

Attending to Receptive Language Functions in Mathematics

“Three Reads¹” and “Problem Stem²” Strategies for Word Problems

The Three Reads Routine:

Read the problem or problem stem three times, each time asking a different question:

1. What is this situation is about?
2. What are the quantities in this situation? How are those quantities related?”
3. What are all the possible mathematical questions we could ask of this situation?

Debrief after each question.

See the notes below for an expanded discussion on each step of this routine and suggestions for a possible way to establish it.

Definitions

Problem Stem: a situation for a word problem without the question.

Three Reads: reading the situation/problem three times, each time with a particular focus—comprehending the text, comprehending the mathematical structure of the situation, listing all possible mathematical questions.

Setting the stage:

“We are going to work on a word problem today. We will read it three times. Each time I am going to ask you to answer a specific question. The first time you will have to listen carefully because I am going to read it out loud to you. You don’t have it in front of you.”

First Read (comprehending the text):

“Listen carefully. What I would like you to listen for is:

What is this situation is about?

(Not the mathematics, not the answer; just the context. Do you understand the words that describe this situation?)”

Read out loud a problem stem, a word problem without the question. For example:

“Sara had a bag of candies. She gave $\frac{1}{3}$ of her candies to Rebecca. Then Sara gave $\frac{1}{4}$ of the candies she had left to John. After giving candies to Rebecca and John, Sara had 24 candies left in her bag.”

Debrief.

Second Read (comprehending the mathematics):

“Here is the situation. [Show the situation on the screen/board. Ask a student to read it out loud for the class.] _____ is going to read it out loud for us. What I would like you to listen/read for is

¹ Adapted from Grace Kelemanik’s Three Read Strategy.

² Adapted from Moving Beyond Answer-getting at http://math.serpmedia.org/tools_problems.html

the important information in the situation. By that I mean the quantities (numbers and their units) and their relationships. Remember, in every situation there are explicit quantities (e.g., 64 inches) and implicit quantities (e.g., John's height). Look for both.

What are the quantities in this situation? How are those quantities related?"

Debrief.

Third Read (listing all possible mathematical questions):

"_____ will read the situation for us one more time. This time I would like you to think about all the possible questions we could ask of this situation. Not what the people in the situation are wearing, but questions about the quantities and their relationships.

What are all the possible mathematical questions we could ask of this situation?

Debrief.

Working on the problem:

"Today I would like you to work on this question:

*"Sara had a bag of candies. She gave $\frac{1}{3}$ of her candies to Rebecca. Then Sara gave $\frac{1}{4}$ of the candies she had left to John. After giving candies to Rebecca and John, Sara had 24 candies left in her bag. **How many candies were in the bag to start?"***

[Make sure every student gets a copy of the problem to work on.]

Draw a diagram that represents the quantities in the problem and how their relationships.

Use your diagram to solve the problem.

Debrief: Compare and contrast different ways of thinking (This is A'isha's diagram. Who can explain A'isha's way of thinking? How is her way of thinking similar/different to yours?); different diagrams (How are these diagrams the same? How are they different?); choose which two or three diagrams to discuss deeply (from least sophisticated to more sophisticated); help students evaluate the diagrams (which diagram shows the relationships among the quantities better? Which diagram would help you the most to solve the problem? Why?); and make connections from one diagram to the next (Juan showed $\frac{1}{3}$ here on his diagram with a rectangle. Where is that $\frac{1}{3}$ in Sarah's number line diagram?).

Some other possible questions to prompt discussion about shared diagrams:

- How does A'isha's diagram show... (name a specific quantity and/or relationship)
- Where is ... (Name a specific quantity and/ or relationship) in this diagram?
- Do you see any new relationships in this diagram -- one that wasn't explicitly given in the problem statement (ex. in Sara's candies, the amount of candy Sara has at the end is half of what she started with or is equal to the amount she gave away to Rebecca and John)

The purpose of this debrief is to upgrade everyone's thinking to, at least, grade level thinking/ understanding and give those students who are ready opportunities to go beyond.