

The background is a dark teal color with vertical dashed lines. It is decorated with various mathematical symbols and numbers in light teal and lime green. Symbols include the dollar sign (\$), yen sign (¥), pound sign (£), and Euro sign (€). Numbers range from 0 to 9. There are also arrows pointing up and down. The text 'PROBLEM SOLVING CIRCLES' is centered in white, bold, sans-serif font.

PROBLEM SOLVING CIRCLES

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Jot down some ideas:

Why are word problems so challenging?

What is the importance of learning to solve word problems?



Welcome!

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Learning Intentions

We are learning to...

- Develop reasoning and discourse skills in our students
- Build disciplinary literacy skills in mathematics
- Implement the Problem-Solving Circles process



CCSS - Standards for Mathematical Practice

- 1) Make sense of problems and persevere in solving them.
- 2) Reason abstractly and quantitatively.
- 3) Construct viable arguments and critique the reasoning of others.



CCSS - Disciplinary Literacy

Reading

1) Read closely, cite textual evidence

Language

6) Correct use of academic and domain-specific vocabulary

Speaking/Listening

1) Prepare/participate in range of conversations

3) Evaluate speaker's point of view, reasoning, evidence

4) Present information clearly



RICH TASKS

What is it?

Where can I find it?

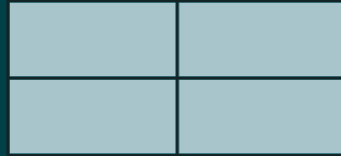
How do I implement it?

“...the task features include the following: the extent to which the task lends itself to multiple solution strategies, the extent to which the task encourages multiple representations, and the extent to which the task demands explanations from the students.”

Example of a rich task?

Non-example:

What fraction is the notecard cut into?

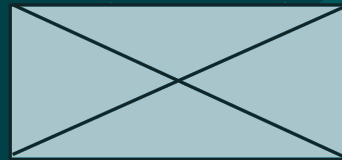


Example:

Is this notecard cut into fourths? Prove it.

OR

Cut a notecard into fourths as many ways as you can. Prove each way works.



“Curiosity ... may put the brain in a state that is more likely to retain new information, even if that information is not what got you curious in the first place.”

Matthias Gruber, University of California, Davis





NORM SETTING

Why “norms” and not “rules”?

Problem Solving Circle Norms

* Trust among members

(wrong answers = We won't make fun.)
→ We learn from our mistakes!

* Respectful (nice, not fake)

→ We can agree or/and disagree!

→ We listen and respond or ask questions!

→ We stay focused on the learning!

→ Use materials appropriately & put back.

* Focus on the learning

→ Don't give answers away (blurt out)!

→ Think why/how you get the answers!

* Keep noise level appropriate



DISCOURSE

What is real discourse and what is it not?

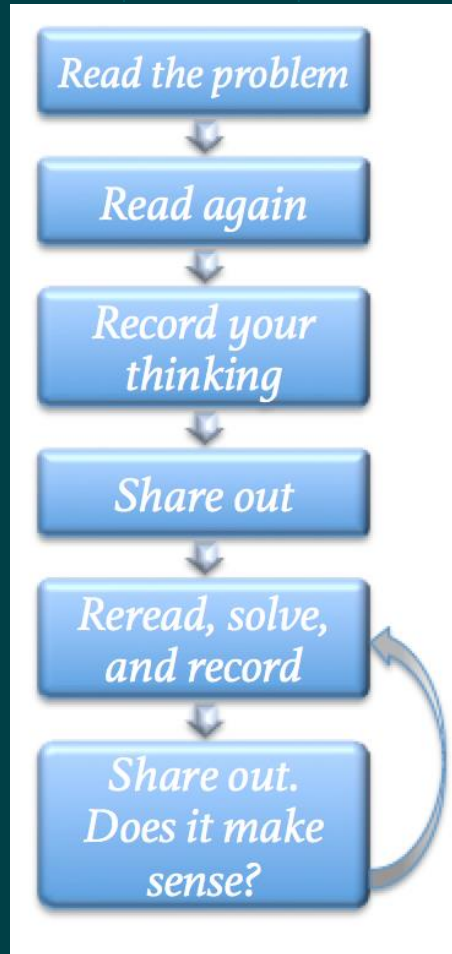
MTP: Facilitate Meaningful Mathematical Discourse

*Effective teaching of mathematics facilitates discourse **among students** to build shared understanding of mathematical ideas by analyzing and comparing student approaches and arguments.*

Principles to Actions (NCTM, 2014, p.10)



PSC Process



Thinking Prompts & Discussion

Thinking (with prompts): Fractions in math mean when
Some thing is cut by something like $\frac{2}{16}$ means some
one eat two of something and there were 16
pieces

Thinking (with prompts): I know that $\frac{16}{16}$ is a full
pizza and $\frac{8}{16}$ is half a pizza

I notice that the pizza is bigger than
the medium size pizza

Solution & Discussion Prompts

We have to get beyond “I agree or disagree with _____’s thinking because... I want to share my own way of doing this.”



YOUR TURN

INDIVIDUAL problem-solving process, NOT COLLABORATIVE!

