

Name:

Weird Whirlers (Teacher Version)

Can you match up these pictures with the types of forces involved?



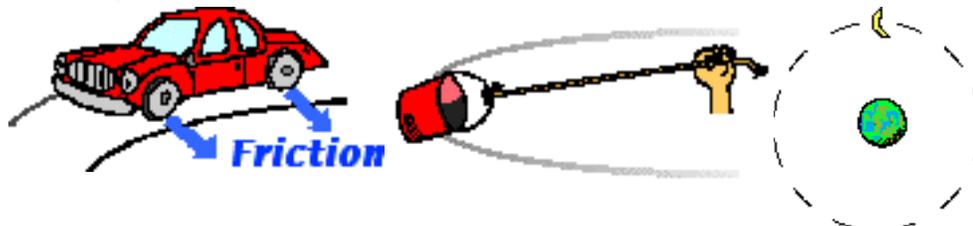
Everyday Forces

Gravitational Air Resistance Applied Magnetic Tension Electrical
Solar System Parachutist Baseball Player Magnets & Iron Tug Of War Balloon & Paper

A Force to be Reckoned With...

Ever noticed that as you're driving around a curve, you hit the door of your car? Same with many spinning rides at an amusement park? Your body obviously wants to move away from the turn, so what keeps you from going that way? This is when the **centripetal force** steps in and keeps you moving in a circular motion!

Here are a few examples:



Can you name which forces are acting as the centripetal force (the force preventing the car, bucket, and moon from flinging off and out of circular motion)?

- A) Friction keeps the car from sliding off the road, and moving around a circular curve.
- B) Tension in the rope keeps the bucket moving in a circle and from flying off.
- C) Gravity keeps the moon orbiting around the earth and from flinging off into space.

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Let's Build a Weird Whirler!

Materials:

- Plastic container
- Cord
- Water



Instructions:

1. Poke three holes, evenly spaced, around the top of the plastic container. Thread about 25 cm of cord through each hole, tying each strand to the cup.

2. After the cup is secured, knot the three loose cord ends together. Then attach a 1m long piece of cord to the knot where all three cords meet. Be sure all your knots are tight!

3. Fill the container half full with water. Go outside and swing your widget in a circle by the long cord. When you feel confident, try over your head! Are you still dry? Try spinning faster and slower and feel the difference in your hand.

Questions: 1. What happened to the water?
2. What force acted as the centripetal force in this experiment?
3. How is this similar to what fluid mixtures undergo in a centrifuge?



Science & The Centrifuge

A centrifuge is a spinning scientific machine that separates liquid mixtures according to their densities. An example is separating milk into cream and skim milk.



What do you know about density? *It's a measure of how compact an object's constituent particles are.*

Are the more-dense objects on top or bottom? *The more compact fluids are heavier, meaning it escapes the centripetal force more than the lighter ones.*

Spin Lifter

Predict: *What object would win in a tug of war, a big or a small eraser?*



Tie 1m of string to the big eraser. Slip the other end through a roll of sturdy paper and tie to the small eraser. Move the roll in a circle, and try to get the small eraser spinning.

What happens to the big eraser?

Humans in Space

1. Why do you think astronauts have to train with a centrifuge before going into space? *To prepare their body for high amounts of centripetal force when travelling from Earth.*



2. How sturdy do you think the human body is against centripetal motion? *The force can move blood and other fluids away from some organs. I.e: blood from the brain, causing people to lose consciousness.*

Name:

Image Sources:

Everyday Forces:

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2. Hope For Your Family: <http://hopeforyourfamily.com/2010/01/26/tug-of-war/>
3. Teach Astronomy: <http://m.teachastronomy.com/astropedia/article/The-Gravity-of-Many-Bodies>
4. Flickr: <https://www.flickr.com/photos/physicsclassroom/galleries/72157624896741488/>
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A Force To Be Reckoned With...

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Let's Build a Weird Whirler!

1. Amazon Supply: <http://www.amazonsupply.com/dixie-cc7-plastic-capacity-clear/dp/B000KIBWUE>
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Science & The Centrifuge:

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2. Steve Spangler Science: <http://www.stevespanglerscience.com/lab/experiments/density-tower-magic-with-science>

Spin Lifter:

1. School Science Lessons: http://www.uq.edu.au/_School_Science_Lessons/UNPh15.html

Humans In Space:

1. The Space Review: <http://www.thespacereview.com/article/402/1>