

PROBLEM SOLVING IN ACTION

GRADE I



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

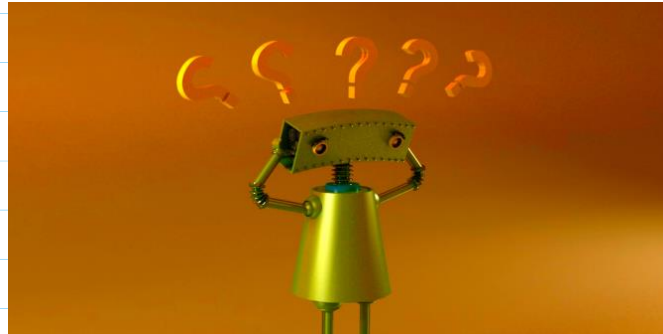
KEY

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)

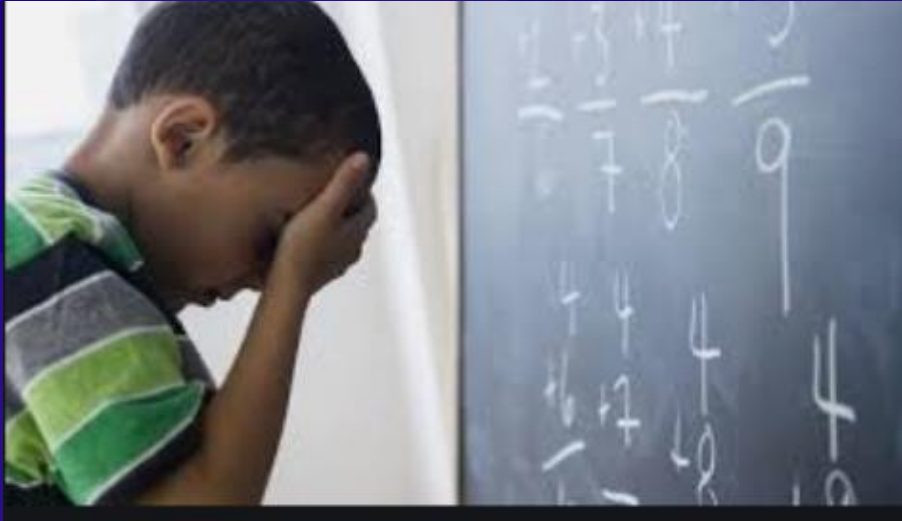
1.ATO.1 Solve real-world/story problems using addition (as a joining action and as a part-part-whole action) and subtraction (as a separation action, finding parts of the whole, and as a comparison) through 20 with unknowns in all positions.

1.ATO.2 Solve real-world/story problems that include three whole number addends whose sum is less than or equal to 20.

Types of Problems

	Result Unknown	Change Unknown	Start Unknown
Add to	Two bunnies sat on the grass. Three more bunnies hopped there. How many bunnies are on the grass now? $2 + 3 = ?$	Two bunnies were sitting on the grass. Some more bunnies hopped there. Then there were five bunnies. How many bunnies hopped over to the first two? $2 + ? = 5$	Some bunnies were sitting on the grass. Three more bunnies hopped there. Then there were five bunnies. How many bunnies were on the grass before? $? + 3 = 5$
Take from	Five apples were on the table. I ate two apples. How many apples are on the table now? $5 - 2 = ?$	Five apples were on the table. I ate some apples. Then there were three apples. How many apples did I eat? $5 - ? = 3$	Some apples were on the table. I ate two apples. Then there were three apples. How many apples were on the table before? $? - 2 = 3$
	Total Unknown	Addend Unknown	Both Addends Unknown ¹
Put Together/ Take Apart ²	Three red apples and two green apples are on the table. How many apples are on the table? $3 + 2 = ?$	Five apples are on the table. Three are red and the rest are green. How many apples are green? $3 + ? = 5, 5 - 3 = ?$	Grandma has five flowers. How many can she put in her red vase and how many in her blue vase? $5 = 0 + 5, 5 = 5 + 0$ $5 = 1 + 4, 5 = 4 + 1$ $5 = 2 + 3, 5 = 3 + 2$
	Difference Unknown	Bigger Unknown	Smaller Unknown
Compare ³	("How many more?" version): Lucy has two apples. Julie has five apples. How many more apples does Julie have than Lucy?	(Version with "more"): Julie has three more apples than Lucy. Lucy has two apples. How many apples does Julie have?	(Version with "more"): Julie has three more apples than Lucy. Julie has five apples. How many apples does Lucy have?

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.**

2 flowers + 2 more = 4 flowers

Problem Solving

Read and Think

Understand

Plan

Choose a Strategy

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!

Think It!

Solve It!

Explain It!

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...



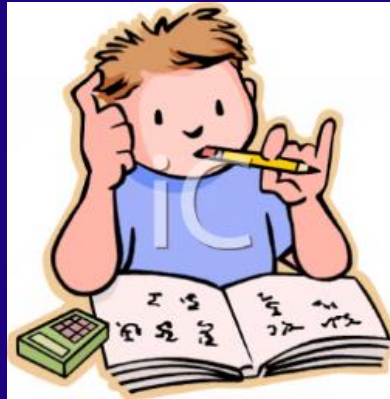
3 READ PROTOCOL

- 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

- 3rd 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

10 frogs sit on a log. 6 more frogs jump onto the log. How many frogs are on the log?



J

3 READ PROTOCOL IN ACTION

7 girls are in the classroom. 8 more girls walk in. How many girls are in the classroom?



