TEACHER MOVES

Presented by Phyllis Guarno and Kylie Spinella

Phyllis Guarno, Math Coach
16 years learning/teaching
8 years focused on Math
6 ½ years married
2 baby girls
23 countries visited
1 year in current position

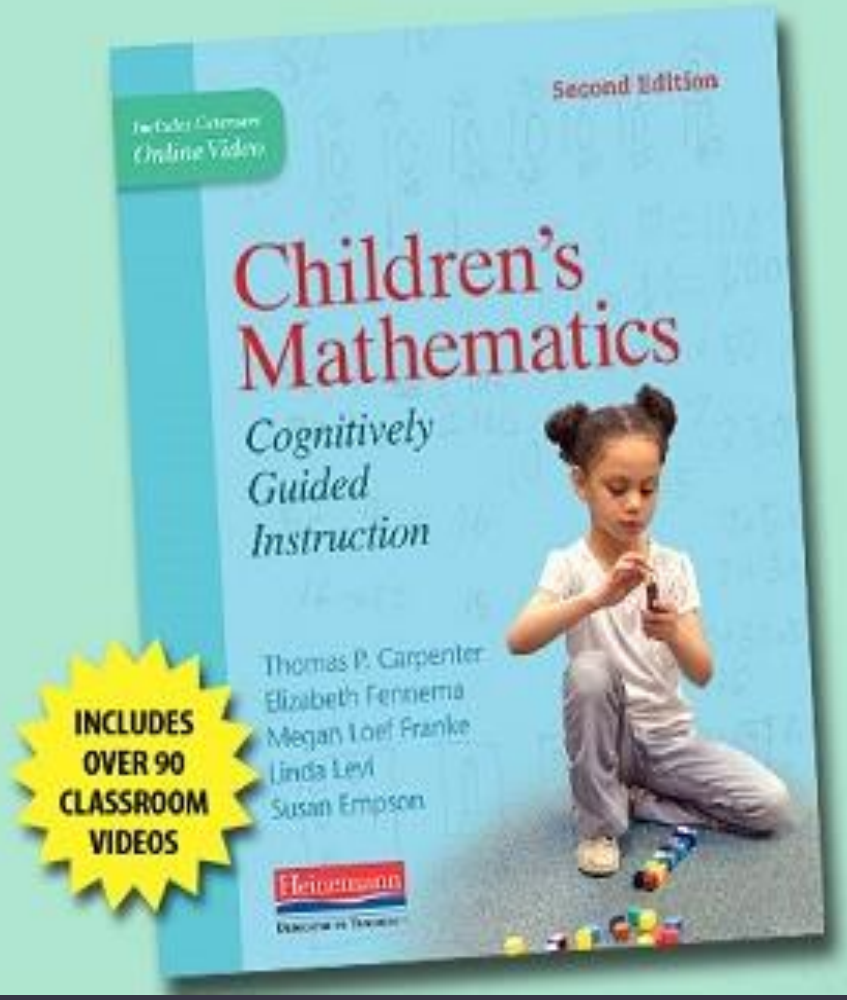
Kylie Spinella, 1st Grade Teacher
6 years teaching
3 years leadership team
10 years living in Florida
14 countries visited
1 cat

GOALS FOR SESSION

Identify and describe the teacher moves that will shift traditional math instruction to student-centered math instruction.

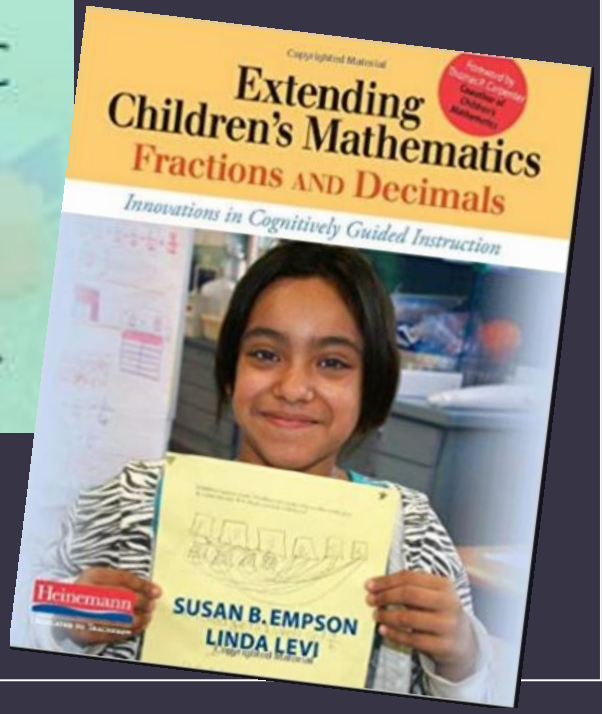
Recognize strengths and opportunities for growth in your understanding of how students think about math.

Plan your teacher moves.



"TEACHERS WHO UNDERSTAND HOW CHILDREN THINK ABOUT MATHEMATICS ARE WELL EQUIPPED TO TEACH FOR UNDERSTANDING *REGARDLESS* OF THE SPECIFIC REFORM INITIATIVES."

—Children's Mathematics, 2nd Ed.

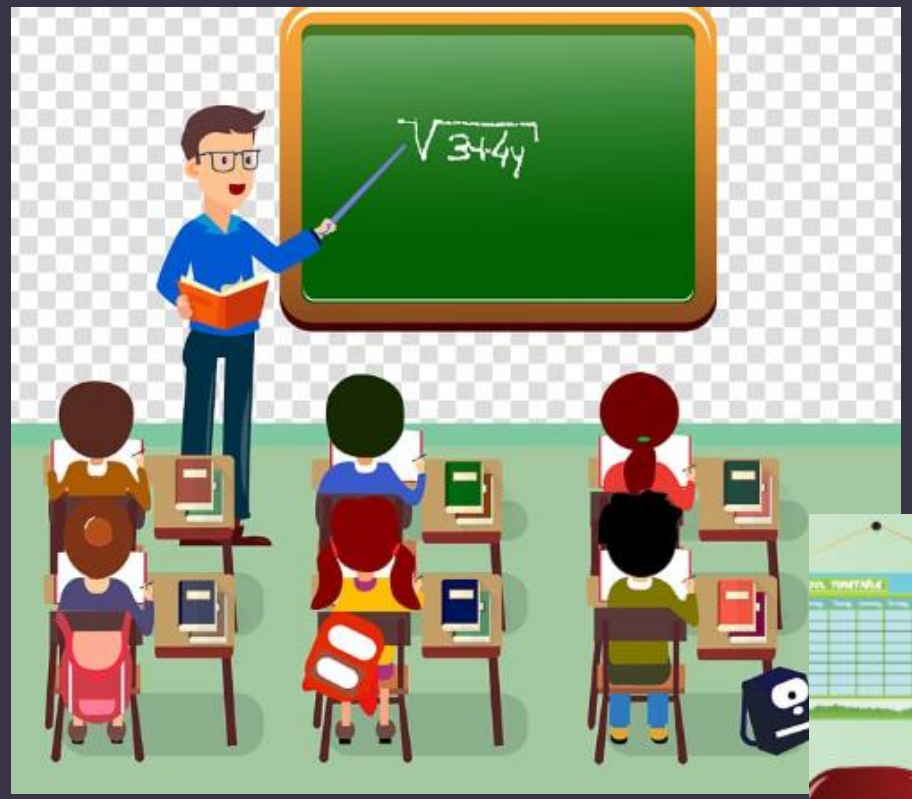


How would you picture math instruction 50 years ago?


