What's the Problem?

Supporting Student Success In Solving Problems



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Engaging, Complex Tasks

- Embed important, useful mathematics
- Require higher-level thinking
- Contribute to conceptual development
- Create opportunity for formative assessment
- Have various solutions or decisions to defend
- Encourage engagement and discourse
- · Connect to important mathematical ideas
- Promote the skillful use of mathematics

NCTM Research Brief, April 2010

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Language Stages



Purposeful Classroom Questioning

Focusing Questions

- Help push student thinking forward
 - Where could you start?
 - What are you trying to figure out?
 - Why does that work?
 - Is there another way to approach it? To represent it?
 - How are these ideas related?

Funneling Questions

- Guide the student down the teacher's chosen path.
 - What if you tried this here?
 - So you could find this first?
 - What if you did this instead of that?



3.06

Take a two-digit number where the digits are 4 units apart on a number line. Reverse the digits, and then figure out the difference between the 2 two-digit numbers. What do you notice? Is the pattern always true?



4.24

How many times in 1 day do the hands of a clock make a right angle?



5.12

Did all the students have the same amount to eat?

6 students equally share a 3 $\frac{1}{2}$ foot-long sandwich 9 students equally share a 4 $\frac{1}{2}$ foot-long sandwich 8 students equally share a 4 $\frac{2}{5}$ foot-long sandwich 5 students equally share a 2 $\frac{1}{3}$ foot-long sandwich



Purposeful Questions to Guide Discourse

- What decisions did you make?
- Can you tell me more about...?
- Can you explain a different way?
- What patterns do you notice?
- How does _____ relate to _____?
- What can you tell me without solving the problem (performing computation)?
- Rather than trying to *add* the numbers, try thinking about the pattern.
- What do you think about Jorge's question/statement?
- Who can repeat what Jessica said in their own words?

Hattie, et. al., 2017; NCTM, 2015; Russell, Schifter, Bastable, 2011

Problem Solving Strategies

- Look for a pattern
- Make a model
- Solve a simpler problem
- Work backwards
- Create a table

- Create an organized list
- Draw a picture or diagram
- Account for all possibilities

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- Act it out
- Create a graph

How do we teach problem solving strategies?

Linda Gojak, What's Your Math Problem?

3.08

If you earn 50¢ every day for jobs around the house, how long will it take you to earn \$70?



4.17

At 5:36 p.m. today, how many minutes will have passed so far in this year?



5.06

How can you figure out how many chairs you need if you know the number of tables in this arrangement?



3.13

How long are television shows if you remove the time taken by commercials?



4.09

How many times does your heart beat in one year?



5.08

Your team has won a prize. Your prize will be in dimes and you can select one of the following options:

- 400 cm of dimes lined up end to end
- 4 m of dimes stacked on top of each other
- I m² of dimes

Which prize will you choose and why?



Normalize the Struggle



This or That

Focus

Using knowledge of all operations and place value with one- and two-digit numbers

Starting the Game

1) The winner is the first player to make a true number sentence with an answer equal to 50.

2) Decide who will be Player 1 and who will be Player 2.

3) Player 1 starts the game.

How to Play

Roll. Make a true number sentence with an answer equal to or as close as possible to 50 (under or over). Play continues in turns until one player makes a number sentence with an answer equal to 50. If players complete their game boards without making 50, then the player who made an answer closest to 50 is the winner.

Example

Colby rolls 1, 3, and 5. He could record 15 x 3 = 45 but figures out that he could make an answer closer to 50 using subtraction. He records 53 - 1 = 52.

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This or That?