N

THINK-PAIR-SHARE

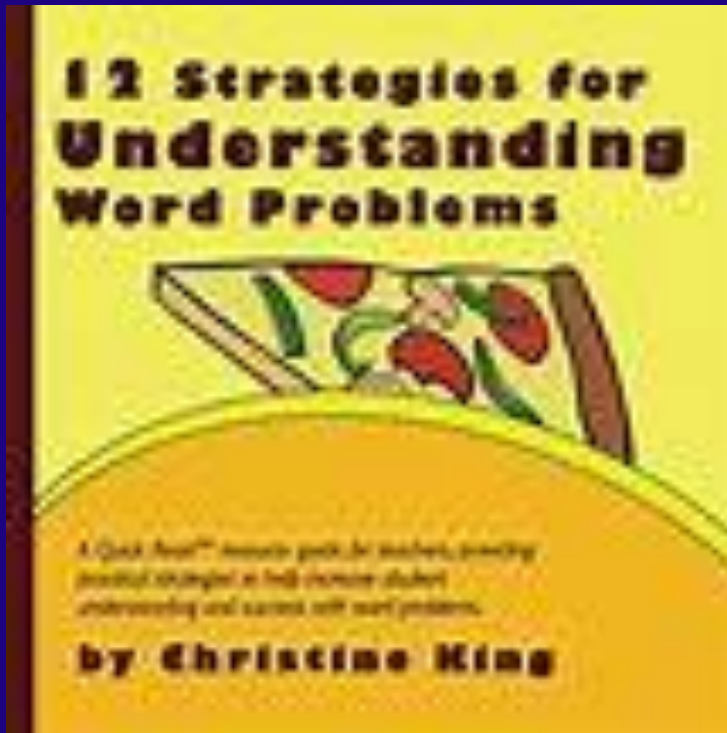


- What are some benefits of a 3 Read Protocol in a math classroom?

Let's
Talk

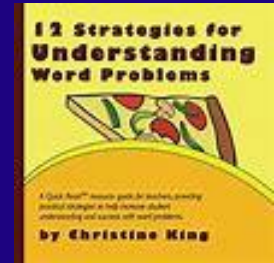
12 STRATEGIES FOR UNDERSTANDING WORD PROBLEMS

By Christine King



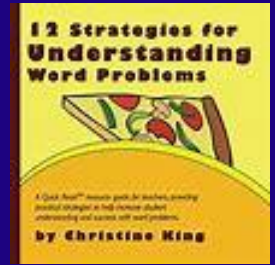
- ❑ A Line at a Time
- ❑ What is the Question

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



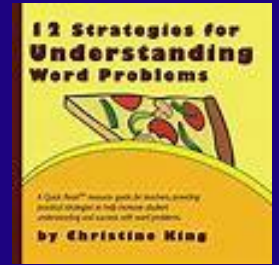
Jake picks 12 apples.

Visualize



A LINE AT A TIME

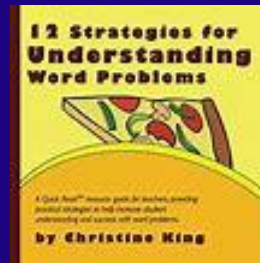
Then, he picks 4 more apples.



Visualize



A LINE AT A TIME



How many apples did he pick in all?

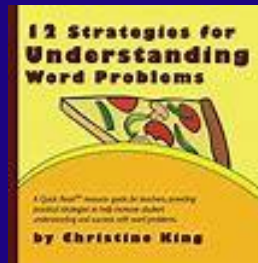
Visualize

A LINE AT A TIME

Jake picks 12 apples.

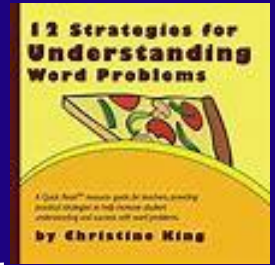
Then, Then, he picks 4 more apples.

How many apples did he pick in all?



Visualize

A LINE AT A TIME

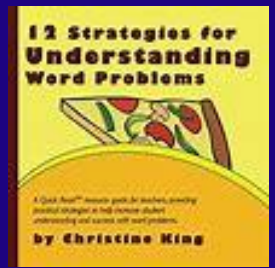


10 snakes lay in the sun on a rock.
Some snakes went away and then
there were 8 snakes on the rock. How
many snakes went away?



A LINE AT A TIME

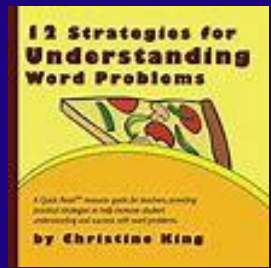
10 snakes lay in the sun on a rock..



Visualize



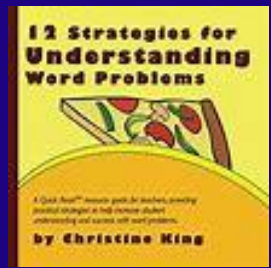
A LINE AT A TIME



Some snakes went away and then there were 8 snakes left on the rock.

Visualize

A LINE AT A TIME



How many snakes went away?

Visualize



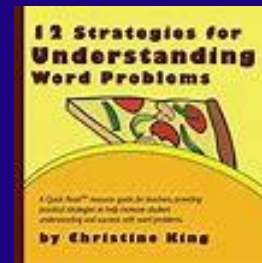
THINK-PAIR-SHARE



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

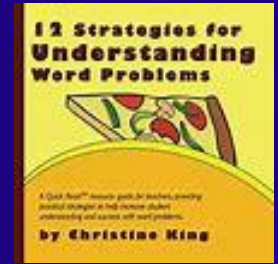
Let's
Talk

WHAT IS THE QUESTION?



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

WHAT IS THE QUESTION?



A monkey eats 12 bananas for breakfast.
He eats 3 bananas for lunch.

Jane had 17 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 some jellybeans. Ruth gave her 8 more. Now Mia has 15 jellybeans. How many jellybeans did Mia have at first?

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

