Name: _____ Date: _____

Student Exploration: Beam to Moon

Vocabulary: proportion, proportional, ratio

Prior Knowledge Questions (Do these BEFORE using the Gizmo.)
At Frugal Foods a loaf of bread cost about $1 in 1980. In 2013, the loaf of bread cost $2.50.

1. A **ratio** is a comparison of two amounts by division. What is the ratio of the cost of a loaf of bread in 2013 to the cost in 1980?

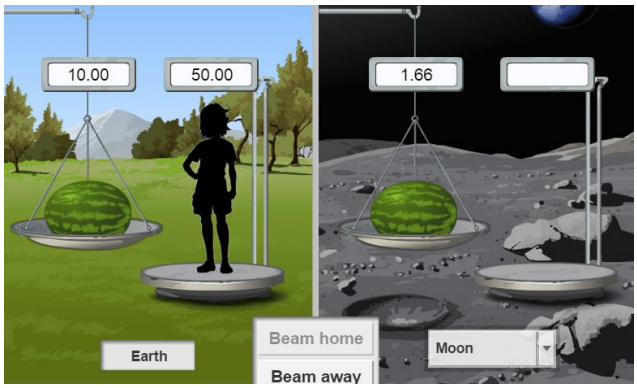
2. Assuming the price of clothing increased at the same rate, if the cost of jeans at Cobb's Corner was $15 in 1980, what would the cost of the jeans be in 2013? _____

   Explain. _____

   Two quantities that change at the same rate, so they keep equal ratios, are **proportional**.

Gizmo Warm-up
If you could travel to the Moon, you would weigh less there. So would a baseball, or a car, or anything. Like the prices above, the weights of any two objects would change proportionally.

In the *Beam to Moon* Gizmo, you can find what your weight would be on the Moon with ratios and proportions. A **proportion** is an equation of two equal ratios.



1. In the Gizmo, be sure **Pounds** is selected at the bottom right, and be sure the **Moon** is selected. Drag the flower onto the first scale, on Earth, and then onto the scale on the Moon.

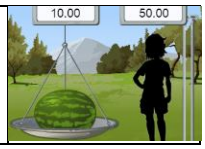
   What is the flower's Earth weight? _____ What is its Moon weight? _____

2. Type your weight at the top left corner of the Gizmo and hit **Enter**. Then select **Newtons**.

   A. What is your weight in pounds? _____ In Newtons? _____

   B. How many Newtons equal one pound? _____ Explain. _____

   _____

Activity A: **Weight on the Moon**	Get the Gizmo ready: • Select **Pounds** in the bottom right. • Select **Moon** from the menu.	

1. In the Gizmo, place the watermelon on the scale on Earth, and on the Moon.

   A. How much does the watermelon weigh in each location? (Use units on the answers.)

   Earth weight: _____ Moon weight: _____

   B. What is the ratio of Moon weight to Earth weight of the watermelon? Write this as a fraction and as a decimal.

   $$\frac{\text{Moon weight}}{\text{Earth weight}} = \frac{\square}{\square} \approx \_\_\_\_\_$$

   C. Find the same ratio (Moon weight to Earth weight) of the flower and the baseball.

   What do you notice? _____

   _____

   D. How much do you weigh on Earth? _____ How do you think you could figure out your Moon weight? _____

   _____

   E. In the space to the right, set up a proportion. One fraction should include the Moon weight and Earth weight of the baseball, flower, or watermelon. The other fraction should be for your weights. (Use *x* for your Moon weight.)

   Then solve the proportion to find what your weight would be on the Moon.

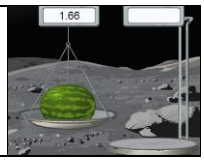
   F. Using the Gizmo, check your answer. (To do this, first type in your weight at the top left corner of the Gizmo. Then weigh the baseball, flower, or watermelon on the Moon and on Earth. When all three weights are entered, click **Beam Away**.)

2. An object weighs 30 pounds on Earth. How much will it weigh on the Moon? _____

   Explain. _____

3. An object weights 30 pounds on the Moon. How much will it weigh on Earth? _____

   Explain. _____

Activity B: **Exploring other planets**	Get the Gizmo ready: • Select **Pounds** in the bottom right. • Select **Pluto** from the menu.	

1. Using the Gizmo, place the flower on the scale on Earth, and on Pluto.

   A. How much does the flower weigh in each location? (Use units on your answers.)

   Earth weight: _____ Pluto weight: _____

   B. What is the ratio of Pluto weight to Earth weight of the flower? Write this as a fraction and as a decimal.

   $$\frac{\text{Pluto weight}}{\text{Earth weight}} = \frac{\square}{\square} \approx \_\_\_\_\_$$

   C. Find the same ratio (Pluto weight to Earth weight) of the baseball and watermelon.

   What do you notice? _____

   _____

   D. How much do you weigh on Earth? _____ Enter your weight at the top left corner of the Gizmo.

   E. In the space to the right, set up a proportion to find what your weight would be on Pluto. Then solve the proportion.

   F. Check your answer in the Gizmo. Weigh an object on Earth and on Pluto. When all three weights are entered, click **Beam Away**.)

   The weights on Earth and Pluto are proportional since the ratio of any object's weights on Earth and Pluto is always the same. Earth weight is about 17 times the Pluto weight, or Pluto weight is about one-seventeenth (about 5.8%) of Earth weight.

2. In the Gizmo, select **Venus** from the menu. Select an object and use the scales to weigh the object on Earth and Venus. In the space to the right, write a proportion to find your weight on Venus. Then solve for your weight (including units). Use the Gizmo to check your answer.

   Object: _____

   Object's Earth weight: _____

   Object's Venus weight: _____

   Your Venus weight: _____

(Activity B continued on next page)

Activity B (continued from previous page)

3. In the Gizmo, select an object (baseball, flower, or watermelon) and weigh it on Earth and on Mars, Jupiter, and Saturn. For each planet, use a proportion to calculate how much you would weigh there. Show your work in the space provided below.

Your weight on: Mars: _____ Jupiter: _____ Saturn: _____

Check each of your answers in the Gizmo by clicking **Beam Away**.

4. Your weight depends on the mass and the force of gravity pulling you down. The stronger the force of gravity, the more you weigh. From planets in the Gizmo as well as the Moon, which has the strongest force of gravity? Which has the weakest?

Strongest gravity: _____ Weakest gravity: _____

Explain. _____

_____

5. Answer each problem without using the Gizmo. Then check your answer to part A in the Gizmo. (Part B uses a fictitious planet.) Make corrections if needed.

   A. Using what you have found earlier, write a proportion to find how much a 60-pound dog weighs on Pluto.

   B. Suppose a 20-pound sledgehammer weighs 8 pounds on the planet Quintron. If a man weighs 58 pounds on Quintron, find his weight on Earth.

Dog's Pluto weight: _____ Man's Earth weight: _____