Ball and Cup Contest

Newton's Toy Box Activity 6
microgravity

Have you ever played with a ball and cup toy?

How does it work? What do you have to do to capture the ball?

How does gravity affect the ball and cup game?

As the ball reaches the peak of the toss, gravity pulls the ball down into the cup in a parabola.

Gravity then holds the ball in the cup.

Cosmonaut Valery Korzun using a Kendama (Ball and Cup toy) on the ISS

How does gravity affect the ball and cup game in orbit?

The ball will strike the bottom of the cup and bounce out again.

Newton's 3rd law predicts this: the cup applies an equal and opposite force to the ball, which is not countered by gravity as it is on Earth.

Newton's Laws and the Ball and Cup

- As you swing the ball around on the string, the string pulls inward on the ball. According to the 1st law, the ball would continue moving in a straight path if a force were not acting on it.
- According to the 2nd law, an object moves in the direction of the force it experiences. The ball moves in the direction that the string pulls it. The result is a circular motion. In circular motion, an inward force is required to continually turn an object from its straight-line path. Any inward-acting force is called a centripetal force. The string pulling in on the ball provides the centripetal force.

Newton's Laws and the Ball and Cup

- According to Newton's 3rd law, there is an equal and opposite reaction force of the ball pulling back on the string.

Microgravity

- This is the term NASA uses to describe the almost weightless conditions in the in-orbit environment.
- Gravitational force exists between any two objects with mass, so there is always some.
- In orbit, the astronauts and other objects in the spacecraft are experiencing free fall. Free fall is the condition of an object falling in a gravitational field. The astronaut, the objects in the spacecraft, and the spacecraft are all falling at the same rate, and thus the astronauts and objects "float".

Eating and drinking in orbit