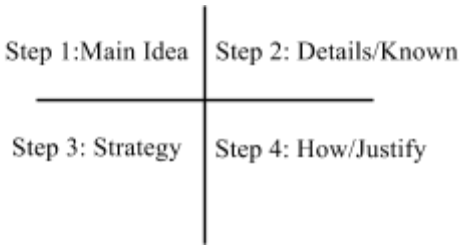
4-Step Process/Strip Diagrams
Frequently Asked Questions

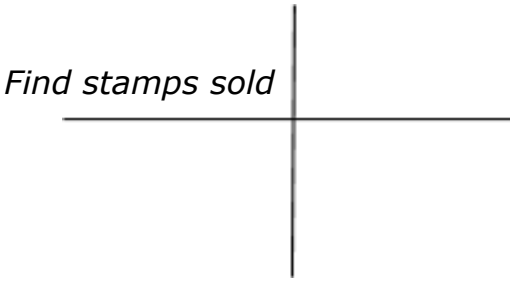
1. Why do students need to do both steps 3 and 4, if they have made the connection between 2 and 3?
   Step 3 is about the math symbolic representation of the strategy (6 – 2 + 4) and Step 4 is about the academic math language (Find the difference of 6 and 2 and then add 4.). Connecting between 2 and 3 is connecting the visual representation with a number sentence that can be used to find the "?". Students must also connect the number sentence to the academic math language. In "operation-type" problems using strip diagrams, the 4-step process allows an easy connection between the visual, math symbolic, and academic math language. Marzano's research shows that academic achievement is improved when teachers regularly use graphic organizers.



2. Why aren't the strip diagrams proportional?
   Strip diagrams should be drawn with some degree of proportionality—the need for showing larger and smaller numbers displays itself in second grade. It is not stressed with students as the main focus, until students gain a deeper knowledge of number sense. In later grades, students represent quantities that are twice, three times, half, etc. Base 10 blocks are certainly another visual model of numbers. Base ten blocks are used to help students with place value and the addition and subtraction algorithms—to easily show grouping and re-grouping. Teachers model with kids, but it is not the focus in the process.

3. Does the student need to write the same words as the teacher for the main idea in the question?
   There are some words that should be in the main idea and some words that are not as important to be in the main idea. A great way to help students write the main idea would be to start with the word "find". Guide the student to verbalize the main idea in his/her own words vs. copying the entire question. Students are encouraged to abbreviate and use symbols.

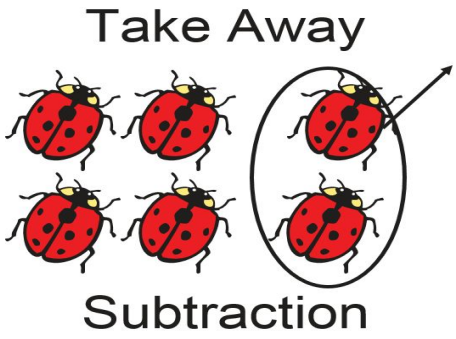
   Ex:
   The post office sold 234 books of stamps with 20 stamps in each book and an additional 56 sheets of stamps with 12 stamps per sheet. How many stamps did the post office sell?
   Possible main idea:



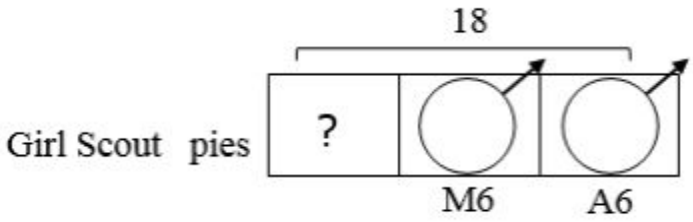
4. In step 4, should you write out the calculation or strategy—take away or put together?
   Yes, step 4 is used for the language. While students might begin with "take away or put together" in step 4, they should move to the academic language here—add, subtract, sum, difference.

5. Take away vs. missing part—Can you use an X for both?

The X is no longer used to show the "take away" action. The take away action is now represented by ♂ *and is determined by the story. This symbol clearly shows that the quantity has been taken away from the total and is more aligned with the action poster.*

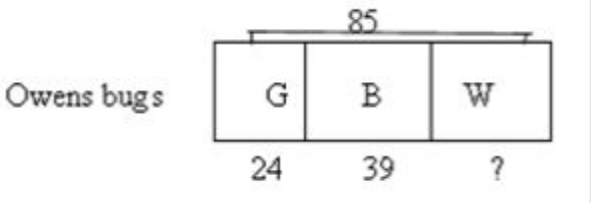


The Girl Scouts baked 18 pies. Mary sold 6 and Anabel sold 6 more. How many Girl Scout pies are left? See an example of a strip diagram below.



A missing part action—has a missing part—and is determined by the story.

Owen had 85 bugs. 24 bugs were grasshoppers and 39 were beetles. How many were walking sticks? See an example of a strip diagram below.



6. We know that all kids do not learn in the same way. Why are we expecting all of the kids to use this process that uses a more abstract approach?

   All kids do not learn in the same way. Although students are using the same graphic organizer to generate an answer, their process or approach is differentiated. It is also true that if a child is to be successful each year in school, the child needs to learn the mathematics in the grade. The mathematics in the grade requires that students be able to use and connect pictorial representations, symbolic representations (number sentences), and academic language. The TEKS (Texas Essential Knowledge and Skills) state as follows:

   ***TEKS 1B** (across all grade levels): use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution*

   ***TEKS 4.5A**: represent multi-step problems involving the four operations with whole numbers using strip diagrams and equations with a letter standing for the unknown quantity;*

   ***TEKS 6.4F**: represent benchmark fractions and percents such as 1%, 10%, 25%, 33 1/3%, and multiples of these values using 10 by 10 grids, strip diagrams, number lines, and numbers*

   All of Marzano's research indicates that use of graphic organizers improves student achievement. More information can be found at marzanoresearch.com.

   One of the tenets from Quantum Learning and their brain research is there is no comprehension without picturing. One of the major problems in mathematics is that students have a weak understanding of the relationships between the abstract symbols of mathematics and the visual representations of that math. Using a specific visual model is one of the reasons for the success of strip diagrams. Using the 4-step process allows students to see that the visual (step 2) connects to the abstract math (step 3) and connects to the academic language (step 4).