

## **Gravity Model notes:**

Every object exerts a gravitational force on every other object. The strength of that force is determined by two things: mass and distance. The greater the mass, the greater the force of gravity. If you double the mass you double the force. If you could take 2 earths and squeeze them together into a ball the size of the earth, aliens standing on that world would experience twice the gravitational pull. Distance from the center of an object reduces the gravity by the square of the distance. In other words if you move 10 times further away from the center, the gravity is reduced by 100 times. (This is called the inverse square law.) If you imagine the earth as a marshmallow in the cosmic microwave, when it puffs up to twice the diameter the creature living on Marshmallowland will experience  $\frac{1}{4}$  gravity. When we look at the gravitational force of planet, we need to take into account both the mass and the density. Working with two variables makes this a more complex idea. These variables work opposite to each other. The mass of Uranus is approximately 15 times that of earth –increasing the gravity by a factor of 15. However the diameter is approximately 4 times greater – decreasing the gravity by a factor of 16 (that is  $\frac{1}{16}$  of the original gravity). In the case of Uranus these factors nearly balance out giving a gravitational force close to Earth's.

## **Extensions:**

Have the students jump 3 times and average their results before computing their jumping ability on other planets.

Have students graph their data.

Students can average class data or graph class data.

Find the mass and diameter of the sun. Compare these to Earth and compute the gravity relative to Earth.

If Uranus were squeezed to the size of Earth, we noted that the gravity would be 15 times that of earth. If Jupiter were squeezed the same way, what would the gravity be on the surface? What if we inflated Mercury to earth size?

## **Summary questions:**

What information do you get from each model?

What difficulty would we have presenting all this information in one model?