I like to read to my doll.
14
13
27

Fortune 500 Top Ten Most Valued Skills By Employers (1970)
1. Writing
2. Computational Skills
3. Reading Skills
4. Oral Communication
5. Listening Skills
6. Personal Career Development
7. Creative Thinking
8. Leadership
9. Goal Setting/motivation
10. Teamwork

How would you picture math instruction occurring in schools today?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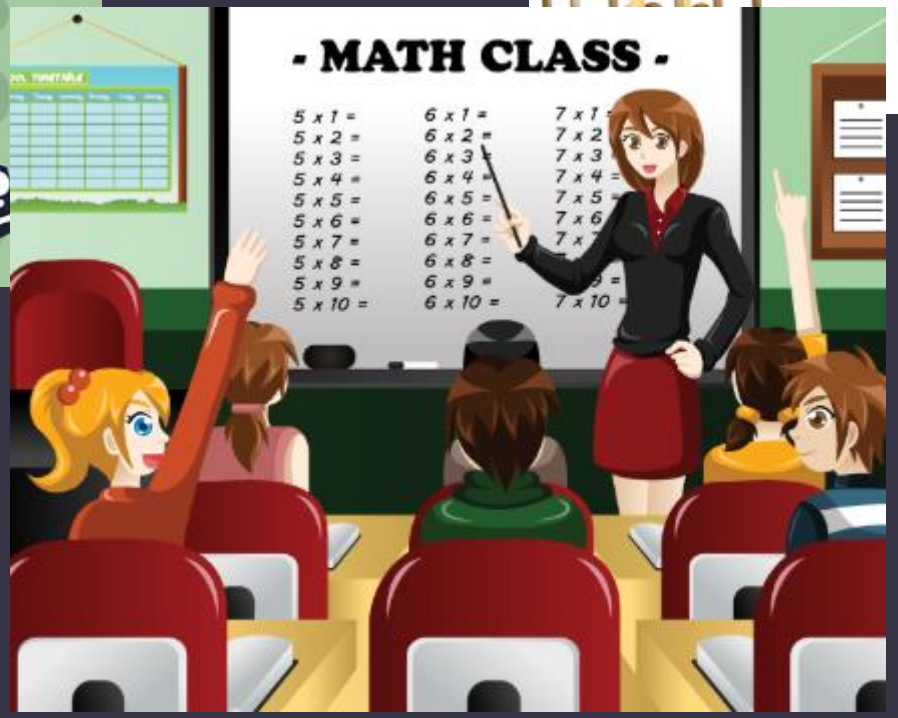
2 two


- MATH CLASS -
5 x 1 =
5 x 2 =
5 x 3 =
5 x 4 =
5 x 5 =
5 x 6 =
5 x 7 =
5 x 8 =
5 x 9 =
5 x 10 =
6 x 1 =
6 x 2 =
6 x 3 =
6 x 4 =
6 x 5 =
6 x 6 =
6 x 7 =
6 x 8 =
6 x 9 =
6 x 10 =

"Group and whole class discussions are really important. Not only are they the greatest aid to understanding – as ***students rarely understand ideas without talking about them*** – and not only do they enliven the subject and engage students, but ***they teach students to reason and to critique each other's reasoning***, both of which are central in today's high-tech workplaces.

-Jo Boaler, Mathematical Mindsets

Fortune 500 Most Valued Skills By Employers (1970)

1. Writing
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6. Personal Career Devel
7. Creative Thinking
8. Leadership
9. Goal Setting/motivatio
10. Teamwork

Fortune 500 Most Valued Skills by Employers (1999)

1. Teamwork
2. Problem Solving
3. Interpersonal Skills
4. Oral Communication
5. Listening Skills
6. Personal Career Developr
7. Creative Thinking
8. Leadership
9. Goal Setting/Motivation
10. Writing

Fortune 500 Most Valued Skills by Employers (2020)

1. **Complex Problem Solving**
2. **Critical Thinking**
3. Creativity
4. People Management
5. **Coordinating with Others**
6. Emotional Intelligence
7. **Judgement and Decision Making**
8. Service Orientation
9. Negotiation
10. **Cognitive Flexibility**

“A major shift is called for from an environment that focuses on getting answers to one that focuses on the thinking process itself; teaching through sense making and problem solving is very different from teaching rules to get answers.”

-Van de Walle


PLAN

Teacher Moves in Planning

Before

- Curriculum driven
- Lesson a day
- Teacher directed strategies

After

- Child driven, standard aligned
- Analyze assessment to ensure standard alignment, identify common misconceptions
- **Plan task selection/problem type to engage students, elicit common misconceptions, and align with standard/learning goal**

Problem Difficulty

- Rate the difficulty of each problem 1 to 5, with 5 being the most difficult.
- Assume the problem is read to the child and the child understands the vocabulary.
- If you can, identify the problem type.

Kylie had 5 pennies. Phyllis gave her 4 more. How many pennies does Kylie have?	Kylie had 9 pennies. She spent 5 pennies on a jawbreaker. How many pennies does she have left?
Kylie has 8 pennies and 3 nickels. How many coins does she have?	Kylie had 5 pennies. Phyllis gave her some more. Now Kylie has 9 pennies. How many pennies did Phyllis give to Kylie?
Kylie had some pennies in her piggy bank. Phyllis gave her 5 more. Now Kylie has 11 pennies. How many pennies did Kylie have to start with?	Kylie had 13 pennies. She spent some pennies on a piece of gum. Now Kylie has 5 pennies. How much did she spend on a piece of gum?
Kylie has some nickels in her bank. She spent 4 nickels on a pack of gum. Now she has 3 nickels. How many nickels did Kylie have in her bank to start with?	Kylie has 12 coins. She has 7 nickels and the rest are dimes. How many coins are dimes?
Kylie has 7 nickels. Phyllis has 13 nickels. How many more nickels does Phyllis have than Kylie?	Kylie has 10 dimes. Phyllis has 5 more dimes than Kylie. How many dimes does Phyllis have?
Kylie has 8 coins. She has 3 more coins than Phyllis. How many coins does Phyllis have?	Kylie made 24 cookies. She wants to put 4 cookies in a bag. How many bags can she fill?
Kylie made 24 cookies. She wants to put them into 4 bags so each bag has the same amount. How many cookies will go in each bag?	Kylie has 4 bags of cookies. There are 6 cookies in each bag. How many cookies does Kylie have altogether?

