

# System Balance Lab

Track inputs and outputs to explain change in a system.

GRADE 6 • TEKS 6.5

**6.5** "Recurring themes and concepts. The student understands that recurring themes and concepts provide a framework for making connections across disciplines..."

NAME \_\_\_\_\_

DATE \_\_\_\_\_

## TRACK WHAT CROSSES THE BOUNDARY

Choose a system boundary, then track what enters and leaves it. The ending amount equals the starting amount plus all inputs minus all outputs, and a system stays stable when its inputs and outputs balance.

## WORKED EXAMPLE

A water tank starts with 31 L of water. It receives 9 L and sends 6 L to a garden. How much water is in the tank now?

1. Start with 31 L.
2. Add the input:  $31 \text{ L} + 9 \text{ L} = 40 \text{ L}$ .
3. Subtract the output:  $40 \text{ L} - 6 \text{ L} = 34 \text{ L}$ .

**Answer: 34 L**

## PRACTICE 6 problems

- 1** A materials tray starts with 25 g of clay. Then 8 g of clay is added, and 11 g is taken away. How much clay is in the tray now?

**ANSWER** \_\_\_\_\_

- 2** A class aquarium filter starts with 42 g of gravel. Students add 13 g of gravel and remove 17 g during cleaning. How much gravel is in the filter now?

**ANSWER** \_\_\_\_\_

- 3** A recycling container starts with 60 kg of cans. Workers add 14 kg of cans and collect 23 kg of cans. How many kilograms of cans remain?

**ANSWER** \_\_\_\_\_

- 4** A hydroponic growing system starts with 47 L of nutrient solution. It receives 16 L of solution, and 12 L leaves the system. How much solution is in the system now?

**ANSWER** \_\_\_\_\_

- 5** A school paper-reuse bin starts with 72 kg of paper. Students add 15 kg, and a recycling truck takes 28 kg. How much paper remains in the bin?

**ANSWER** \_\_\_\_\_

- 6** A seed bank has 45 packets. It sends out 17 packets. How many packets must enter the seed bank for the number of packets to stay stable? Explain why.

**ANSWER** \_\_\_\_\_

## APPLY IT Show your work

- 1** A school reuse station begins a book swap with 120 books. Students donate 35 books during the week, and other students take 48 books. How many books are at the reuse station at the end of the week?

WORK SPACE

ANSWER \_\_\_\_\_

- 2** A rain barrel starts with 150 L of water. The table shows rainwater entering the barrel over three days. After the third day, 64 L is used in the school garden. How much water remains in the barrel?

### RAINWATER ENTERING THE BARREL

| Day   | Water entering (L) |
|-------|--------------------|
| Day 1 | 16                 |
| Day 2 | 21                 |
| Day 3 | 14                 |

ANSWER \_\_\_\_\_

## CHALLENGE One step up

A water-recycling system begins with 200 L of water and ends with 200 L. During one cycle, 37 L leaves the system for cleaning, and 15 L returns to the system. How many more liters must enter the system during the cycle? Explain how you know.

WORK SPACE AND ANSWER

## PART 1 • PRACTICE

| # | PROBLEM                                                                                                                                                              | ANSWER                                                                                              |
|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| 1 | A materials tray starts with 25 g of clay. Then 8 g of clay is added, and 11 g is taken away. How much clay is in the tray now?                                      | <b>22 g</b>                                                                                         |
| 2 | A class aquarium filter starts with 42 g of gravel. Students add 13 g of gravel and remove 17 g during cleaning. How much gravel is in the filter now?               | <b>38 g</b>                                                                                         |
| 3 | A recycling container starts with 60 kg of cans. Workers add 14 kg of cans and collect 23 kg of cans. How many kilograms of cans remain?                             | <b>51 kg</b>                                                                                        |
| 4 | A hydroponic growing system starts with 47 L of nutrient solution. It receives 16 L of solution, and 12 L leaves the system. How much solution is in the system now? | <b>51 L</b>                                                                                         |
| 5 | A school paper-reuse bin starts with 72 kg of paper. Students add 15 kg, and a recycling truck takes 28 kg. How much paper remains in the bin?                       | <b>59 kg</b>                                                                                        |
| 6 | A seed bank has 45 packets. It sends out 17 packets. How many packets must enter the seed bank for the number of packets to stay stable? Explain why.                | <b>17 packets; the number entering equals the number leaving, so the total stays at 45 packets.</b> |

## PART 2 • APPLY IT

- 107 books** Add the donated books to the starting amount, then subtract the books taken.  $120 + 35 - 48 = 107$ .
- 137 L** Add the three rainwater inputs:  $16 + 21 + 14 = 51$  L. Then calculate  $150 + 51 - 64 = 137$  L.

## CHALLENGE

**22 L; the system ends with the same amount it started with, so total inputs must equal total outputs. Since 37 L leaves and 15 L returns,  $37 - 15 = 22$  L more must enter.**

Accept correct equations that track starting amount, inputs, and outputs. For stability explanations, accept statements that inputs equal outputs or that the ending amount equals the starting amount.