Volta Voices would like to introduce a 5-part column focusing on how arithmetic word problems can aid in the development of listening and spoken language for children who are deaf and hard of hearing.

Professionals may not recognize that learning to solve arithmetic word problems involves language learning. Some children learn such language informally, either from parents or peers, but many do not. In the case of children who are deaf or hard of hearing, parents, teachers, speech-language pathologists and listening and spoken language specialists (LSLSs) should be prepared to help.

Through this series, we will show that there is a connection between learning arithmetic and learning language. This article will show you that, in general, word problems incorporate important language distinctions. In the articles to follow we will examine more thoroughly the language of addition, subtraction, multiplication and division.

Arithmetic word problems offer a large array of language development opportunities. Here is an example involving a child, Lynn, who has a profound hearing loss and uses bilateral cochlear implants. She is trying to solve an arithmetic word problem and it should be clear that her difficulty is as much about language as it is about arithmetic.

It is Halloween and Jessica and Lynn have collected way too much candy, including lots of candy corn. As it happens, Jessica has collected 4 pieces of candy corn and Lynn has collected 9.

Rob (Jessica and Lynn’s teacher): Jessica, how many pieces of candy corn do you have there?

Jessica: (She takes a quick look at the small pile of candy and, without counting, answers.) I've got 4.

Rob: Lynn, it looks like you have more than Jessica has. How many pieces of candy corn do you have?

Lynn: (Counting the candies) 1, 2, 3, 4, 5, 6, 7, 8, 9.

Rob: Lynn, how many more pieces of candy do you have than Jessica has?

Lynn: (She seems to think that Rob is repeating himself. She looks at him like she doesn’t understand why and repeats her previous answer.) I have 9.

Rob: Right, you do have 9, but I want to know how many more you have than Jessica has.

Lynn: (No response.)

Rob: Right, you have 5 more candy corns than Jessica. Here are your 9 (pointing), here are Jessica’s 4 (pointing), here are your 4 that match Jessica’s (pointing) and here are your 5 extras (pointing).

In trying to help, we show Lynn what to count and use that language over and over again, always relating the words back to the physical candies. We talk about “matching up” some of Jessica’s candies and about Lynn’s “extra ones.” At the end of the conversation we use the words of the problem: “You have 5 more candies than Jessica has” and we essentially re-state the problem and the solution. We are trying to teach her what the words of the problem mean with respect to how the candies must be manipulated and what must be counted.
Here is an example involving a multiplication word problem. The child, Mike, has a moderately severe hearing loss and uses bilateral hearing aids. In this case, it is not that Mike does not understand. Rather, he has misunderstood. Once again his difficulty is as much about language as it is about arithmetic.

Jane (Mike’s teacher): I have a very hard problem for you to try to solve. Suppose that your dog, Punch, has 3 collars.

Mike: She only has 2.

Jane: OK. But just suppose that she had 3 collars. And suppose also that she had 4 scarves.

Mike: (He has been building with some wooden blocks and picks out 3 blocks to represent the collars and, in a separate pile, 4 blocks to represent the scarves. Without even knowing what the question is, Mike knows that it will be helpful to make a physical model of it.)

Jane: OK. Good. Now when Punch gets dressed up for something special, she likes to wear a scarf and a collar. So here is what I want to know. How many outfits does Punch have? So if she wants to wear a scarf with a collar, how many different outfits can she make?

Mike: (He has been building with some wooden blocks and picks out 3 blocks to represent the collars and, in a separate pile, 4 blocks to represent the scarves. Without even knowing what the question is, Mike knows that it will be helpful to make a physical model of it.)

Jane: OK. But just suppose that she had 3 collars. And suppose also that she had 4 scarves.

Mike: (He has been building with some wooden blocks and picks out 3 blocks to represent the collars and, in a separate pile, 4 blocks to represent the scarves. Without even knowing what the question is, Mike knows that it will be helpful to make a physical model of it.)

Jane: OK. Good. Now when Punch gets dressed up for something special, she likes to wear a scarf and a collar. So here is what I want to know. How many outfits does Punch have? So if she wants to wear a scarf with a collar, how many different outfits can she make?

Mike: (He has been building with some wooden blocks and picks out 3 blocks to represent the collars and, in a separate pile, 4 blocks to represent the scarves. Without even knowing what the question is, Mike knows that it will be helpful to make a physical model of it.)

Jane: OK. But just suppose that she had 3 collars. And suppose also that she had 4 scarves.

Mike: (He has been building with some wooden blocks and picks out 3 blocks to represent the collars and, in a separate pile, 4 blocks to represent the scarves. Without even knowing what the question is, Mike knows that it will be helpful to make a physical model of it.)