

# PROBLEM SOLVING IN ACTION

GRADES K



Presenter  
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# OVERVIEW

## Learning Intention:

- Fostering higher expectations for all learners to accelerate student achievement

## I can statements:

- I can participate in problem solving protocols.
- I can share strategies for teaching problem solving.





# TURN AND TALK

What strategies and/or resources are you currently using to teach problem solving in your classroom?



Let's  
Talk

KEY

POINT

The primary goal of problem solving is  
making sense of mathematics!

# Key Words:


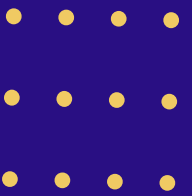
Key words are **NOT** a viable strategy for solving word problems. **Instead, we want students to make sense of problems and make use of their understanding to solve the problems.** Moreover, research tells us that the use of key words as a strategy for solving problems adds to our students' inability to solve problems.





# MATHEMATICAL PROCESS STANDARD #1

**Make sense of problems and persevere in solving them.**

- 
- Relate a problem to prior knowledge.
  - Recognize there may be multiple entry points to a problem and more than one path to a solution.
  - Analyze what is given, what is not given, what is being asked, and what strategies are needed, and make an initial attempt to solve a problem.
  - Evaluate the success of an approach to solve a problem and refine it if necessary.
- 

# WHAT DOES IT LOOK LIKE WHEN STUDENTS MAKE SENSE OF PROBLEMS?



<https://www.youtube.com/watch?v=kibaFBgaPx4>

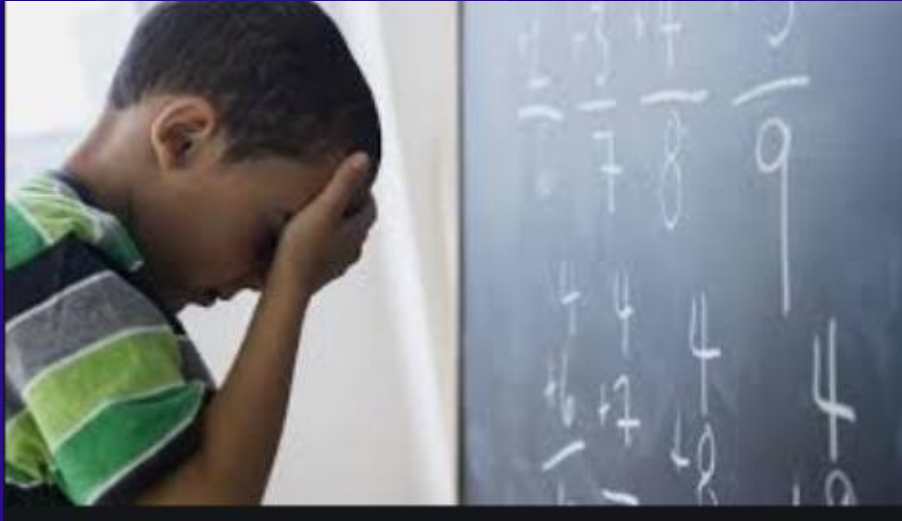
# MATH SCCCR STANDARDS PROGRESSION (K-I)

K.ATO.2 Solve real-world/story problems using objects and drawings to find sums up to 10 and differences within 10.

Adding To/ Joining	Take From/ Separating	Part-Part-Whole Total Unknown	Part-Part-Whole Both Addends Unknown
Two bunnies sat on the grass. Three more bunnies hopped there. How many bunnies are on the grass now? $2 + 3 = ?$	Five apples were on the table. I ate two apples. How many apples are on the table now? $5 - 2 = ?$	Three red apples and two green apples are on the table. How many apples are on the table? $3 + 2 = ?$	Grandma has five flowers. How many can she put in her red vase and how many in her blue vase? $5 = 0 + 5, 5 = 5 + 0$ $5 = 1 + 4, 5 = 4 + 1$ $5 = 2 + 3, 5 = 3 + 2$



**MANY STUDENTS THINK WORD PROBLEMS ARE HARD!**



# WHY ARE WORD PROBLEMS SO HARD?

## Issue #1: Reading Levels (Student's Level)

"...mathematics text contain more concepts per sentence and paragraph than any other type of text. They are written in a very compact style; **each sentence contains a lot of information**, with little redundancy."

