Name _____

Gravity Exploration

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.

Part A: How much would you weigh on other planets and the moon?

The more mass a planet has, the more gravity it has. Planets which have more mass than Earth would have more gravity than Earth. A person would weigh more on these planets than they do on Earth.

Location	Weight on Earth		Gravity		Calculated Weight
Moon		X	0.17	=	
Mercury		X	0.38	=	
Venus		X	0.86	=	
Mars		X	0.38	=	
Jupiter		X	2.87	=	
Saturn		X	1.32	=	
Uranus		X	0.93	=	
Neptune		X	1.23	=	

Part B: How far could you jump on other planets and the moon?

Determine how far you can jump on the Earth. To do this, place a piece of tape on the floor as a starting line. Jump as far as you can off of both feet. Have your partner mark where you land not where you end up! Measure the distance and record in the table.

Location	Average Length on Earth		Gravity		Length
Moon		÷	0.17	=	
Mercury		÷	0.38	=	
Venus		÷	0.86	=	
Mars		÷	0.38	=	
Jupiter		÷	2.87	=	
Saturn		÷	1.32	=	
Uranus		÷	0.93	=	
Neptune		÷	1.23	=	

Conclusion:

1. Complete each statement:

A person would weigh more on _____ than on _____, because_____
_____
_____.

A person could jump further on _____ than on _____, because
_____
_____.

The force of gravity between two objects depends on
_____
_____
_____..

2. Identify a planet that has a similar gravitational attraction as Earth.

3. List the planets' gravitational attraction from least to greatest.

4. Compare the multiplication factors in the chart. Judging from these factors, which planet do you think has the greatest mass?

5. Another student claims that the moon's gravity is 1/6 of the Earth's gravity. Is this a true statement? Look at the chart and use mathematics to support your answer.

6. 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.