a baseball bat, a meter stick, a piece of corrugated cardboard, a scissors, and some tape. You also need, a ruler and a pencil or a scale that can measure to the nearest 0.1 gram.

What will I be doing?

First, you will learn how to find the center of mass (CM) of a meter stick by balancing it on your fingers. Next, you'll find the CM of a baseball bat the same way. Finally, you will cut-out a model of a bat in cardboard, find it's CM, cut it in two at the CM, and see which side has more mass.

What do I think will happen?

Take a minute and write down a description of what you think will happen and why you think it. Will the CM of the meter stick be at the 50cm mark? If not, which side will be longer? Will the CM of the bat be right in the middle? If not, which side will be longer, the handle or the barrel? For the bat cut at the CM, which side will have more mass?

What really happened?

1. Rest the meter stick on one finger from each hand, as shown at the right. Slowly bring your fingers together. They will meet at the CM. You should be able to balance the meter stick on one finger under the CM.
2. Repeat this process to find the CM for the bat. Is it longer from the CM to the handle end or the barrel end?
3. Use the template on the last page to make a cardboard bat. Find its CM.
4. Cut the bat in two at the CM. Put one piece on each end of the ruler. Then hold a pencil under the center of the ruler to determine which piece has more mass. You could just use a scale if you have one.



Write a description of your results.

What did I learn?

While the CM is in the middle of a uniform object, like the meter stick, it is not in the middle of more complex objects. Also, the mass on opposite sides of the CM is not generally equal. You can understand this in terms of a seesaw. If a heavy person is on one side and a lighter person is on the other, the heavier person needs to move closer to the pivot to get the seesaw to balance.

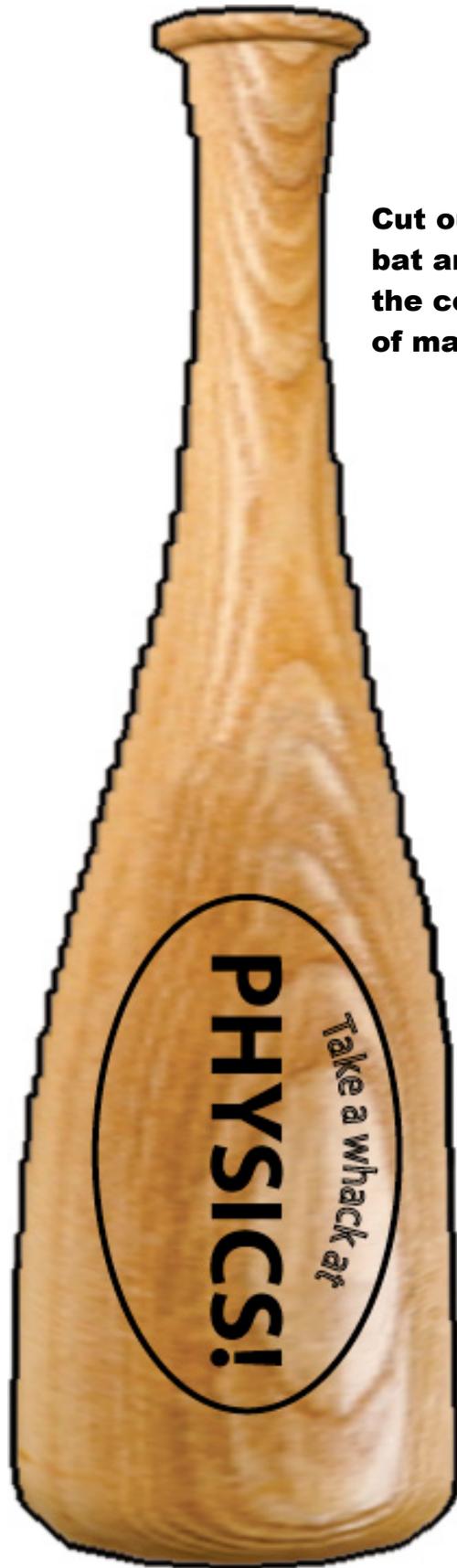
What else should I think about?

Some ball players like to shave the handle of their bats. What does this do to the CM for their bat?

 Catch it in the Web!

 Major League Baseball's Bat Buying Guide
(<http://shop.mlb.com/sm-baseball-bat-buyers-guide--bg-222833.html>)

 The Evolution Of The Baseball Bat From The First Crack To The 'Clank' by Bernie Mussill
(http://www.stevetheump.com/Bat_History.htm)
Over 150 years of the history of the baseball bat is described.



**Cut out the
bat and find
the center
of mass**