- Barton & Heideman, 2002

# WHY ARE WORD PROBLEMS SO HARD?

## Issue #2: Answer-Getting Mind Sets

Phil Daro says...

Why give students problems to solve?

### 1. To learn mathematics!

2. Answers are part of the process, they are not the product.
  - The product is the student's mathematical knowledge and know-how.
  - The "correctness" of the answers is only part of the process.

# WHY ARE WORD PROBLEMS SO HARD?

## Issue #3: Over simplification of the problem solving process

**Problem Solving Steps to Success**

- Read over the problem twice
- Underline or highlight the question
- Choose an appropriate strategy to solve the problem
- SOLVE**  
Draw a picture, make a chart, write out your calculations
- SHOW ALL OF YOUR WORK!**
- Answer the question in a complete sentence
- Explain your thinking ("I know because...") and tell how you solved the problem
- Check over your answer and ask yourself! "Does my answer make sense?"

**STEPS for Solving Word Problems**

- 1. Read the problem carefully.**

*Maggie picked 2 flowers. Her mom gives her 3 more. How many flowers does Maggie have now?*
- 2. Underline the facts you will need to solve the problem.**

*Maggie picked 2 flowers. Her mom gives her 3 more. How many flowers does Maggie have now?*
- 3. Draw a picture, if needed, to help you solve the problem.**
- 4. Write a number sentence for the problem.**


$2 + 2 =$
- 5. Solve the problem. Show your work.**

$2 + 2 = 4$
- 6. Check your answer.**

**Problem Solving**

**Read and Think**


**Understand**



**Plan**

**Choose a Strategy**

Adapted from *Math Alive!*



**Do**

**Solve the Problem**

$3 + 3 + 3 = 9$

**Check**

**Explain Your Work!**

"I made three hops of 3 on the number line"

**Problem Solving Model**

**Read It!**

**UNDERSTAND THE PROBLEM**

- Read the problem 2, maybe 3 times. Highlight or underline important information.
- Talk it! - talk about the problem to understand it better.

**Think It!**

**MAKE A PLAN**

- What strategy will you use and why?
- Talk it! - discuss strategies with a partner.
- What manipulatives will you use?

**Solve It!**

**CARRY OUT THE PLAN**

- Apply your strategy.
- You may need to revise and try a different strategy....
- Show your work (thinking).
- Ask yourself!
  - Is your answer reasonable?
  - Does it make sense?

**Explain It!**

**COMMUNICATE THE SOLUTION**

- Answer the question!
- Tell, show, write... how the answer was reached. Consider extensions.
- First I... I noticed that... Then I... I thought... Finally...

# KEY MESSAGES



The teacher's role as facilitator is crucial in the delivery of an effective problem-solving experience.



**So what can we do?**



# DISTRICT PROBLEM SOLVING PROTOCOL

## Mathematics Problem-Solving Protocol K-2

# R

READ

READ  
the  
problem  
carefully.



# I

ILLUSTRATE

DRAW  
a picture  
diagram, or  
use a  
manipulative.



# S

SOLVE

USE  
your  
math  
strategies.



# E

EXPLAIN

JUSTIFY

your  
answer.



The Department of  
**Early Childhood Education**  
Richland School District One



## So what can we do?

1. Assess where students 'break-down' when problem solving
2. Select a manageable and achievable goal(s) or focus area(s)
3. Implement research-based strategies to address and target areas of challenge
4. Assess and celebrate progress



## STRATEGY #1 **3** READ PROTOCOL

- 1st Read: **Read for key ideas.** (understanding)
- Students read or listen to the problem to understand the math.

**No pencils...**



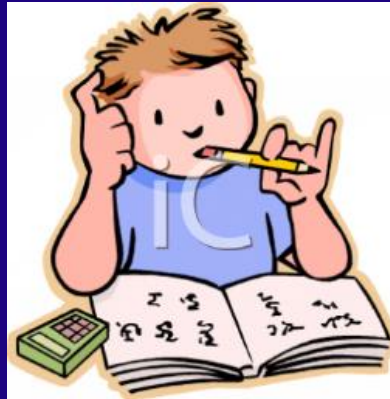
# 3 READ PROTOCOL

- 2nd Read: Read to understand the math.
- Students read to make sense of what is happening. What are some of the numbers represented in the problem? What do the numbers mean?



