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**Student Exploration: Triple Beam Balance**

**Vocabulary:** fulcrum, lever, mass, rider, triple beam balance

**Prior Knowledge Questions** (Do these BEFORE using the Gizmo.)

1. A **lever** is a long beam that is set on a pointed **fulcrum**. A heavy rock is placed on a lever, as shown. Draw an arrow where you should push down to lift the rock most easily.



1. Suppose you wanted to balance the rock with a smaller rock. Where would you put the smaller rock? Draw a smaller rock on the diagram above so that it balances the big rock.

**Gizmo Warm-up**

A **triple beam balance** is a type of lever that is used to measure **mass**, or the amount of matter in an object. An object with an unknown mass is placed on the measurement tray. On the other side of a fulcrum, a set of sliding weights, called **riders**, slide on beams to balance the object.



Practice using the balance in the *Triple Beam Balance* Gizmo.

1. Where is the fulcrum of this lever? Circle and label its location on the diagram above.
2. How do you balance the object on the measurement tray? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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| **Activity:** **Measuring mass** | Get the Gizmo ready: * Set all the **Riders** to 0.
 | 385SE2 |

**Question: How is a triple beam balance used to find mass?**

1. Observe: The riders have masses of 10 grams (top), 100 grams (middle), and 1 gram (bottom). Drag the **100-gram rider** to **300**. At this position it balances a 300-gram mass.

What happens to the **pointer**? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Compare: Place each object on the measurement tray, one at a time. Which objects have a mass greater than 300 grams? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

How do you know? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Measure: Move the **100-gram rider** back to **0**. Place the **light bulb** on the tray.
* Move the **100-gram rider to the right**, one notch at a time, until the pointer sinks. Now move the 100 gram rider back to the left one notch. (The pointer should lift up.)
* Move the **10-gram rider** to the right, one notch at a time, until the pointer sinks below the **zero mark**. Now move the rider back to the left one notch.
* Slowly move the **1-gram rider** until the pointer lines up with the **zero mark**.
1. Calculate: The mass of the light bulb is the sum of the values on each rider. To get a magnified view of the **1-gram rider**, place the cursor over that rider. (Each tick mark represents 0.1 g.)

100-g rider: \_\_\_\_\_\_\_\_\_\_\_\_\_\_ 10-g rider: \_\_\_\_\_\_\_\_\_\_\_\_\_\_ 1-g rider: \_\_\_\_\_\_\_\_\_\_\_\_\_\_

Mass of the light bulb: ­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Note: Because the position of the 1-g slider can be estimated to the nearest 0.01 g, the mass measurement is typically recorded to the nearest hundredth. For example, we would write 201.32 g or 146.70 g if the slider is exactly on a 0.1-g tick mark.

1. Practice: Use the Gizmo to find the mass of the other objects. Write their masses below.

Paper clips: \_\_\_\_\_\_\_\_\_\_\_\_\_\_ Cone: \_\_\_\_\_\_\_\_\_\_\_\_\_\_ Cube: \_\_\_\_\_\_\_\_\_\_\_\_\_\_