Join, Result Unknown To lure Edmund to her side, the White Witch gave him 18 ounces of Turkish Delight. When Edmund returned to Narnia, she gave him another 29 ounces of Turkish Delight. How many ounces of Turkish Delight did the White Witch give Edmund?	**Join, Change Unknown** Lucy, Peter and Susan have already traveled 67¾ miles. To get to the stone table, they will need to travel a total of 110½ miles. How many more miles do they still need to travel to get to the stone table?	**Join, Start Unknown** At the beginning of the battle, Peter's army had many creatures. During the battle, Aslan brought 2,994 creatures that joined Peter's army. Once these creatures joined the army, there were 3,567 creatures in Peter's army. How many creatures were in Peter's army before Aslan and the other creatures arrived?
Separate, Result Unknown When Aslan arrived at the White Witch's castle he found 3,249 creatures that had been turned to stone. He brought 2,994 creatures back to life. How many creatures are still in stone?	**Separate, Change Unknown** Lucy had 5.2 grams of cordial in her bottle. She gave Edmund some of the cordial after he had been wounded in battle. She then had 4.27 grams of cordial in her bottle. How much cordial did she give Edmund?	**Separate, Start Unknown** Susan had a quiver full of arrows at the beginning of the battle. She shot 328 arrows during the battle. She had 50 arrows left at the end of the battle. How many arrows were in her quiver at the beginning of the battle?
Part-Part-Whole, Whole Unknown 3,205 mice were helping to untie Aslan's front paws. 2,995 mice were helping to untie Aslan's back paws. How many mice were helping to untie Aslan's paws?		**Part-Part-Whole, Part Unknown** There were 195 creatures around Lucy when she was attacked by the wolf. 99 of them were Naiads and the rest of them were Dryads. How many Dryads were around Lucy when she was attacked by the wolf?
Compare, Different Unknown Before the White Witch cast a spell on Narnia, the average temperature was 68 degrees. Now the average temperature is -15 degrees. How much colder has the average temperature gotten since the White Witch cast her spell?	**Compare, Compare Quantity Unknown** 257 Centaurs fought in the battle against the White Witch. 34 more Eagles than Centaurs fought in the battle. How many Eagles fought in the battle?	**Compare, Referent Unknown** Peter has 3.4 grams of rubies in his crown. Peter's crown has .5 grams of rubies more than Edmund's crown. How many grams of rubies are in Edmund's crown?
Multiplication Each of the children's crowns contained 42⅜ grams of gold. How much gold all together was used to make the four crowns?	**Measurement Division** During the White Witch's rule, the depth of the snow covering Narnia increased by .3 inches each month. At the end of her rule, the depth of the snow had increased by 87.4 inches. How many months did the White Witch rule Narnia?	**Partitive Division** Mrs. Beaver packed 187 pounds of provisions when she, Mr. Beaver and the three children escaped from the Beaver's home. She divided the provisions so that each person and animal carried the same amount of weight. How many pounds did each person or animal carry?

Problem Types

"The differences among the eleven problem types is important because they are related to how children solve the problems which in turn affects the difficulty level of different problems."

-Children's Mathematics, 2nd Editon

Teacher Moves in Planning

Before

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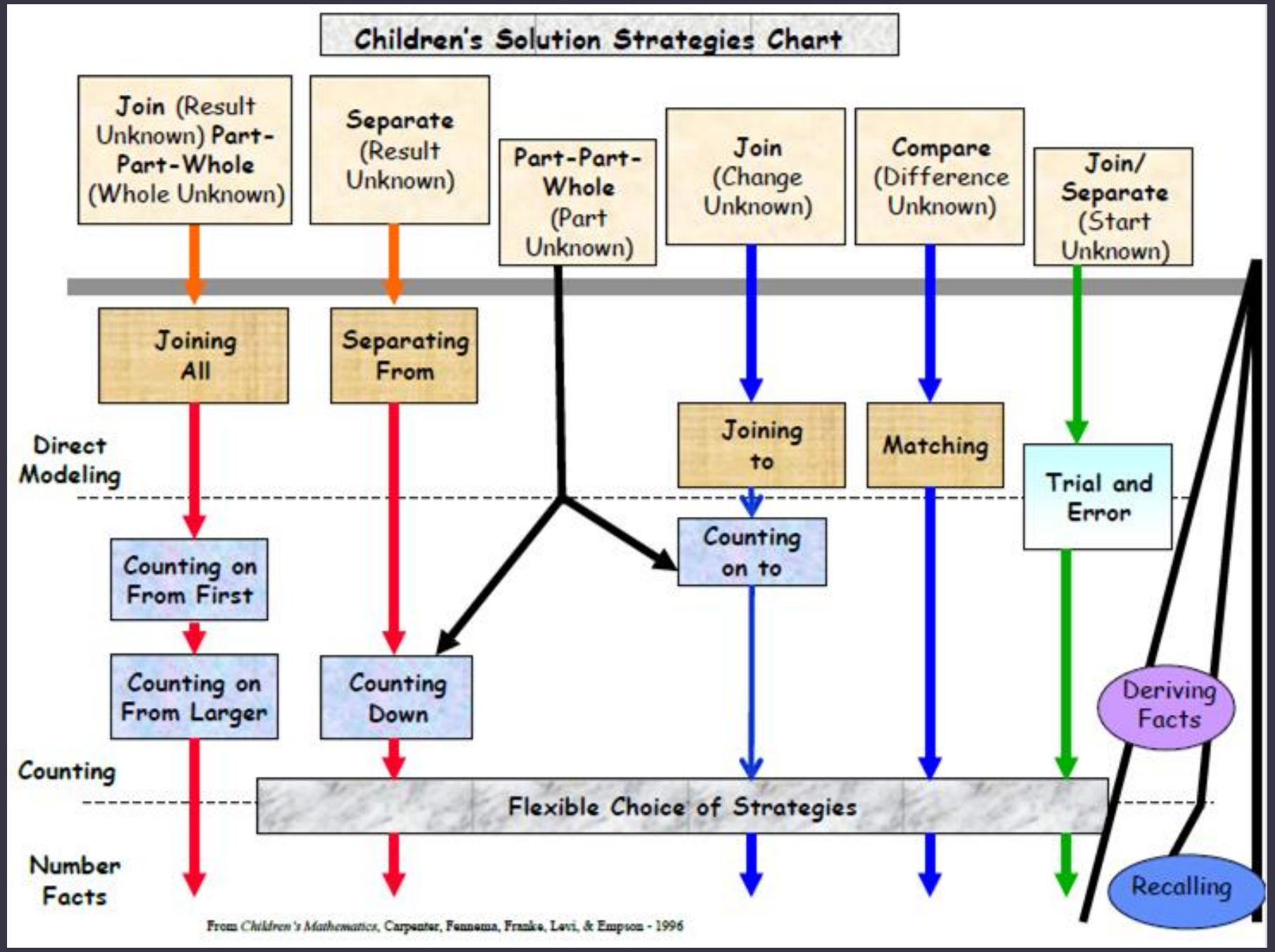
- Plan task selection/problem type to engage students, elicit common misconceptions, align with standard/learning goal
- Plan formative tools
- **Anticipate and order possible student strategies**



"When children have the opportunity to solve problems using their own strategies, discuss their strategies with their teacher and classmates, and discuss their classmates' strategies, the use of Derived Facts becomes even more prevalent."
-Carpenter and Moser 1984

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Coach Role

- **Planning document(s)**
- Facilitate conversation so ***all*** teachers have say/commitment
- Question vs Telling

Date _____ Task/Problem Type _____

Representation/Strategies *Anticipate* likely responses to a challenging task/problem. *Monitor* and add any unanticipated strategies.	**Posing Questions to Move the Math Thinking Forward**		**Sequence/Order** *Select* the strategies you will present during whole group discussions. *Sequence* the order of student presentations.	**Connect Strategies** What questions can you ask to help students make connections between the strategies?	**Who?** Names of students
	Assessing Questions - Intended to assess what a student knows and is able to do; helps make thinking visible.	**Advancing Questions** – Intended to help move a student's thinking forward or to explore the underlying concept(s) more deeply.			
Strategy:					
Strategy:					
Strategy:					
Strategy:					
Strategy:					

