

# Rate Detectives

Use calculations to compare science patterns.

GRADE 5 • TEKS 5.2.C

5.2.C "use mathematical calculations to compare patterns and relationships; and"

NAME \_\_\_\_\_

DATE \_\_\_\_\_

## COMPARE RATES

When a quantity changes at a steady rate, divide the total change by the number of equal time periods or groups. Compare the amounts for one unit to decide which pattern changes faster or slower.

## WORKED EXAMPLE

A beetle moves 42 cm in 7 seconds at a steady rate. How far does it move each second?

1. Write the total distance divided by the time:  $42 \div 7$ .
2. Divide 42 by 7.
3. Add the unit cm per second.

**Answer: 6 cm per second**

## PRACTICE 6 problems

- 1** A snail leaves a trail 20 cm long in 4 minutes at a steady rate. How many centimeters does it travel each minute?

ANSWER \_\_\_\_\_

- 2** Moss A grows 15 mm in 3 days. Moss B grows 32 mm in 4 days. Which moss grows faster, and by how many millimeters per day?

ANSWER \_\_\_\_\_

- 3** A sample of warm water cools by  $27^{\circ}\text{C}$  in 3 hours at a steady rate. How many degrees Celsius does it cool each hour?

ANSWER \_\_\_\_\_

- 4** A water filter lets 45 mL of water pass through in 5 minutes at a steady rate. How many milliliters pass through each minute?

ANSWER \_\_\_\_\_

- 5** A vine grows 12 cm in 3 days at a steady rate. How many centimeters will it grow in 5 days?

ANSWER \_\_\_\_\_

- 6** In Trial A, 8 seeds sprout in 2 trays. In Trial B, 15 seeds sprout in 3 trays. Which trial has more sprouts per tray, and how many more?

ANSWER \_\_\_\_\_

## APPLY IT Show your work

- 1** The nature club recorded bird visits at different times. Use the table to find the number of bird visits per minute for each observation period. Which period had the greatest rate, and how many more visits per minute was that than the lowest rate?

### BIRD FEEDER OBSERVATIONS

| Observation period | Minutes watched | Bird visits |
|--------------------|-----------------|-------------|
| Before school      | 20              | 80          |
| Lunch              | 25              | 125         |
| After school       | 30              | 120         |

ANSWER \_\_\_\_\_

- 2** A science club tests two materials around bottles in the sun. The temperature rises steadily for each bottle. Which material keeps the temperature from rising more quickly? At that material's rate, how much would the temperature rise in 10 minutes?

### BOTTLE TEMPERATURE TESTS

| Material | Minutes in sun | Temperature rise (°C) |
|----------|----------------|-----------------------|
| Foil     | 5              | 25                    |
| Foam     | 8              | 32                    |

ANSWER \_\_\_\_\_

## CHALLENGE One step up

Three seedlings make new leaves at steady rates. Seedling P makes 20 new leaves in 4 days. Seedling Q makes 24 new leaves in 8 days. Seedling R makes 45 new leaves in 5 days. Mina says Seedling R has the fastest pattern because it made 45 leaves. Is her claim supported? Calculate each daily rate, explain your reasoning, and predict how many new leaves Seedling R would make in 10 days.

WORK SPACE AND ANSWER

## PART 1 • PRACTICE

| # | PROBLEM                                                                                                                                  | ANSWER                                |
|---|------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|
| 1 | A snail leaves a trail 20 cm long in 4 minutes at a steady rate. How many centimeters does it travel each minute?                        | <b>5 cm per minute</b>                |
| 2 | Moss A grows 15 mm in 3 days. Moss B grows 32 mm in 4 days. Which moss grows faster, and by how many millimeters per day?                | <b>Moss B, by 3 mm per day.</b>       |
| 3 | A sample of warm water cools by 27°C in 3 hours at a steady rate. How many degrees Celsius does it cool each hour?                       | <b>9°C per hour</b>                   |
| 4 | A water filter lets 45 mL of water pass through in 5 minutes at a steady rate. How many milliliters pass through each minute?            | <b>9 mL per minute</b>                |
| 5 | A vine grows 12 cm in 3 days at a steady rate. How many centimeters will it grow in 5 days?                                              | <b>20 cm</b>                          |
| 6 | In Trial A, 8 seeds sprout in 2 trays. In Trial B, 15 seeds sprout in 3 trays. Which trial has more sprouts per tray, and how many more? | <b>Trial B, by 1 sprout per tray.</b> |

## PART 2 • APPLY IT

- Lunch, 5 bird visits per minute, which is 1 more visit per minute than the lowest rate.** Divide visits by minutes for each period:  $80 / 20 = 4$ ,  $125 / 25 = 5$ , and  $120 / 30 = 4$ . Lunch has the greatest rate.
- Foam. The temperature would rise 40°C in 10 minutes.** Foil rises  $25 / 5 = 5^\circ\text{C}$  per minute, while foam rises  $32 / 8 = 4^\circ\text{C}$  per minute. Foam has the slower rise, and  $4 \times 10 = 40$ .

## CHALLENGE

**Yes. Seedling P makes 5 new leaves per day, Seedling Q makes 3 new leaves per day, and Seedling R makes 9 new leaves per day. Seedling R has the greatest daily rate, so it would make 90 new leaves in 10 days.**

Accept equivalent unit-rate wording, such as "5 visits each minute" for "5 visits per minute." For the challenge, students must compare daily rates, not only compare total numbers of leaves.