# 3 READ PROTOCOL

- 3<sup>rd</sup> Read: Read to make a plan.
- Students read to make a plan on solving the problem. What is the question? How can I solve this problem? Are there manipulatives that I can use?



### 3 READ PROTOCOL IN ACTION

Dad catches 5 fish. Then he catches 2 more fish.  
How many fish does dad catch in all?



G

### 3 READ PROTOCOL IN ACTION

There were 8 apples were on the table. Bob ate 2 apples. How many apples are on the table now?

# THINK-PAIR-SHARE

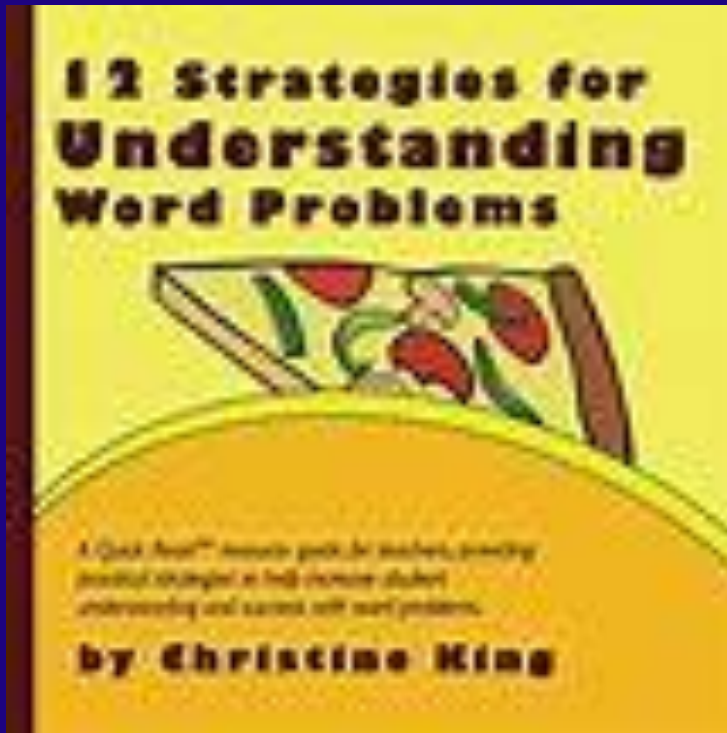


- What are some benefits of a 3 Read Protocol in a math classroom?

Let's  
Talk

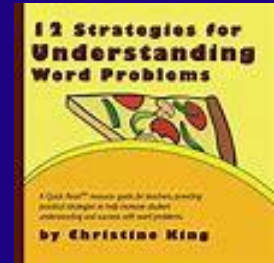
# 12 STRATEGIES FOR UNDERSTANDING WORD PROBLEMS

By Christine King



- ❑ A Line at a Time
- ❑ What is the Question

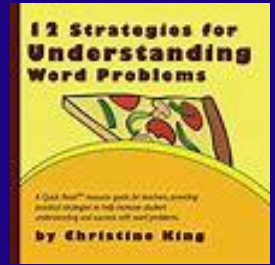
## A LINE AT A TIME



Word problems are revealed one sentence at a time. As each line is revealed have students discuss and visualize the information and how that information connects to what they already know.



# A LINE AT A TIME



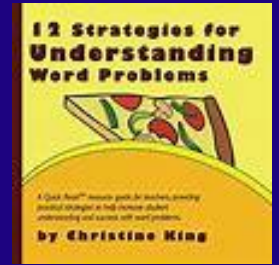
Jake picks 6 apples.

Visualize



# A LINE AT A TIME

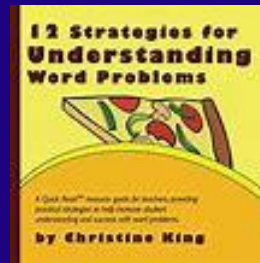
Then, he picks 4 more apples.



Visualize



# A LINE AT A TIME



How many apples did he pick in all?

