

# Fixing Sam's Review Packet: A Frog, a Pond and Eight Claims

**Learning target:** I can find the mistakes in another student's explanations of resources and population data, name the idea that went wrong, and rewrite each claim so it matches the evidence.

Error analysis

About 40 min

Individual

MS-LS2-1 · practice

MS-LS2-2 · supports

writing

data analysis

independent practice

Name \_\_\_\_\_

Date \_\_\_\_\_

Period \_\_\_\_\_

## Directions

Sam finished a chapter review packet with eight statements. Some are correct and some contain a common mistake. Read the facts Sam was given and study the pond data first. In Part A decide whether each statement is correct, and if it is not, name the idea that went wrong in a few words. In Part B explain each mistake using the facts or the numbers, then rewrite the statement so it is accurate. 'It is wrong' is never an explanation: say what the evidence shows.

**You will need:** This worksheet, Pencil, Calculator (optional)

**Facts Sam was given — The frogs.** Wild poison dart frogs eat ants, mites, small beetles and millipedes from the rainforest floor, and some of those prey carry bitter chemicals called alkaloids. Frogs bred in zoos are fed fruit flies and crickets. Zoo-bred frogs have no alkaloids in their skin. Wild-caught frogs kept in zoos lose their alkaloids slowly. When researchers fed zoo frogs insects dusted with alkaloids, the same alkaloids appeared in the frogs' skin. **The pond.** Hollis Pond is a new farm pond. In Year 1 the owners stocked it with 40 bluegill, a small sunfish that eats mostly insect larvae and other tiny animals. No bass or other fish-eating fish live in the pond. Every summer a student team estimated the number of bluegill, counted the cattail stems along the shore, and took ten standard scoops of mud and weeds to find the average number of insect larvae per scoop.

## Hollis Pond survey, Years 1-8 (teaching dataset)

Simulated teaching dataset: the numbers are invented to be realistic, not measured.

| Year | Bluegill (estimated) | Cattail stems along the shore | Insect larvae per scoop (average) |
|------|----------------------|-------------------------------|-----------------------------------|
| 1    | 40                   | 15                            | 62                                |
| 2    | 110                  | 40                            | 58                                |
| 3    | 260                  | 85                            | 49                                |
| 4    | 480                  | 140                           | 35                                |
| 5    | 650                  | 210                           | 24                                |
| 6    | 720                  | 280                           | 18                                |
| 7    | 740                  | 350                           | 17                                |
| 8    | 730                  | 410                           | 17                                |

Simulated data for teaching; the pond and the numbers are invented. Year 1 shows the 40 fish that were stocked.

## Sam's review packet

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1. Zoo dart frogs are not poisonous because captivity makes them tame. In a zoo there are no predators, so the frogs' bodies stop making poison, since they don't need it anymore.
2. The bluegill's resources are insect larvae for food, oxygen dissolved in the water, warm water, and cattail stems where the young fish hide.
3. There are no bass in Hollis Pond, so nothing can stop the bluegill. The population went up by about 100 fish a year on average ( $730 - 40 = 690$  fish in 7 years), so in Year 12 there will be about 1,100 bluegill.
4. From Year 2 to Year 3 the population grew by  $260 - 110 = 150$  fish, so it grew by 150 percent.
5. My graph shows cattail stems and bluegill going up together from Year 1 to Year 6. So the cattails caused the bluegill to increase. If the owners plant more cattails, they will get more fish.
6. The insect larvae per scoop dropped from 62 to 17 while the number of bluegill went up. That fits the idea that the fish were eating down their own food supply.
7. When food got scarce, the bluegill competed by fighting. The biggest fish killed the smaller ones, and that is why the population stopped growing.
8. The carrying capacity of Hollis Pond is the insect larvae, because the larvae ran out.

Part A: Diagnose

1. Complete the table for all eight statements. If a statement is partly right, mark it 'incorrect' and name only the part that is wrong.

| Correct or incorrect? | If incorrect, the idea that went wrong (a few words) |
|-----------------------|------------------------------------------------------|
| Statement 1           |                                                      |
| Statement 2           |                                                      |
| Statement 3           |                                                      |
| Statement 4           |                                                      |
| Statement 5           |                                                      |
| Statement 6           |                                                      |
| Statement 7           |                                                      |
| Statement 8           |                                                      |

Part B: Explain and rewrite

2. Statement 1: Sam's explanation has two separate mistakes. Name both, and use **one** of the frog facts to show that the poison depends on food, not on predators or tameness. Then rewrite the statement correctly in two or three sentences.

3. Statement 2: One item on Sam's list is not a resource. Name it, explain the test that shows it is not a resource, and rewrite the list.

4. Statement 3: Sam's arithmetic is right, but the forecast is not. Calculate how much the population changed from Year 5 to Year 6, Year 6 to Year 7, and Year 7 to Year 8, and use those numbers to explain what Sam missed. Then write a better forecast for Year 12 and say what it depends on.

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5. Statement 4: Calculate the correct percent increase from Year 2 to Year 3. Show the formula and the division, round to the nearest whole percent, and say in one sentence what Sam forgot to do.

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6. Statement 5: Use the cattail and bluegill numbers from Years 6, 7 and 8 to show that the pattern Sam saw does not hold. Then explain why cattails and bluegill could rise together in Years 1-6 without one causing the other, and rewrite the statement.

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7. Statement 6 is sound. Explain why the words 'that fits the idea' are good scientific language here, and describe one test the student team could do in the pond to check whether the bluegill really are eating down the larvae.

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8. Statement 7: Explain what competition for food means for bluegill, why the population stopped growing even without anyone being killed, and what in the data does **not** support Sam's story. Rewrite the statement.

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9. Statement 8: Sam mixed up two terms and also misread the larvae column. Fix both mistakes and rewrite the statement so it uses **limiting resource** and **carrying capacity** correctly, with a number.

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### Part C: Advice the owners can use

10. The pond owners read Sam's packet and plan to add 300 more bluegill and plant a lot more cattails 'to get more fish.' Write them a short note (4-6 sentences). Predict what will happen to the bluegill population after the extra fish are added, explain why using the words **competition** and **carrying capacity**, and tell them what would actually have to change for the pond to support more bluegill.

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#### Four questions to ask of every statement

Check each statement with these questions in order. (1) Is something called a resource that organisms cannot use up? (2) Does the claim say 'because' or 'caused' without naming how one thing acts on the other? (3) Does it predict past the last data point as if the trend must continue? (4) Does it mix up a thing (a limiting resource) with a number (a carrying capacity)? For percent change, the formula is  $(\text{new} - \text{old}) \div \text{old} \times 100$ . Put a finger on the Years 5-8 rows of the table before you answer any question about the bluegill forecast.

#### Plant a mistake of your own

Write two new statements about Hollis Pond that each contain a different mistake not on Sam's page; for example, one that treats a sample average as an exact count, or one that predicts the Year 9 count without considering a hot summer that lowers oxygen in the water. Trade with a partner, diagnose each other's statements and rewrite them. Then decide together which of all ten mistakes would most mislead the pond owners, and explain why in a short paragraph.