



# DOES IT ADD UP?



## BENCHMARKS and TASKS

**SC.A.1.2.1** The student determines that the properties of materials (e.g., density and volume) can be compared and measured (e.g., using rulers, balances, and thermometers).

**SC.A.1.2.3** The student knows that the weight of an object always equals the sum of its parts.

- The student measures matter using various tools such as rulers, thermometers, balances, and graduated cylinders.
- The student compares the weight or mass of an object to the sum of its parts using a spring scale or balance.

## KEY QUESTION

Does the mass of an object always equal the sum of its parts?

## BACKGROUND INFORMATION

People often refer to **mass** and weight as if they are the same thing, **BUT THEY ARE NOT!**

Mass is a measure of the amount of **matter** in an object. We use a balance to measure mass. A balance compares the mass of an object to objects with known masses (e.g., gram sets). An object’s mass always stays the same unless part of the object is removed.

Guide students to use the word mass and not weight during this activity. Weight is the measure of the force of gravity on an object and is found by using a spring scale. The weight of an object will change depending on the **force** of **gravity** acting upon it. That’s why astronauts weigh less on the moon than on earth.

## MATERIALS

### Teacher

1 Hershey bar

### Per student

journal

pencil

### Per group

1 balance and gram set

1 small box of unused crayons (8 count)

paper (for recording data)

pencil

1 stick of clay

wax paper

## TEACHING TIPS

1. Make sure all boxes of crayons are identical and unused.
2. Measure the mass of the clay ahead of time to ensure groups have equal amounts.
3. Have enough chocolate to share with everyone at the end of the lesson.
4. Provide a table/chart for student data if necessary.

## ENGAGE

1. Show the students a wrapped Hershey bar. Place it on a balance, find the mass, and write it on the board.
2. Unwrap the Hershey Bar and break it into its individual pieces. Ask: *What do you think the mass of these pieces and the wrapper together will be?* Record their predictions. Tell them you will find the actual mass at the end of the lesson.

## EXPLORE

1. Distribute materials to groups.
2. Students should create a chart for recording data from the activity. The chart should include:
  - total mass of the box of crayons
  - mass of each crayon (identify by color)
  - mass of empty box
  - sum of individual crayons + empty box
3. Have students measure the mass of the whole box of crayons. (They should take turns within the group so everyone has an opportunity to use the balance.)
4. Have students record the mass of the box of crayons on their charts.
5. Ask:

*What is the mass of the box of crayons?*  
*If we find the mass of each crayon separately and then find the total sum of all the single crayons, will the mass equal that of the whole box of crayons?*
6. Have students explore this question by measuring and recording the mass of each crayon.
7. Next, they should find the total mass of the eight crayons, record the measurement, and see if it equals the mass of the whole box of crayons.
8. Discuss why it is necessary to also find the mass of the empty box and include this measurement in the total sum. *Why not find only the sum of the eight crayons?* (The box has its own mass and was part of the total mass when they measured the full box.)

## EXPLAIN

1. Write on the board: **The mass of an object is equal to the sum of its parts.**
2. Ask:

*What does this statement mean?*  
*What is a sum?*  
*What was the mass of the whole box of crayons?*  
*Did the parts measured separately (the 8 crayons and the box) have the same mass as the whole box?*  
*Can you give any other examples that demonstrate that the mass of an object is equal to the sum of its parts?*

## EXTEND/APPLY

1. Show students the Hershey bar from the Engage section. Ask if they would like to change their predictions based on what they have learned. Find the mass of the Hershey bar pieces and the wrapper together and compare that measurement to the mass of the whole bar and wrapper. The two measurements should be very close since the mass of an object is equal to the sum of its parts.
2. Repeat the procedure using clay:

- Have students make a shape (e.g., person, animal) with the clay on a piece of wax paper.
- Have students measure and record the mass of their clay object.
- Next, they should break their clay object into 5 or 6 small pieces.
- Explain that students must show within their group that the sum of all the parts is equal to the original mass of the object. (They should follow the same procedure as in the Explore section.)

### ASSESSMENT

Have students explain in their journals how the mass of an object is equal to the sum of its parts.

Solve:

What is the **total mass** of John's pencil case if his pencils are 5g each, his erasers are 10g each, and his ruler is 15g? The pencil case itself has a mass of 20g. John has 3 pencils, 2 erasers, and 1 ruler.