

Matter Stays Put

Measure, compare, and graph total mass.

GRADE 5 • 5-PS1-2

5-PS1-2 "Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved..."

NAME _____

DATE _____

SAME TOTAL MASS

In a closed system, the total mass of matter is the same before and after it melts, freezes, dissolves, or reacts. Measure or calculate the total before and after, then graph the two totals as bars of equal height.

WORKED EXAMPLE

A sealed jar has 27 g of water and 13 g of sugar before the sugar dissolves. What total mass should the jar's contents have after the sugar dissolves?

1. Add the masses: $27\text{ g} + 13\text{ g} = 40\text{ g}$.
2. The jar is sealed, so no matter leaves or enters.
3. The total mass after dissolving is 40 g.

Answer: 40 g

PRACTICE 6 problems

- 1** A sealed container holds 14 g of ice. The ice melts. What is the total mass of the contents after melting?

ANSWER _____

- 2** In a sealed cup, 32 g of water is mixed with 9 g of sand. What total mass should the contents have after mixing?

ANSWER _____

- 3** A closed bottle of juice has a total mass of 56 g. The juice freezes in a freezer. What total mass should it have after freezing?

ANSWER _____

- 4** Before mixing in a sealed jar, 18 g of powder plus x g of water have a total mass of 63 g. Find x.

ANSWER _____

- 5** A sealed bag of vinegar and baking soda reads 75 g before the substances react. What should the scale read after the reaction is finished?

ANSWER _____

- 6** A student will graph a sealed container that measures 38 g before and after salt dissolves. What heights should the Before and After bars reach?

ANSWER _____

APPLY IT Show your work

- 1** After soccer practice, Kai makes a sports drink in a tightly closed bottle. The bottle and ingredients weigh 146 g before Kai shakes it. After the powder dissolves, draw a two-bar graph labeled Before and After. What height should each bar reach?

WORK SPACE

ANSWER _____

- 2** For science club, Nia places 24 g of vinegar and 6 g of baking soda in a sealed bag. After fizzing stops, what total mass of the ingredients should she record? Write one equation that supports the result.

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

Three groups graph a sealed container before and after heating it. Group A shows 84 g before and 84 g after. Group B shows 84 g before and 81 g after. Group C shows 84 g before and 84 g after. Which groups give evidence that mass was conserved? Give one reasonable reason Group B's graph changed.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	A sealed container holds 14 g of ice. The ice melts. What is the total mass of the contents after melting?	14 g
2	In a sealed cup, 32 g of water is mixed with 9 g of sand. What total mass should the contents have after mixing?	41 g
3	A closed bottle of juice has a total mass of 56 g. The juice freezes in a freezer. What total mass should it have after freezing?	56 g
4	Before mixing in a sealed jar, 18 g of powder plus x g of water have a total mass of 63 g. Find x.	45 g
5	A sealed bag of vinegar and baking soda reads 75 g before the substances react. What should the scale read after the reaction is finished?	75 g
6	A student will graph a sealed container that measures 38 g before and after salt dissolves. What heights should the Before and After bars reach?	Before: 38 g; After: 38 g

PART 2 • APPLY IT

- Before: 146 g; After: 146 g** The bottle is closed, so the total mass stays 146 g. Both bars should be the same height.
- 30 g; 24 g + 6 g = 30 g** The gas made during the reaction stays inside the sealed bag. Add the starting masses to find the conserved total.

CHALLENGE

Groups A and C. Group B may have had a leak that let matter leave, or the group may have made a measurement error.

Accept answers that state both graph bars have the same stated height. For the challenge, accept a leak or a measurement error for Group B if students identify Groups A and C.