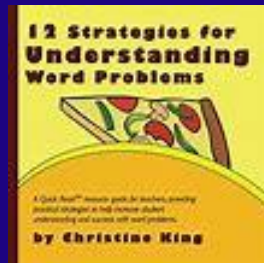
Visualize

## A LINE AT A TIME

Jake picks 6 apples.

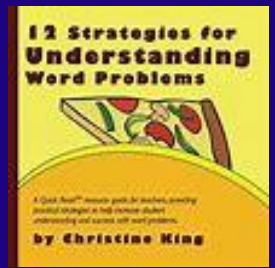
Then, Then, he picks 4 more apples.

How many apples did he pick in all?



# A LINE AT A TIME

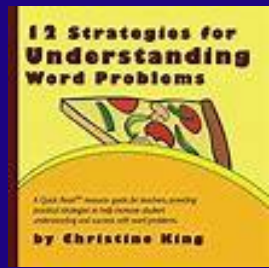
There were 6 girls on the playground.



Visualize



# A LINE AT A TIME

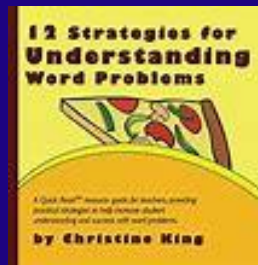


After lunch, 2 boys joined them.

Visualize



# A LINE AT A TIME

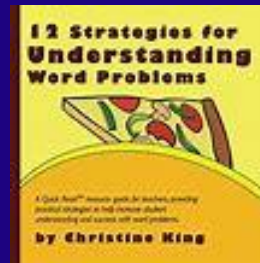


How many children are on the playground now?

Visualize



# A LINE AT A TIME



There were 6 girls on the playground. After lunch, 2 boys joined them. How many children are on the playground now?



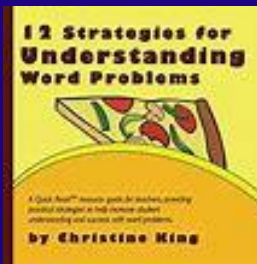
# THINK-PAIR-SHARE



- What are some benefits of A Line At A Time?

Let's  
Talk

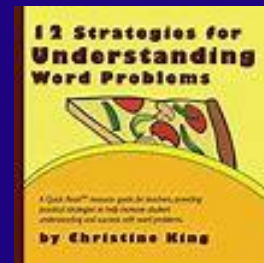
# WHAT IS THE QUESTION?



Take a word problem and remove the question. Students come up with questions that could be answered based upon the context or situation.



# WHAT IS THE QUESTION?



A monkey eats 4 bananas for breakfast. He eats 3 bananas for lunch.

Jane had 7 cookies. She gave some to her sister. She now has 3 cookies.

# THINK-PAIR-SHARE



- What are some benefits of using What is the Question Protocol?



# GRAPHIC ORGANIZERS & PROBLEM SOLVING



# BEGINNING, MIDDLE, END STRATEGY

- Mia had 4 jellybeans. Ruth gave her 3 more. How many jellybeans did Mia have in all?

**Beginning/Middle/End Work Mat**

Beginning	Middle	End



# THINK-PAIR-SHARE



- How can graphic organizers help students' problem solve?
- Are there other graphic organizers that your school is currently using to help with problem solving?

Let's  
Talk

## WHEN CHILDREN PRACTICE EFFECTIVE PROBLEM-SOLVING STRATEGIES, THEY REAP MANY BENEFITS:

- apply, understand and practice skills in context;
- collaborate with others to develop new strategies;
- formulate and test their own explanations;
- communicate their explanations and listen to others' explanations;
- use flexible representations to help them solve problems.





# HOW DO WE FIND ADDITIONAL PROBLEM SOLVING TASKS FOR STUDENTS?

All K-5 Math units include at least 1 problem solving task.





Let's  
talk.

**TAKE A MOMENT TO THINK ABOUT  
YOUR EXPERIENCE TODAY.  
CHOOSE ONE DISCUSSION STARTER  
TO SHARE YOUR THOUGHTS.**



## Discussion starters

I think...

It reminds me of...

I predict...

I noticed...


I like...



# QUESTIONS

## Contact Information

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Please  
complete  
the  
Survey

