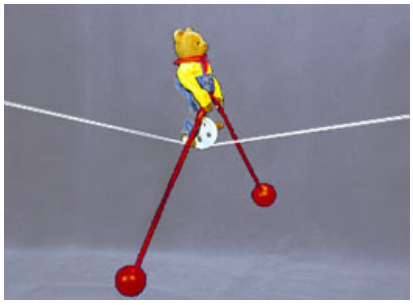
Tightrope Wheel

Materials Needed

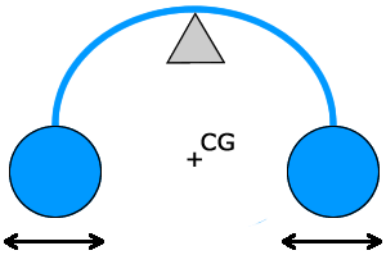
- K'Nex or Lego Technic pulley wheel and axle. These are found in many Lego and K'Nex sets, but can be bought individually on Amazon or other online sellers.
- 2 pipe cleaners. Local craft stores should carry pipe cleaners
- 4 identical pencils or pens
- 3M blue masking tape. Scotch tape or duct tape can be used as a substitute.
- 2 meters or more of yarn or fishing line.

Procedure

1. Tie the yarn or fishing line to any fixed point.
2. Hold the other end of the yarn. Keep it higher up than the fixed point, and pull tight.
3. Slide the wheel onto the axle.
4. Place the wheel on top of the yarn. Does it stay balanced or fall off?
5. Wrap approximately two inches of pipe cleaner tightly around one end of the axle.
6. Sandwich the axle and pipe cleaner between the eraser ends of two pencils. Keep the
7. Wrap the remaining length of the pipe cleaner around the pencils and back around the axle.
8. Repeat steps 1-3 for the other side of the axle.
9. Place the wheel on top of the yarn again. Does it balance and roll down the yarn this time?



Scientific Explanation



The wheel stayed balanced the second time because its *center of gravity* was below the yarn, instead of above. The *center of gravity* is where the "middle" of an object is. For example, your *center of gravity* should be near your bellybutton! For our wheel, it would be impossible to balance it perfectly, so it will always start tipping. Without pencils attached, the center of gravity was above the yarn, so when it began tipping to one side, the center of gravity would also tip to that side, causing more tipping and the wheel to fall off. With the pencils, when the wheel tipped to one side, the center of gravity was below the yarn, and would swing to the *other* side and pull the wheel back to being straight.