

# Water on the Move

*Use fractions to track water through a cycle model.*

**GRADES 6-8 • MS-ESS2-4**

**MS-ESS2-4** "Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity. Clarification Statement: Emphasis is on the ways water changes its state as it moves through the multiple..."

NAME \_\_\_\_\_

DATE \_\_\_\_\_

## TRACK THE WATER

In a water-cycle model, find the amount that moves by multiplying the total amount by the fraction that moves. Water is conserved as it changes location or state. The sun provides energy for evaporation and transpiration, while gravity pulls water down as precipitation, runoff, and infiltration.

## WORKED EXAMPLE

A model begins with 48 cups of water in a lake. The sun causes  $\frac{1}{3}$  of the water to evaporate. How many cups become water vapor?

1. Start with 48 cups of liquid water.
2. Multiply:  $48 \times \frac{1}{3} = 16$ .
3. The 16 cups changed from liquid water to water vapor.

**Answer: 16 cups become water vapor.**

## PRACTICE 6 problems

- 1** A pond model contains 60 mL of liquid water. The sun causes  $\frac{1}{4}$  of it to evaporate. How many milliliters become water vapor?

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

- 2** A cloud model contains 72 water drops. Gravity pulls  $\frac{2}{3}$  of them down as precipitation. How many drops fall?

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

- 3** A hillside receives 90 L of rainwater. Gravity causes  $\frac{1}{5}$  of the water to flow downhill as runoff. How many liters become runoff?

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

- 4** A cloud contains 84 g of water vapor. If  $\frac{3}{7}$  of the vapor condenses, how many grams become liquid water drops?

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

- 5** A soil model holds 56 mL of rainwater. Gravity pulls  $\frac{3}{8}$  of the water deeper into the ground. How many milliliters infiltrate?

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

- 6** A plant has 96 mL of water in its leaves. The sun helps  $\frac{5}{6}$  of the water leave as water vapor through transpiration. How many milliliters leave as water vapor?

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

## APPLY IT Show your work

- 1** The school environmental club makes a water-cycle model for a video. It starts with 120 water units in a pond. The sun evaporates  $\frac{3}{10}$  of the units. Then  $\frac{1}{2}$  of that water vapor condenses, and the club assumes all of the condensed water falls as precipitation. How many water units fall as precipitation?

WORK SPACE

ANSWER \_\_\_\_\_

- 2** After rain, 144 L of water collect in a shallow basin near a community skate park. Gravity moves  $\frac{1}{4}$  of the water downhill as runoff. Of the water left in the basin,  $\frac{2}{3}$  infiltrates into the soil. How many liters infiltrate?

WORK SPACE

ANSWER \_\_\_\_\_

## CHALLENGE One step up

### CHALLENGE

A water-cycle model begins with 192 water units in the ocean. The sun evaporates  $\frac{1}{3}$  of the units. Half of the water vapor condenses and falls as rain. Gravity moves  $\frac{1}{4}$  of the rainwater as runoff, and the rest infiltrates into groundwater. How many water units enter groundwater? Explain how the sun and gravity move water in this model.

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## PART 1 • PRACTICE

| # | PROBLEM                                                                                                                                                         | ANSWER                                 |
|---|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|
| 1 | A pond model contains 60 mL of liquid water. The sun causes 1/4 of it to evaporate. How many milliliters become water vapor?                                    | <b>15 mL become water vapor.</b>       |
| 2 | A cloud model contains 72 water drops. Gravity pulls 2/3 of them down as precipitation. How many drops fall?                                                    | <b>48 drops fall as precipitation.</b> |
| 3 | A hillside receives 90 L of rainwater. Gravity causes 1/5 of the water to flow downhill as runoff. How many liters become runoff?                               | <b>18 L become runoff.</b>             |
| 4 | A cloud contains 84 g of water vapor. If 3/7 of the vapor condenses, how many grams become liquid water drops?                                                  | <b>36 g become liquid water drops.</b> |
| 5 | A soil model holds 56 mL of rainwater. Gravity pulls 3/8 of the water deeper into the ground. How many milliliters infiltrate?                                  | <b>21 mL infiltrate the ground.</b>    |
| 6 | A plant has 96 mL of water in its leaves. The sun helps 5/6 of the water leave as water vapor through transpiration. How many milliliters leave as water vapor? | <b>80 mL leave as water vapor.</b>     |

## PART 2 • APPLY IT

- 1. 18 water units fall as precipitation.** First find the evaporated amount:  $120 \times 3/10 = 36$ . Then find the amount that condenses and falls:  $36 \times 1/2 = 18$ .
- 2. 72 L infiltrate into the soil.** Runoff is  $144 \times 1/4 = 36$  L, so 108 L remain. Then  $108 \times 2/3 = 72$  L infiltrate.

## CHALLENGE

**24 water units enter groundwater. The sun evaporates  $192 \times 1/3 = 64$  units. Half condenses and falls as 32 units of rain. Gravity moves 1/4 of 32, or 8 units, as runoff, so  $32 - 8 = 24$  units infiltrate into groundwater.**

Accept equivalent multiplication or fraction work when the final amount and unit are correct. For the challenge, accept explanations that identify sunlight as the driver of evaporation and gravity as the driver of precipitation, runoff, or infiltration.