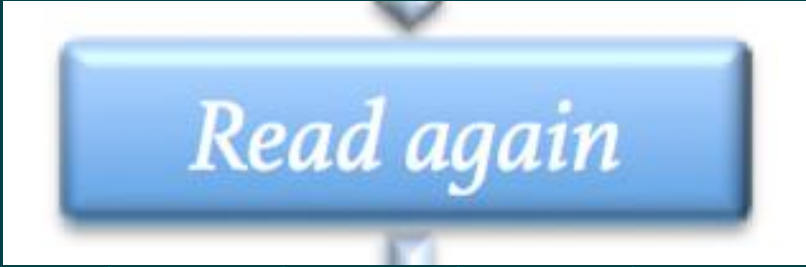
The share-outs are to extend thinking and promote discourse, not to solve.





Purpose: Just to read to get the feel for the problem - start to visualize it.





Purpose: To find what is important - star, circle, highlight



Record your thinking

Read the problem

Read again

Record your thinking

Share out

Reread, solve, and record

*Share out.
Does it make sense?*



Thinking Prompts

I notice...

A question I have is...

I need to know...

One pattern I see is...

_____ in math means...

I need to draw...

A strategy to use is...

I already knew...

It is important to

This reminds me of...

remember...

I am confused by...

YOUR OWN

My first step is...



Share out

Read the problem

Read again

*Record your
thinking*

Share out

*Reread, solve,
and record*

*Share out.
Does it make
sense?*

Why did you think that was important?

How will you use that strategy?

I saw something similar...

*Reread, solve,
and record*

Read the problem

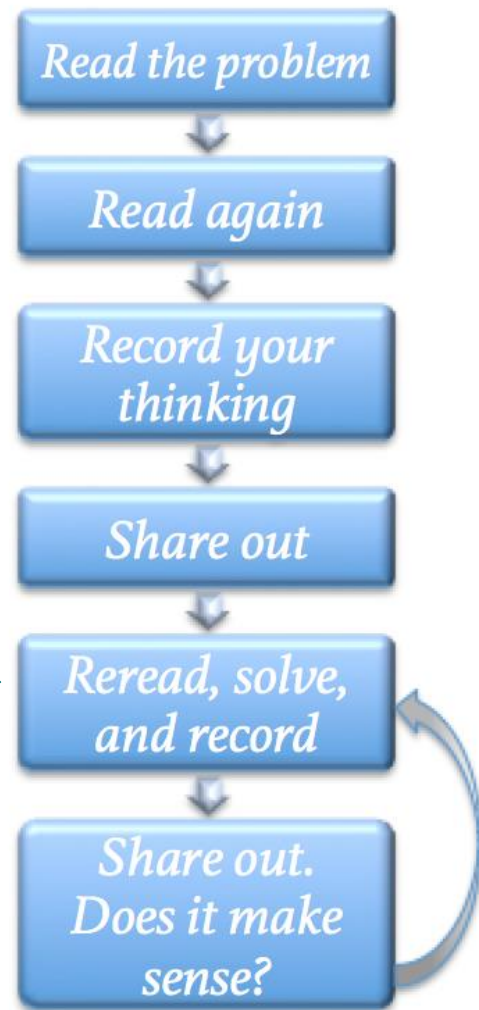
Read again

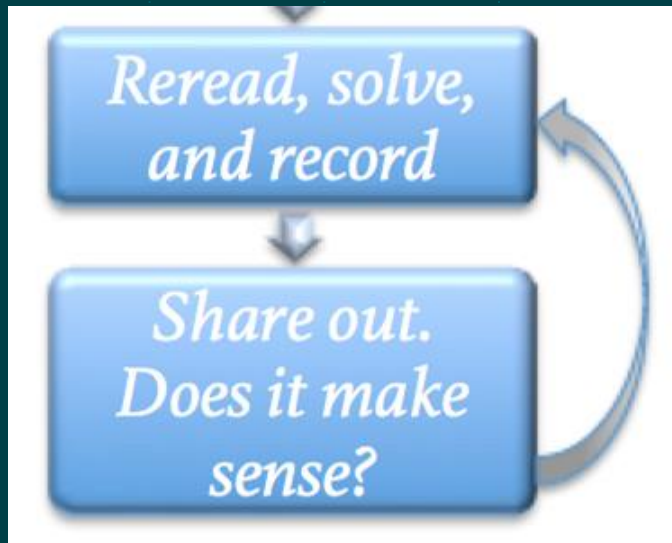
*Record your
thinking*

Share out

*Reread, solve,
and record*

*Share out.
Does it make
sense?*





Solution Responses

I agree/disagree with _____'s thinking because...

How do you know that?

How did you figure that out?

Can you explain that in another way?

How does your visual support your thinking?

_____ (this part) really helped me understand your thinking.

What if

_____?

Is that what the problem was really asking?

However, it says in the problem _____.



Thoughts to take with you...

- What did you like about PSC?
- What did you struggle with in PSC?
- What effect did PSC have on reasoning process?
- What role could you see this process playing in your classroom?



Learning Intentions - Revisited

We are learning to...

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Thank you!

Any questions?

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SlidesCarnival icons are editable shapes.

This means that you can:

- Resize them without losing quality.
- Change fill color and opacity.
- Change line color, width and style.

Isn't that nice? :)

Examples:

