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Using the PoWs: Getting Started

How to Start Problem Solving in Your Classroom

When you start doing problem solving in your classroom, keep in mind that one goal should be to create an environment that supports problem solving as an extended process. The intent is to engage students in the process, so the short term goal should be process over product. Don't worry about whether or not your students are solving all the problems correctly or completely. Are your students engaged? Are they all participating? Are they asking questions? Are they talking about math? If so, then the process is happening, and the product will follow.

Forget "The Question"

To put the focus more on the process, introduce the class to the problem by removing The Question. This can be done as a whole class (which is how I might start) or in small groups. The students must analyze the situation and focus on reading and interpretation instead of coming up with The Answer. (For an example of what this looked like in one class I taught, see the other side of this sheet.)

1. Give students the text of the problem without the question (the overhead works great for this) or draw the associated picture on the board and tell them only what they need to know to understand the situation.
2. Go around the group and have each person list one thing they "notice". Responses might be as simple as "the lines go up", or even "there is one blue line and one red line", or as complex as "the blue line is going up twice as fast as the red line". Everyone can contribute something, and all the "noticings" are recorded for the group (on the class data pad or whiteboard, etc.) with minimal discussion.
3. Ask the students which items on the list they are wondering about (we often use the language of "wondering" instead of asking them what they don't understand). For example, a student might ask, "I'm wondering how you know that the blue line is going up twice as fast as the red line." Let the students respond to these questions. "Who would like to try to explain?" If possible or necessary, have more than one student explain each idea so that more student voices get heard.
4. At this point, I often ask students to pose a question for the situation presented. You might learn that sometimes math is pretty predictable—in my experience, kids almost always come up with a question that is a lot like the actual question!
5. Pose the actual question and talk about it as a group.
 - Have students list the observations they think will be helpful in answering The Question.
 - Let some kids take a stab at answering The Question. Depending on the readiness of your students, you may do this as a whole class or have students work in pairs.

Remember that the goal is to get your students engaged in the process of thinking mathematically and about how to solve problems. It is not about finding the solution, at least not initially. You will be able to judge the success of this activity as you listen to the buzz in the classroom and see how many more students are participating.

Other Ideas for Introducing Problems and Problem Solving

- Read the problem aloud.
- Talk about any vocabulary that students are wondering about (or that you are pretty sure they haven't seen recently).
- Have students retell the problem in their own words. Let them read it again if they're having trouble remembering.
- Make lists with questions such as what we know about the problem, what we want to figure out, and what questions we have.
- Talk about the questions and how we might figure out the answers.
- Draw pictures or a table or chart if it might help.

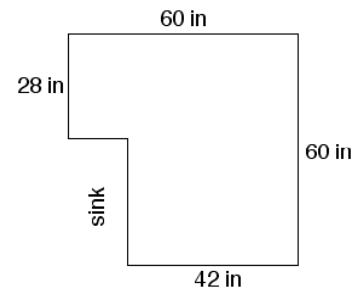


Teresa's Tiles in an 8th Grade "Lowest Level" Class

In the spring of 2007, I presented "Teresa's Tiles" to a "lowest level" eighth grade class. I chose the problem because it is similar to problems on that state's Grade 8 assessment.

I drew this picture on the board and described to the students what we were about to do. "This is a picture of Teresa's bathroom floor. We're going to list as many things as we can about the picture. I'm going to ask each of you to offer one thing that you notice. Anything at all." Here's what they said:

- two sides are equal
- one side is 28 inches
- one side is 42 inches
- your lines aren't very straight
- the sink is a rectangle
- you can find the area of the whole thing by making it two pieces
- two sides are 60 inches
- they are longest
- it used to be a square
- the short side of the sink is 18"
- the long side of the sink is 32"



I was excited—that was a great list! I picked out the items I figured were most likely to be both important in eventually solving the problem and potentially confusing and asked for volunteers to explain them to me and the rest of the class. The following responses came from many different students.

AF: What does it mean to say that it used to be a square?

Student: The floor is like a square, but the sink is in the way.

AF: How do you know it is a square?

Student: Because all of the sides are 60 inches. That's a square.

AF: But all the sides in the picture aren't 60 inches long. Could someone show us on the board what you mean?

Student: *[drawing figure 1]* If the sink wasn't there, they would all be 60 inches.

AF: Okay. How do we know that the short side of the sink is 18 inches?

Student: Because it's 60 take away 42.

AF: How did you know to do 60 minus 42?

Student: 'Cause 60 is all the way and only want part of it.

AF: Would someone like to come up and show us what that means on the board?

Student: *[drawing figure 2]* That part is 42 because it is just like the bottom. So you do 60 take away 42.

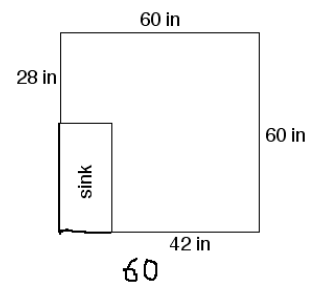


Figure 1

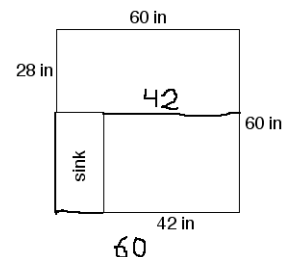


Figure 2

We went through a similar process with the ideas that the long side of the sink is 32" and that the area can be found by splitting the floor into two pieces. Then I explained that Teresa was going to put down new tiles, and that the new tiles are squares that are 4 inches by 4 inches. I drew a small tile on the board and labeled it 4" on each side. Then I said, "What can we say now?"

- the tiles are smaller than the floor
- it will take a lot of them!
- 15 tiles will fit across the top and the side
- each tile is 16 square inches
- 7 tiles will fit across the 28" side
- tiles won't fit across the bottom

At this point, we had reached the end of the class period. I gave each student a copy of the full text of the problem and told them that for tomorrow's class, they were to write down everything they remembered from our conversation. I told them that they should not to worry about solving the problem. I also told them that they had done an awesome job and that I had had a lot of fun!

I told the teacher that I had been really impressed with her students. Turns out she had been too! She was surprised by the number of things they had come up with and by how many of them had participated. A few days later I got an email saying that almost all of them had done their homework, and most had remembered more than half of what we talked about in class. A couple of the students had gone on to solve the problem, and when they worked on it in class the next day, many of them were engaged in the process. Not bad for their "first time"!