Adapted from *5 Practices for Orchestrating Productive Mathematics Discussions* by M. Smith & M. Stein, 2018

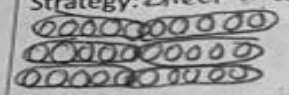
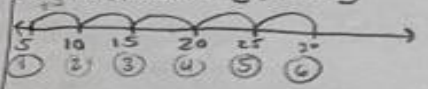
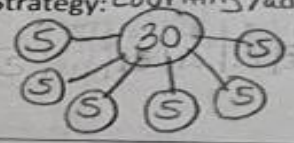
"Decisions about what problem to pose, what numbers to use, what questions to ask, who to ask, whose idea to share, whose idea could be connected to the strategy shared all can be supported by your knowledge of the development of children's mathematical thinking."

-Children's Mathematics, Cognitively Guided Instruction

How would you expect a first grade student to solve this problem?

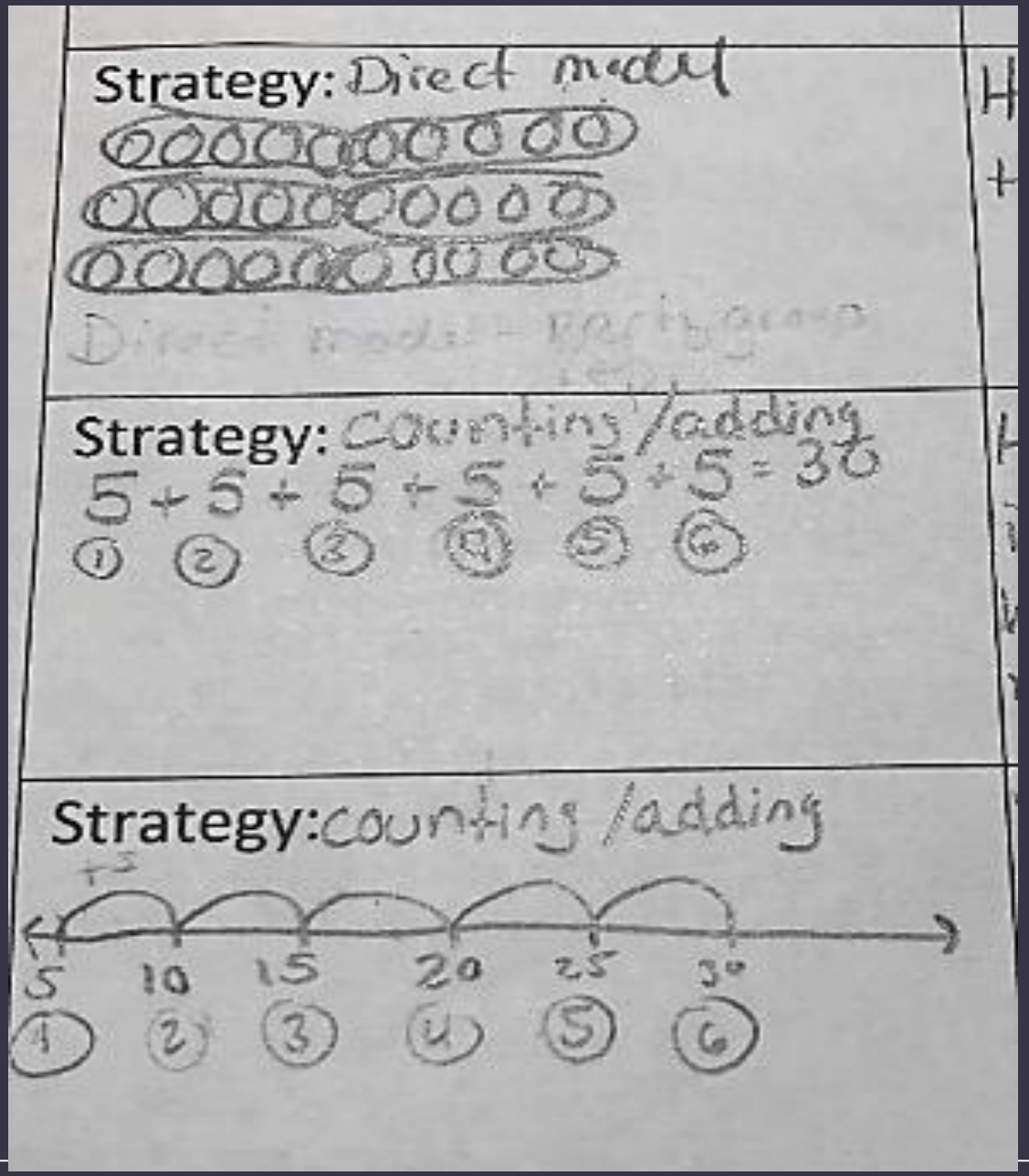
Ms. Davis has 30 pieces of candy. She wants to put 5 pieces of candy in a bag. How many bags can she fill?

Date 10/11/19 Task/Problem Type Measurment Div.

Representation/Strategies *Anticipate* likely responses to a challenging task/problem. *Monitor* and add any unanticipated strategies.	Posing Questions to Move the Math Thinking Forward: Assessing Questions - Intended to assess what a student knows and is able to do; helps make thinking visible.	Posing Questions to Move the Math Thinking Forward: Advancing Questions – Intended to help move a student's thinking forward or to explore the underlying concept(s) more deeply.	Sequence/Order *Select* the strategies you will present during whole group discussions. *Sequence* the order of student presentations.	Connect Strategies What questions can you ask to help students make connections between the strategies?	Who? Names of students
Strategy: Direct model 	How did you count that?	Can you use a number sentence to represent your drawing?	1	where do you see the groups of 5?	
Strategy: counting/adding 5+5+5+5+5+5=30 ① ② ③ ④ ⑤ ⑥	How did you know it was 6 bags? What do the circled numbers represent?	Could you write a different equation? Is there a different way to represent the story?	2	Why are the numbers above your groups different?	
Strategy: counting/adding 	Why did you count by fives? How did you get your solution?	Is there a different way you can represent your groups? What does the 3 under the 15 represent?	3	Can you write a statement to describe your strategy?	
Strategy: counting/adding 	What does each circle represent?	can you represent that with an equation?			Jaycey
Strategy: 30-5=25	Will you tell me your thinking?	How much candy did Ms. Davis have? How many pieces go in each bag? What does it say you have to do with the candy? Could you make another bag of 5?			

Adapted from *5 Practices for Orchestrating Productive Mathematics Discussions* by M. Smith & M. Stein, 2018

Teacher Moves:
Why do you think the teacher selected these strategies as (possible) ones to share?

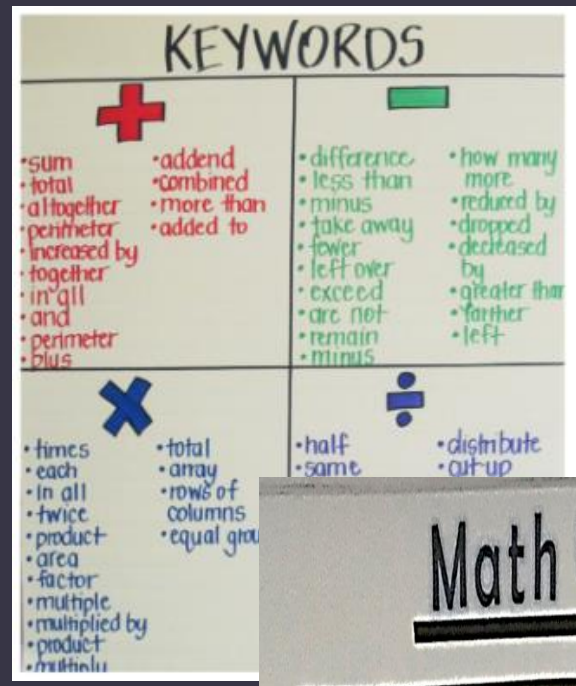


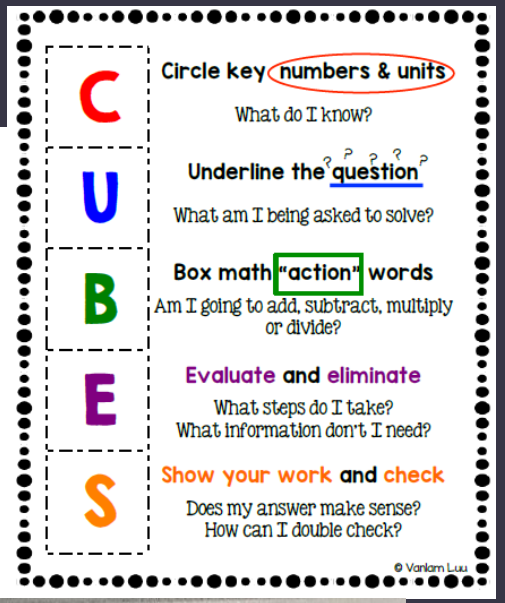
INSTRUCTIONAL MOVES

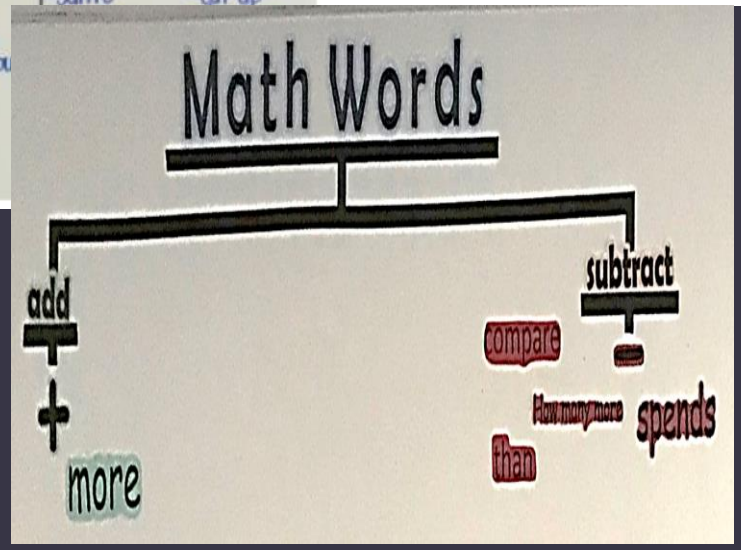
Teacher Moves in Instruction

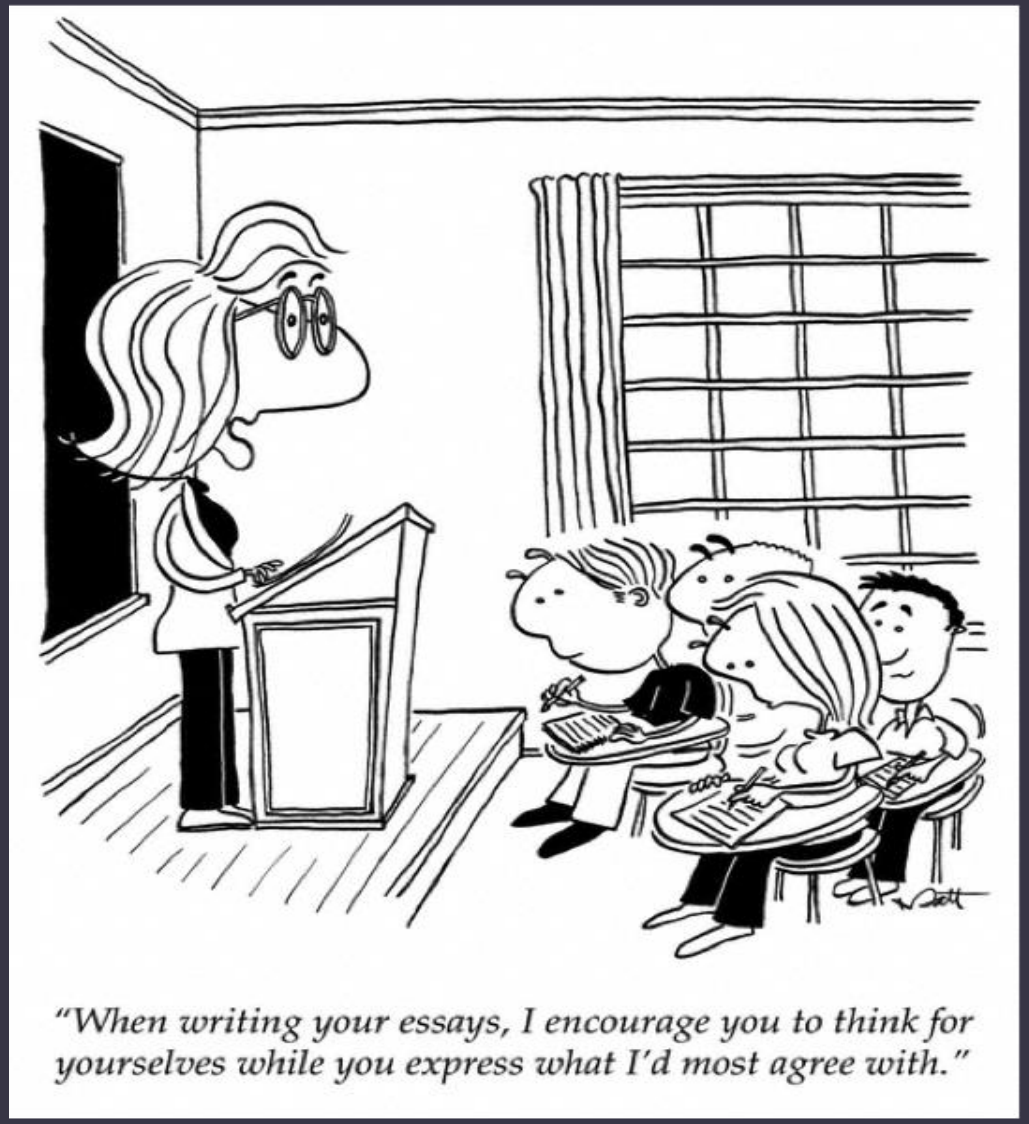
Before

- I do, we do, you do (Teacher talks and explains, students mimic teacher)
- Students are to solve the way teacher demonstrates
- Drill and practice, memorize processes
- Key words/dissecting word problems using "CUBES" to understand
- Timed math fact tests
- Students who are able to answer correctly share.









