

Evidence Rate Choices

Use test data to choose a solution.

GRADE 6 • 6.1.d

6.1.d "constructing and critiquing conclusions and explanations construct explanations that includes qualitative or quantitative relationships between variables construct scientific explanations based on valid and reliable evidence obtained from..."

NAME _____

DATE _____

RATE-BASED CONCLUSIONS

Use a rate to compare how much happens in one equal unit of time. A strong conclusion names the rate and checks every criterion and constraint, such as a minimum performance or maximum cost.

WORKED EXAMPLE

A sensor collects 84 readings in 6 minutes. The criterion is at least 13 readings per minute. Does the sensor meet the criterion?

1. Find the rate: $84 / 6 = 14$.
2. Compare 14 readings per minute with 13 readings per minute.
3. 14 is greater than 13.

Answer: Yes. The sensor collects 14 readings per minute, so it meets the criterion.

PRACTICE 4 problems

- 1** A sensor records 45 insects in 5 minutes. What is its rate in insects per minute?

ANSWER _____

- 2** Design A filters 96 mL of water in 12 seconds. What is its rate in mL per second?

ANSWER _____

- 3** Design A moves 63 cm in 7 seconds. Design B moves 88 cm in 11 seconds. Find both rates. Which design is faster?

ANSWER _____

- 4** A greenhouse fan must move at least 10 L of air per second and cost no more than \$25. Fan P moves 72 L in 6 seconds and costs \$24. Fan Q moves 99 L in 9 seconds and costs \$27. Which fan meets both requirements?

ANSWER _____

APPLY IT Show your work

- 1** A science club tested solar panels. The table shows each panel's average battery-charge increase after 3 hours. The panel must charge at least 18 percentage points per hour and weigh no more than 500 g. Which panel should the club choose? Give its rate and reason.

SOLAR PANEL TEST AVERAGES

Panel	Charge increase in 3 h	Mass (g)
A	54 percentage points	480
B	60 percentage points	520
C	51 percentage points	450

ANSWER _____

- 2** For a camping trip, a student needs a rechargeable lantern that runs at least 9 hours and costs no more than \$12. Lantern R costs \$10 and runs 12 hours. Lantern S costs \$12 and runs 15 hours. Which lantern is better if longer run time is preferred after all requirements are met? Explain.

WORK SPACE

ANSWER _____

CHALLENGE One step up

Two water-filter designs are tested twice for 2 minutes each. Design A removes 50 particles in the first test and 46 in the second test. It costs \$16. Design B removes 54 particles in the first test and 42 in the second test. It costs \$13. A design must average at least 24 particles per minute and cost no more than \$14. Which design should be used? Show the average calculation and explain.

WORK SPACE AND ANSWER

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	A sensor records 45 insects in 5 minutes. What is its rate in insects per minute?	9 insects per minute
2	Design A filters 96 mL of water in 12 seconds. What is its rate in mL per second?	8 mL per second
3	Design A moves 63 cm in 7 seconds. Design B moves 88 cm in 11 seconds. Find both rates. Which design is faster?	Design A: 9 cm per second. Design B: 8 cm per second. Design A is faster.
4	A greenhouse fan must move at least 10 L of air per second and cost no more than \$25. Fan P moves 72 L in 6 seconds and costs \$24. Fan Q moves 99 L in 9 seconds and costs \$27. Which fan meets both requirements?	Fan P. Its rate is 12 L per second and it costs \$24, so it meets both requirements.

PART 2 • APPLY IT

- Panel A. Its rate is 18 percentage points per hour and its mass is 480 g, so it meets both requirements.** Divide each charge increase by 3. Panel B is too heavy, and Panel C charges too slowly.
- Lantern S. Both lanterns meet the cost and run-time requirements, but Lantern S runs 3 hours longer.** Check that both choices meet the minimum run time and maximum cost. Then compare their run times.

CHALLENGE

Design B. Design A: $(50 + 46) / 4 = 24$ particles per minute, but it costs \$16. Design B: $(54 + 42) / 4 = 24$ particles per minute and costs \$13, so it meets both requirements.

Accept equivalent rate wording, such as 9 insects/minute. For explanations, students should state the calculated rate or average and identify the criterion or cost constraint that supports the conclusion.