



## Curiosity Guide #401

### Center of Gravity

Accompanies Curious Crew, Season 4, Episode 1 (#401)

#### Leaning Tower

Investigation #8

#### Description

Challenge a friend to defy gravity!

#### Materials

- 4 by 4 piece of wood cut to 12 inches long, and two small sections cut to 2 inches each
- Saw
- Black marker
- Plumb bob
- Framing square

#### Procedure

1. Cut the 12-inch piece of wood so that its base is angled by 10 degrees.
2. Find the center of gravity by suspending the plumb bob from different points to find the intersecting center line.
3. Mark the intersecting center line with a black marker.
4. Stand the 12-inch piece of wood on its angled base.
5. Use the framing square to draw a perpendicular line from the center of gravity to the table surface.
6. Stack one and then the second small block on the top of the tower.  
Is the tower still stable?

## My Results

### Explanation

The tower is stable at first because the center of gravity is still over the base of the block on the table. However, as soon as the small blocks are added, the center of mass of the tower moves up. If you draw a new line from the center of the tower to the table's surface, you can see that the center of gravity is no longer inside the base of the bottom block, so the whole thing becomes unstable and tips over.

**Extend your learning!** Have you ever heard of the Leaning Tower of Pisa? If you were to travel to the city of Pisa in Italy, perhaps you could visit the famous bell tower that is one of four buildings that make up the Campo dei Miracoli, the field of miracles. The 185-foot tower was started in 1173 and was built over the next 200 years. Soon after this tower was started, it began to lean! By the time the tower was finished, the top of the tower was 17 feet off its vertical point and leaning on a ten-degree angle. The tower's center of gravity is barely over the base, so the famous tower is still standing. Without the reinforcements that have been added, the Leaning Tower of Pisa probably would have fallen. Amazing!

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