"When writing your essays, I encourage you to think for yourselves while you express what I'd most agree with."

Teacher Moves in Instruction

After

- Teachers pose problems to students without first teaching students how to solve the problem.
- Teachers expect that students will use different strategies to solve the problem.
- Different students use different strategies to solve the same problem.
- The teacher asks questions to understand students thinking.
- Multiple students share their thinking/strategies.
- The teacher supports students in using their own strategy.
- Students listen to each other's strategies. (sentence frames as needed)
- The teacher supports students to think about each other's ideas and make connections between strategies.
- Focus on developing critical thinking skills/problem solving.

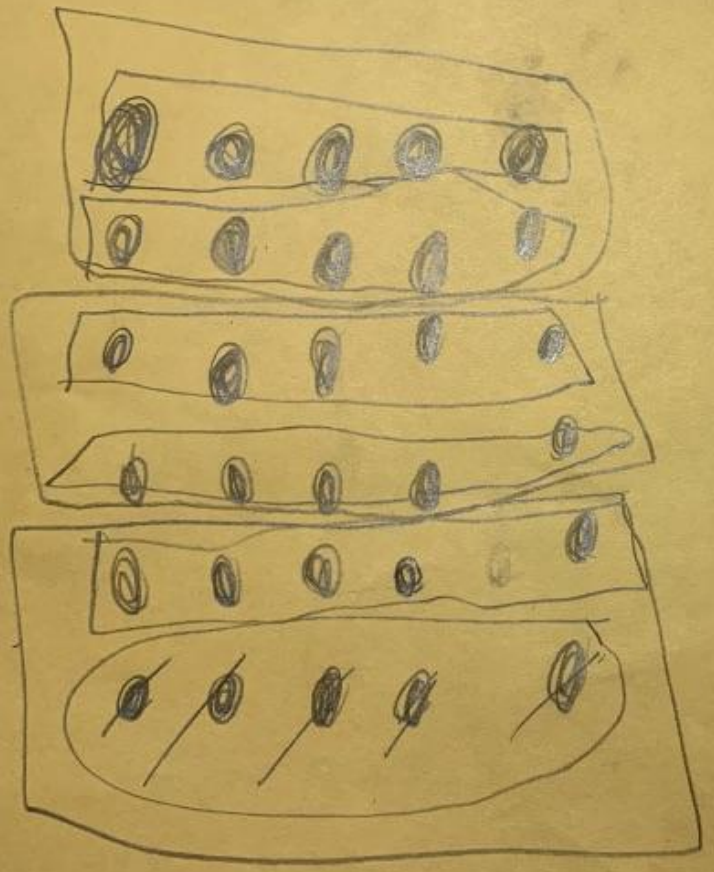
Coach Role

- Modeling
- Learning Walks
- Feedback
- Coaching in the moment
- Make time to be in classrooms with teachers

Look over the 1st grade student work.

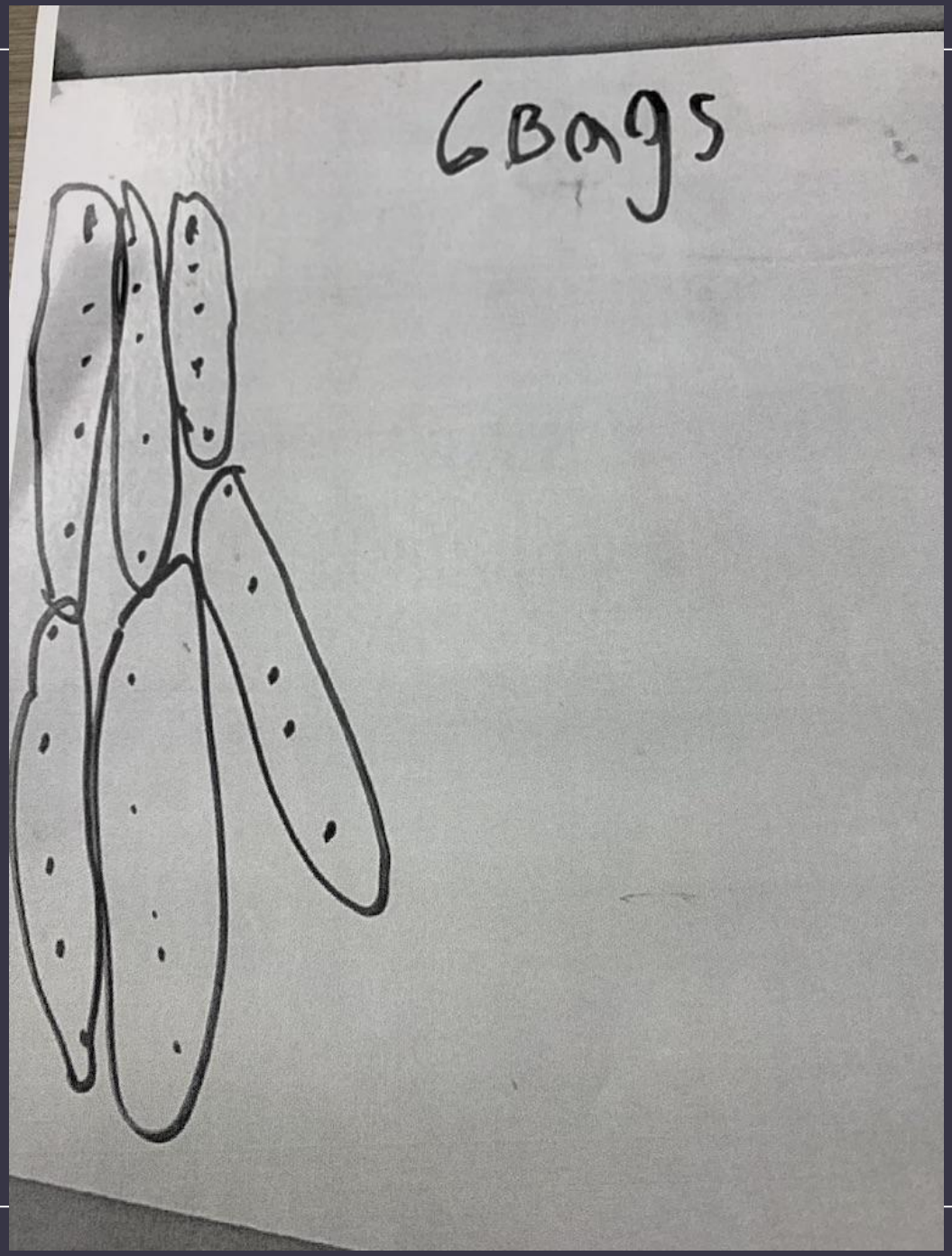
1. Were there any strategies you did not identify?
2. Would you select any of those strategies to share?
3. Are there any additional strategies you would like students to make connections between?
4. Did you learn anything new about students' math thinking?

