4.OA Comparing Growth, Variation 2

Leo has two snakes, Jewel and Clyde. Jewel was six feet and Clyde was eight feet. A year later Jewel was eight feet and Clyde was 10 feet. When asked which one grew more, students gave varying answers.

Mia said, "Since the two snakes both grew two feet ($8 - 6 = 2$ and $10 - 8 = 2$) then I would say that they grew the same amount."

Raul said, "They both grew 2 feet, but Jewel was only 6 feet to start with while Clyde was 8 feet to start with. That means Jewel grew more compared to her original length (2 is a larger part of six than it is of eight)."

Compare the two arguments. Describe the difference in the way the two students are thinking about the problem. Suppose a one-foot snake grew two feet and a 20-foot snake grew two feet. Could the two students still make the same type of argument?

Commentary:
The purpose of this task is to assess students' understanding of multiplicative and additive reasoning. We would hope that students would be able to see identify that Student A is just looking at how many feet are being added on, while the Student B is comparing how much the snakes grew in comparison to how long they were to begin with. The follow up question is meant to highlight the difference in the two ways of thinking about growth. Some students will be more likely to agree with Student B when the difference in relative growth is accentuated as it is in the follow-up problem.

In later grades, students will learn that "which grows more" means "which has the greater absolute increase?" and "which has the greater growth rate?" means "which has the greater increase relative to the starting amount?" but students won't see this type of language for two or three years. Teachers need to be aware of this and work to ask questions as unambiguously as possible; for example, when asking for multiplicative comparisons, use language such as, "How many times greater is x than y." They should also be prepared to address this potential for confusion along the way.

Solution: 1

Viewing this additively, both snakes grew 2 feet and therefore grew the same amount. Viewing it multiplicatively, Jewel grew $\frac{2}{6}$ its length, while Clyde grew $\frac{2}{8}$ its length. From this perspective, Jewel grew more. Given the purposeful phrasing of the problem, both answers are correct, but the goal is to see if the student understand the two perspectives, and thus the difference between additive and multiplicative reasoning.

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