

GRAVITY DEFYING FROG

A balance investigation!

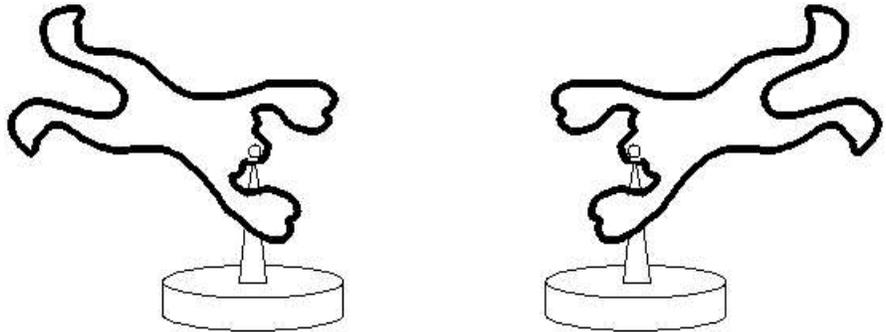
Curriculum topics:

- Balance
- Cause and Effect
- Center of Mass
- Equilibrium

Subject:

Physical Science

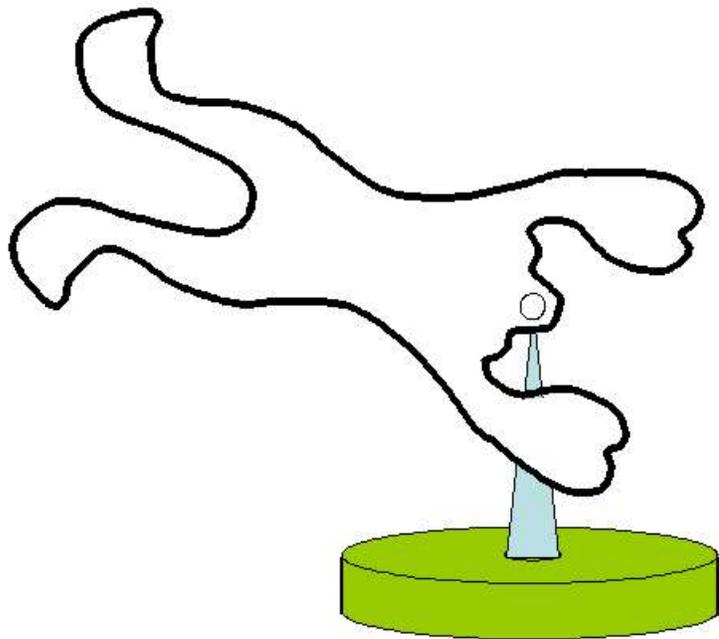
Grade range: K – 8



Move the center of mass (gravity) of a paper frog to create a gravity defying illusion! How can the frog spin around with most of its body suspended in mid-air? Use moveable weights to discover what forces are needed to keep the frog balanced on its head. Conceal the weights to heighten the mystery!

Who we are:

Resource Area for Teaching (RAFT) helps educators transform the learning experience by inspiring joy through hands-on learning.



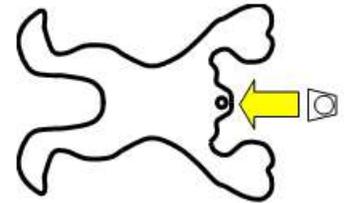
For more ideas visit
<https://raft.net/resources-2/>

Materials required

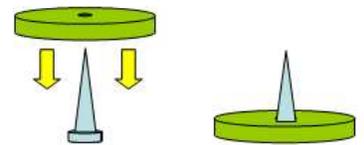
- Pre-cut balancing frog (x1)
- Plastic pivot piece (x1)
- Foam disk (x1)
- Pipette tip (x1)
- Paperclips, pennies, or other small weights

Set-Up

- 1 Secure the plastic pivot piece in place by pushing down around the edges of the hole in the frog's head, as shown at right.



- 2 Insert the pipette tip through the center hole of the foam disk to create a base.



- 3 Put the frog onto the pipette tip by positioning the plastic pivot piece over the point on the pipette tip.



To do and notice

- 1 Have students investigate, by trial and error, how to make the frog balance on the pivot point. They will need to add weight to the frog using paperclips. Where do the weights need to be positioned? Try balancing the frog on the stand, a pencil, your finger, or your nose!
- 2 Once the locations are found, students can replace the paperclips with other weights, such as pennies, attached to the underside of the frog's feet. This will make the weights less noticeable.

The science behind the activity

An object will balance on a point if that point is aligned with the object's center of mass. A flat object (like a paper frog) would normally balance at its geometric center. Adding weight to the frog's front feet changes its weight distribution and moves its center of mass (gravity) closer to its head.

Content Standards:

NGSS

Forces & Motion:

[K-PS2-1](#)

[K-PS2-2](#)

[3-PS2-1](#)

[MS-PS2-2](#)

Gravity:

[5-PS2-1](#)

Learn more

- Cut out other shapes and attempt to make them balance.
- Look for other examples of objects in balance – such as boats in the water, birds on branches, or kids riding bicycles. Can you determine what forces are acting to keep these objects in balance?
- Check out the “balancing bird” toys offered in stores and on the Internet. Read the explanations about how they work and see if you can separate science fact from science fiction!
- Create a scaled model of the Gravity Defying Frog. How does this change the amount of weight needed to balance the frog?
- Balance the frog on your finger and adjust the weights as needed. This can be a nice added challenge!

Visit <https://raft.net/resources-2/> to view the following related activities!

Balancing Act
Balance Mobile
Balancing Your Budget
Finding Your Balance
Water in the Balance

Resources

See these websites for more information on the following topics:

- **Balance and equilibrium** - <https://bit.ly/3bbRVRO>
- **“Balancing Bird” with explanation for how it works** – <https://bit.ly/2Qtudsr>
- **Miyoko Shida, "The Incredible Weight of a Feather"**- <https://bit.ly/2WyDgMi>
- **Khan Academy, Balanced and Unbalanced Forces** - <https://bit.ly/3a7bElr>