30 - 5 = 26

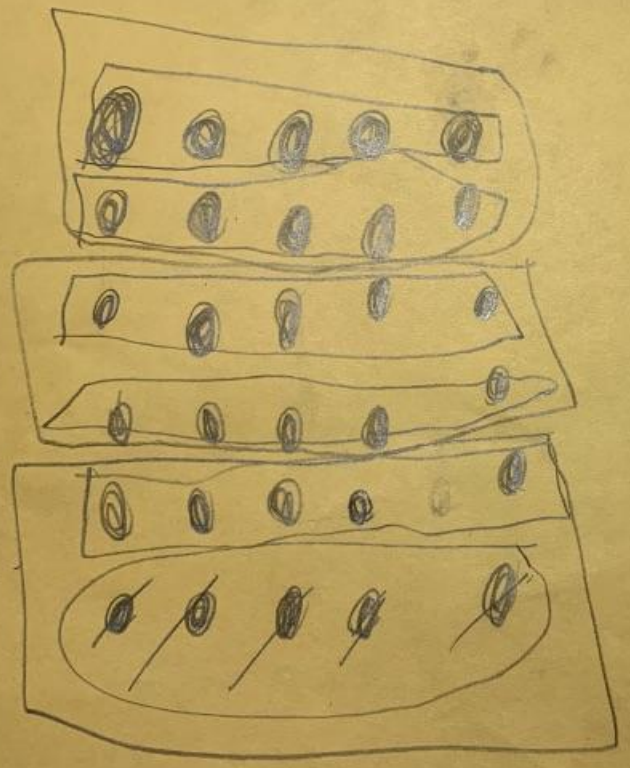


She can fill 26

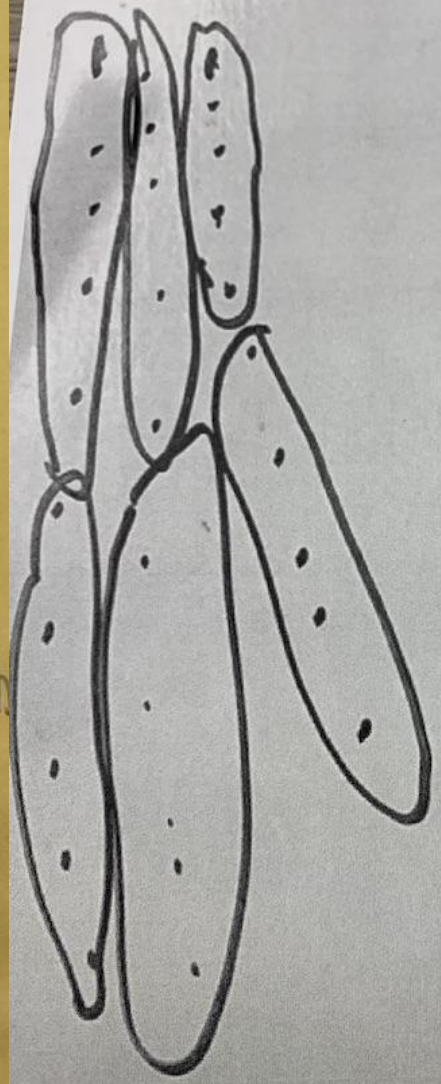
30

