

CENTER OF GRAVITY – ON THE MOVE!

(05/14)

Purpose

The purpose of this experiment is to understand the concept of center of gravity and to determine where the center of gravity is located on a given object. You will also learn how to predict changes in gravity when weight is added somewhere on an object.

Performing the experiment

1. Take an index card and number each corner 1, 3, 5, and 7, and number the center of each side 2, 4, 6, and 8.
2. Predict where the card's center of gravity is located. (This is the spot where the card will balance flat on your finger tip.) Mark that spot with a pencil.
3. Holding the card up so you can see the spot, place the spot on the tip of your index finger. If the card balances, you have found the center of gravity. If the card does not balance, observe how much it tilts and in what direction it tilts. Move the card on your finger tip in the direction that you think will make the card balance. When the card balances, your finger is on the center of gravity. Mark the actual center of gravity with the help of your partner. Then, your partner should repeat steps 2 and 3 on the same card.
4. Attach a paper clip to the corner marked "1" on the card. You and your partner should each put a dot on the card where you think the new center of gravity will be. Put your initials next to your dots. Place your mark on your finger tip and find the center of gravity as you did before. Now, your partner should test his/her prediction of where the location of the center of gravity. Mark the new center of gravity. Use your ruler to see if you or your partner was closer to the actual center of gravity.
5. Repeat Step 4, but this time, add two more paper clips to any two locations on the card.
6. Assuming the United States is totally flat, that is there are no mountains or valleys, in which state would you expect to find the geographic center of the 48 continental states? Determine how accurate your prediction is by finding the center of gravity on the map of the United States on your table. (HINT: Balance the map on a pencil tip to pinpoint the center more accurately. It will be easier to do this if you work with a partner.) The actual geographical center of gravity is shown on the map on the next page.
7. Predict and then find the center of gravity of the irregularly shaped pieces of wood and other objects on your table. To find the center of gravity, place your 2 pointer fingers (palms facing each other) under each end of an object, so that you can hold it up in front of you. Gradually move your hands together, keeping the object balanced so that it does not fall. When your hands meet, you have found the **center of gravity**.

Questions to think about

1. How would the Rocky Mountains affect the geographical center of gravity if you accounted for them on the USA map? Use paper clips to test your ideas.

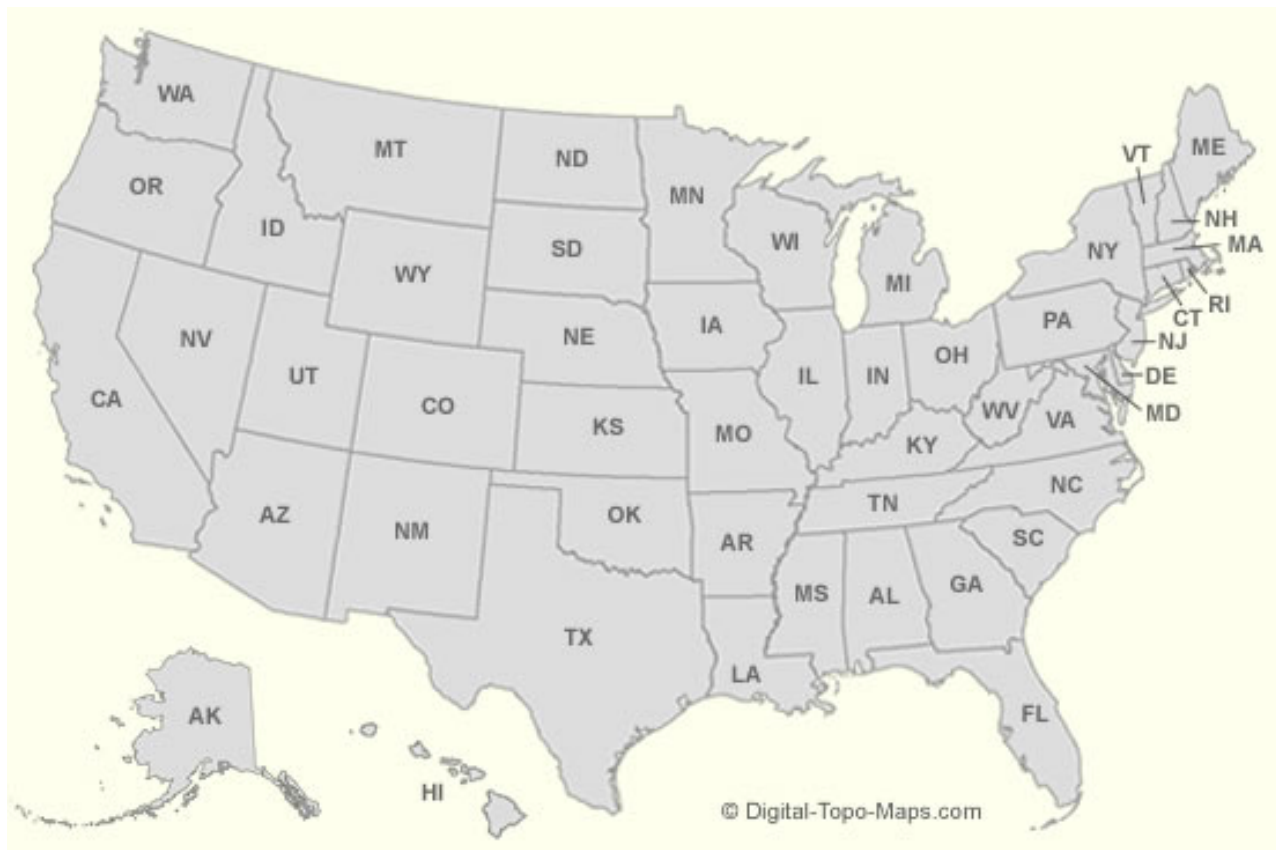
2. How would the Great Lakes change the center of gravity of the United States? Use paper clips to test your ideas.

Equipment needed

3x5 index cards, paper clips, pencils, rulers, small maps of the United States, a variety of irregularly shaped pieces of wood, metal, or other objects.

Explanation

Center of gravity is the exact spot on an object where there is the same amount of weight on one side of the spot as there is on the opposite side. Once you change the weight anywhere on the object, the center of gravity changes too. The *geographic* center of the United States (the continental states) is located in north central Kansas. The *geodetic* center, which allows for the curvature of the earth instead of the flat plane of a map, is about 50 miles south of the geographic center.



The geographic center is just outside of Lebanon, Kansas.