Grade 2: Two Snakes

2.OA.A.1: Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.

A grass snake is 28 inches long. A rat snake is 74 inches long. How much longer is the rat snake?

Answer: ☐ inches longer

Solution

Correct if student writes the number 46.

As shown in the diagram, students can think of the 74-inch rat snake as being composed of two parts: one part that is 28 inches long and another part whose length is initially unknown. Subtraction gives the size of this missing part: $74 - 28 = 46$ inches.

28 in.   grass snake

28 in.   ? in.   rat snake

74 in.
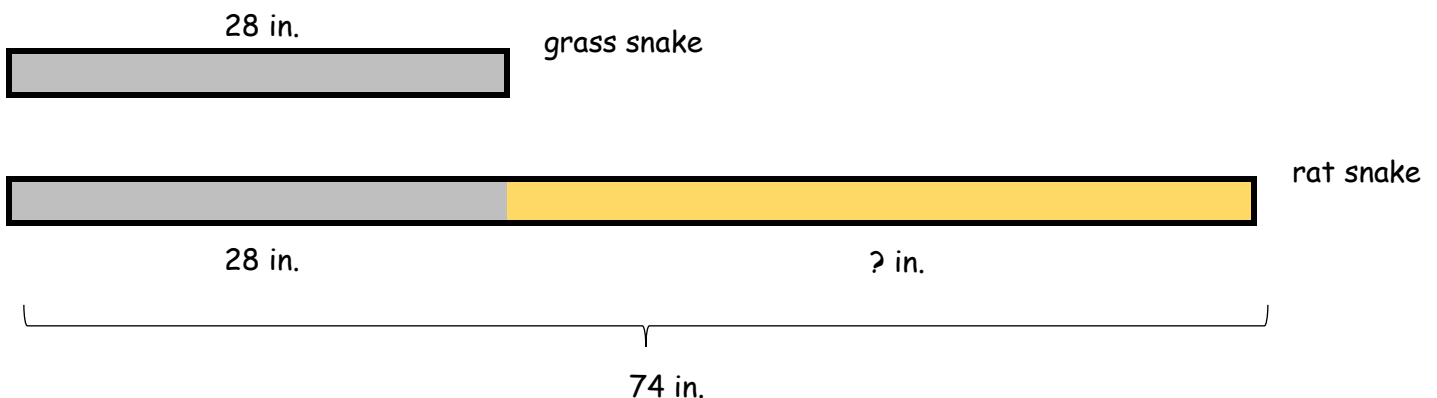
Here is a diagram that a second grader drew for the problem. (The student didn't draw a diagram when solving the problem, but afterwards did so when asked.)
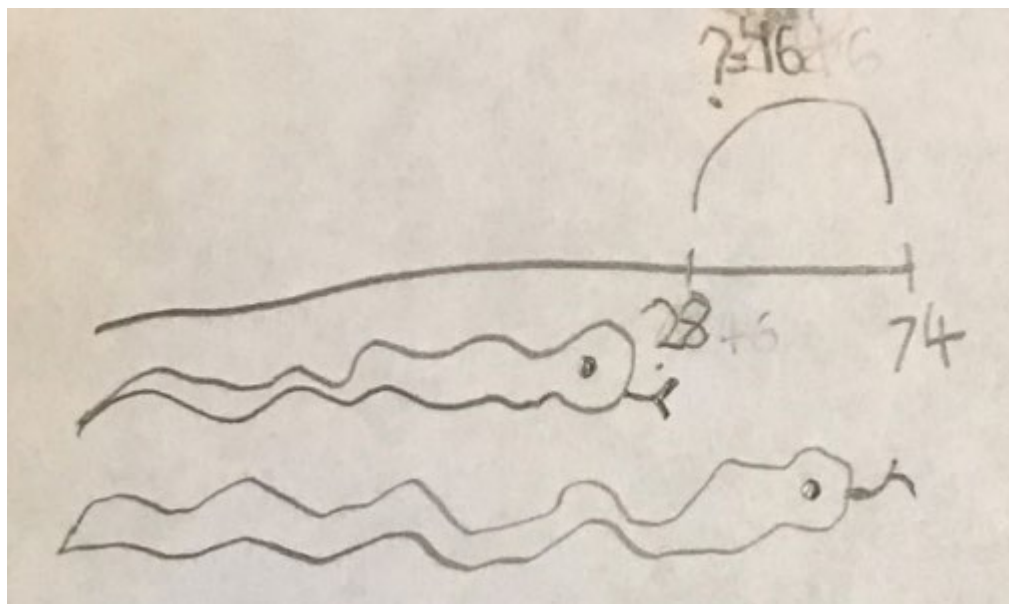
The diagram appropriately shows the unknown quantity (question mark) and its value (46). The diagram shows the unknown quantity as a length stretching from 28 to 74. In drawing this diagram, the student might have been thinking of a ruler or a number line. The diagram isn't to scale, but that's okay because it accurately shows the relationships in the problem.

Knowing to subtract 74 − 28 is only the beginning of solving this problem. We also have to calculate the difference, 46. By the end of grade 2, students should be fluent with calculations like 74 − 28. Likely, the student will carry out the subtraction on scratch paper because 74 − 28 is not very easy to calculate mentally.

Elaboration on Alignment

In Kindergarten and grade 1, addition and subtraction were most likely applied to discrete quantities such as marbles or books. But arithmetic also applies to continuous quantities such as length, time, or mass. Measurement units make these uncountable quantities countable, as in this problem, where the unit of inches is being counted and subtracted as if it were an apple or a book. Beginning in grade 3, counting in whole units won't be the end of the story: we will use fractions to represent part of a unit. Thus, applying addition and subtraction to length in grade 2 is an important stepping-stone to building a continuous notion of quantity and using fractional parts in later grades.

The numbers 74 and 28 were chosen to assess computational fluency at the level of the grade 2 expectations. These numbers probably require written work on the part of most students; a mental calculation such as 74 − 28 = 74 − 30 + 2 = 44 + 2 is also possible.

Second graders are expected to perform three-digit calculations as well, but the fluency expectation for grade 2 multi-digit addition and subtraction is for two-digit numbers.

In terms of the situation, snakes (when stretched out) are much longer than they are wide, which makes length a natural quantity in this context. The grass snake was chosen because "grass" is easy to read and because 28 inches

is a reasonable length for a grass snake; similarly "rat" is easy to read and 74 inches is a reasonable length for a rat snake.

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Name: _____

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