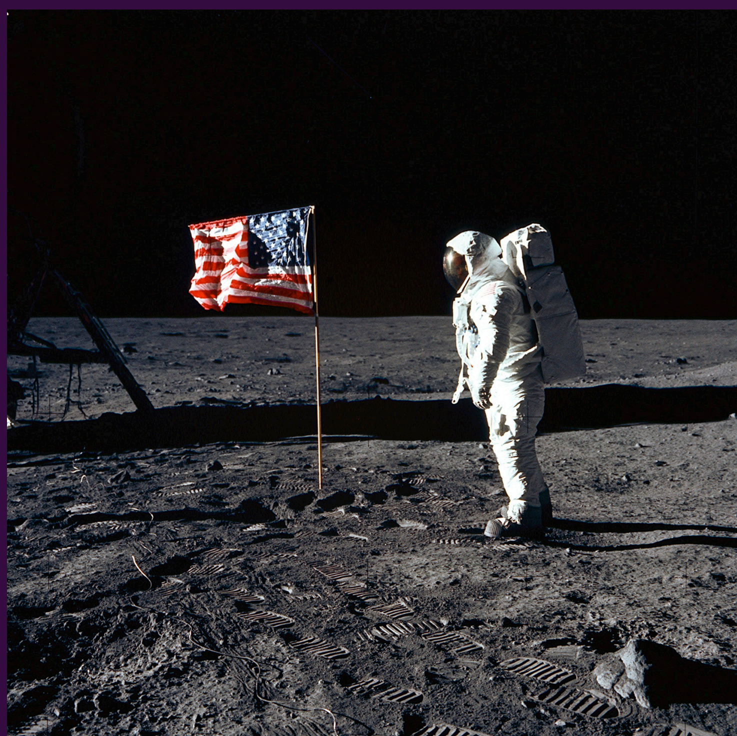
STEM Sims™

# Space Gravity



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**Do you need an idea for a scientific study?**
**Try out one of our ideas or make one of your own.**

**Start learning right now about gravitational forces in outer space. Take the following brief quiz to see how much you already know about space gravity.** See the bottom of page 4 to check your answers.

1. At what latitude on Earth would you weigh the most?
   a. The Arctic Circle
   b. The Tropic of Cancer
   c. The Equator
   d. The Tropic of Capricorn

2. What term do scientists use to describe the point at which an object can no longer overcome the gravitational pull of another object?
   a. no-man's land
   b. the impossible escape
   c. event horizon
   d. the diminishing point

3. On Earth, a panda weighs about 250 pounds. If the panda was on the moon, it would weigh the equivalent of ____________ on Earth.
   a. an American mouse
   b. a Siberian husky
   c. a Bengal tiger
   d. an African elephant

4. What sandwich ingredient triples the thrust force of a rocket, according to MythBusters?
   a. whole wheat bread
   b. mayonnaise
   c. tomatoes
   d. salami

5. Which of the following changes to the human body will **not** occur in space?
   a. The astronauts will grow 3% taller in six months.
   b. The astronauts will lose 6% bone density in six months.
   c. The astronauts will get puffy heads.
   d. The astronauts will get thicker legs.

# Defying Gravity...

**Gravity is not actually something that is defied, but rather there are other forces at play that allow airplanes to fly, metallic objects to levitate, and springs to remain motionless in midair! Follow the instructions below to learn more about gravity and other forces.**

**Supplies Needed:**

- a roll of masking tape
- a toy spring (can be found at your local toy store)
- a tennis ball
- a set of stairs or a balcony
- adult supervision
- video camera (optional)

**Instructions:**

1. Fasten one end of the spring to the masking tape.
2. (Optional) Set up the video camera so that the entire height of the experiment is in view and begin recording.
3. Hold the opposite end of the spring and release the weighted side of the spring over the edge of a staircase or balcony. Wait until the spring is still. (*Make certain that there is no one below because they could be injured by falling objects.*)
4. Hold the tennis ball in the opposite hand of the spring.
5. Release the tennis ball and the spring at the same time and watch what happens (or if you recorded video of the experiment, play back your recording).

**Questions:**

1. Did the spring fall uniformly stretched? Write down your observations.

2. Explain a possible cause of what you observed.

# Space Gravity

## Gravity in Outer Space

There are many things that we can learn about force from experiments on Earth and in space. Many scientists throughout history have given us different equations that can help us calculate the g-value of a specific celestial body.

Sir Isaac Newton first discovered that F=ma, or force is equal to mass multiplied by acceleration. Gravity is a specific type of acceleration that each mass emits and pulls toward itself. Even things as small as marbles have gravity, but the gravity is incredibly weak by comparison to the gravity of Earth, and therefore we do not perceive it.

Robert Hooke determined that F=kx of a spring, where k is the constant of the specific spring, and x is the distance by which the spring is intended to be compressed or stretched out. Therefore, if we combine the two equations, we can solve for the gravity value of the planet as long as we know the spring constant, the mass exerted on the spring, and the change in spring length.

Did you know that the Sun is 1000 times heavier than Jupiter and 300,000 times heavier than Earth? This is why the planets orbit the Sun and not vice versa. Knowing this, we can easily guess that a spring would be much more compressed by the same mass on Jupiter than it would be on Earth's moon, just as we would weigh more on Jupiter than we would on the moon.

Please visit our site for more helpful information:

**STEMsims.com**

**Answers: Page 2 Answers:** 1) a. 2) c. 3) b. 4) d. 5) d.

The Green Engineering Magnet (GEM) project was funded in part under the National Science Foundation grant contract #IIP-1127544. Its contents are solely the responsibilities of the authors and do not necessarily represent the official views of the National Science Foundation.