



## Activity 2: Student Worksheet How Much Do You Weigh?

Did you know that when the astronauts walked on the moon thirty years ago, they actually *weighed less* than they did when they left Earth? It wasn't because of any special diet or exercise, either--it could happen to you in outer space, too! Here's an activity that explains why. To complete this activity, you'll need to know your current weight.

Gravity is a universal, natural force that attracts objects to each other. Originally defined by Isaac Newton, and redefined by Albert Einstein, gravity is basically the natural force of attraction between two objects. Two factors determine the magnitude of the gravitational force between two objects: 1) their masses and 2) the separation distance between them. Gravity is the pull toward the center of an object; let's say, of a planet or a moon. When you weigh yourself, you are measuring the amount of gravitational attraction exerted on you by Earth. The Moon has a weaker gravitational attraction than Earth. So, you should weigh less on the Moon.

Isaac Newton showed that the planets do not fly off into space because the gravitational attraction between the sun and each planet holds them close together. This attracting force exists between objects because of their mass. The greater the mass, the greater the attraction of gravity. Since every planet has mass, then every planet exerts a gravitational force on nearby objects.

For this activity, we say that planets have gravity, but actually what we really mean is that there is a gravitational force of attraction between the planet and a person standing on that planet's surface. Therefore, people have different weights on different planets.

Complete the chart below (show all work) and then answer the questions that follow.

PLANET	Multiply your Earth weight by:	Your "new" weight
Mercury	0.4	
Venus	0.9	
Earth	1	

Moon	0.17	
Mars	0.4	
Jupiter	2.5	
Saturn	1.1	
Uranus	0.8	
Neptune	1.2	
Pluto	0.01	

1. Identify a planet that has a similar gravitational attraction as Earth.
2. List the planets' gravitational attraction from least to greatest.
3. Compare the multiplication factors in the chart. Judging from these factors, which planet do you think has the greatest mass?
4. Another student claims that the moon's gravity is  $\frac{1}{6}$  of the Earth's gravity. Is this a true statement? Look at the chart and use mathematics to support your answer.
5. What if your doctor told your aunt that weighing 165 pounds at 5'4" makes her 20 pounds overweight--to what planet could she travel to be at an acceptable weight? Justify your answer.