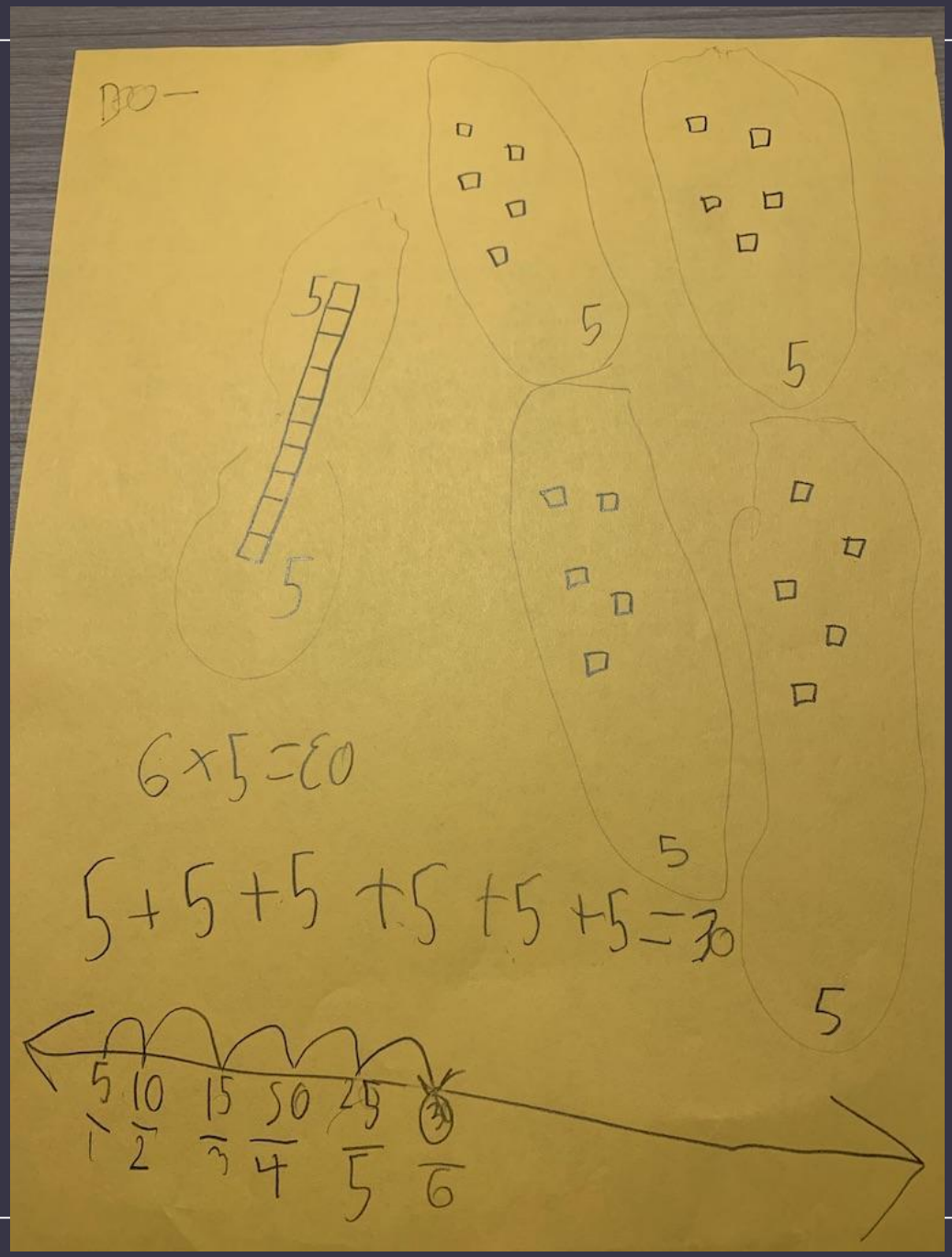

6 Bags

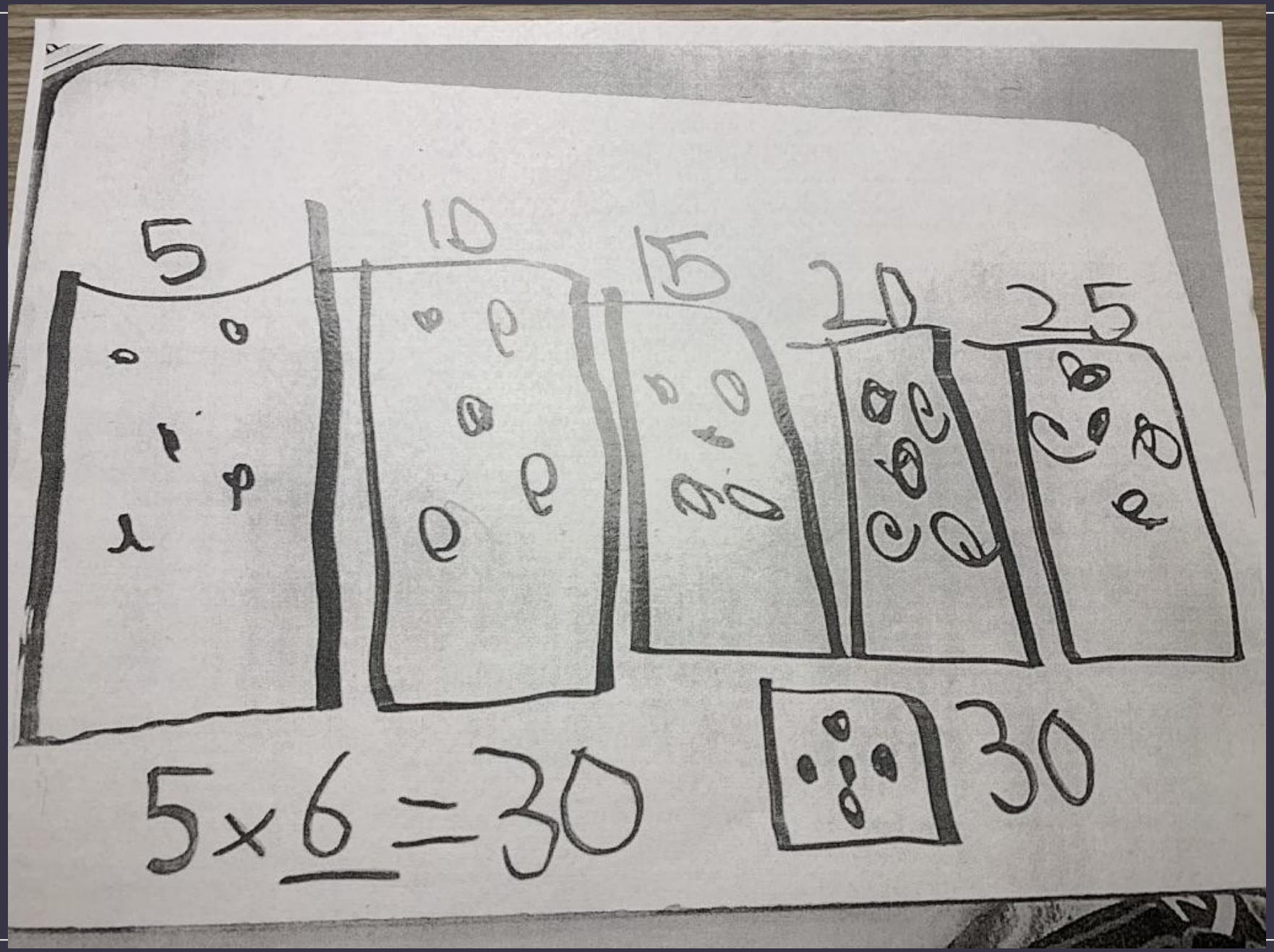
30 - 5 = 26

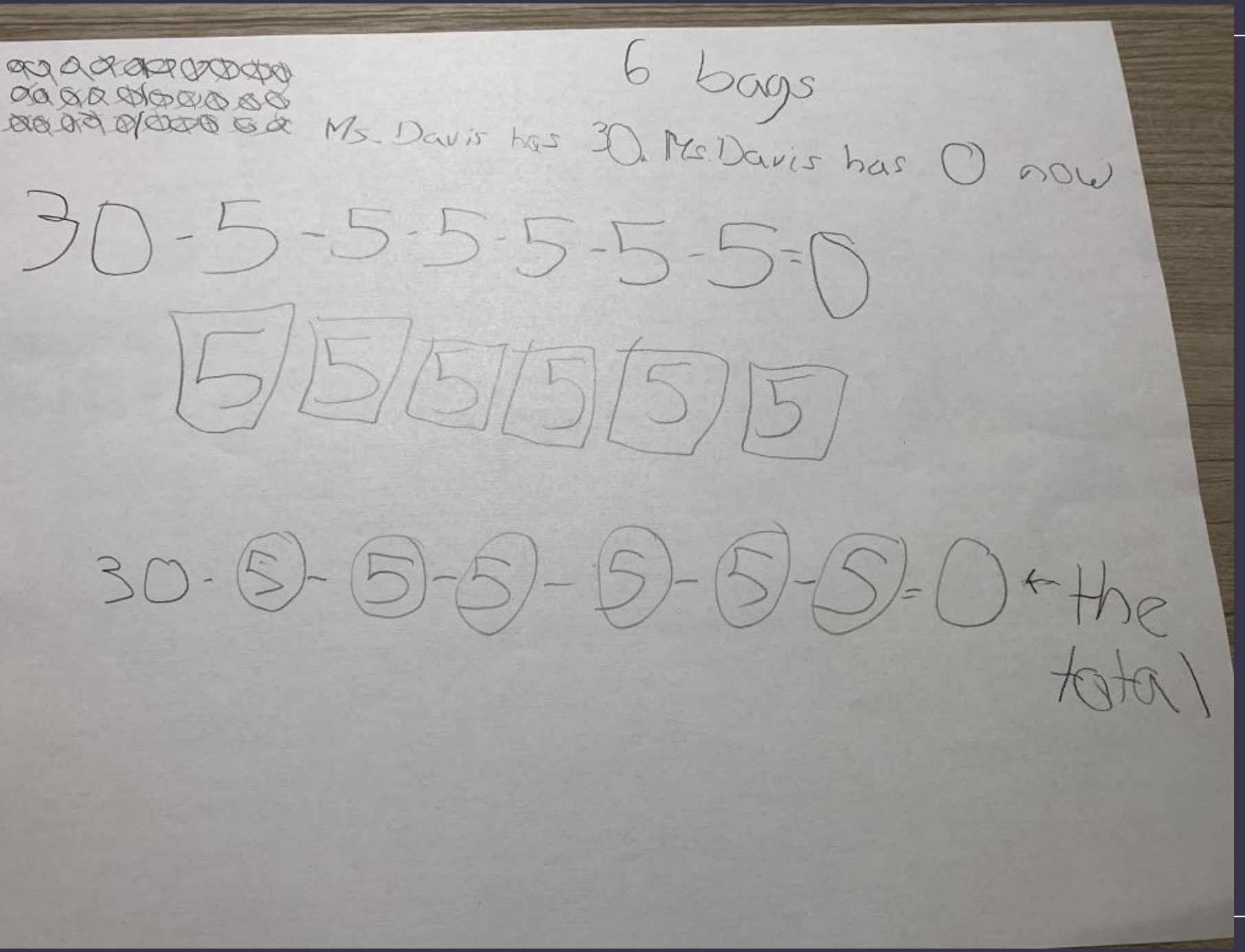


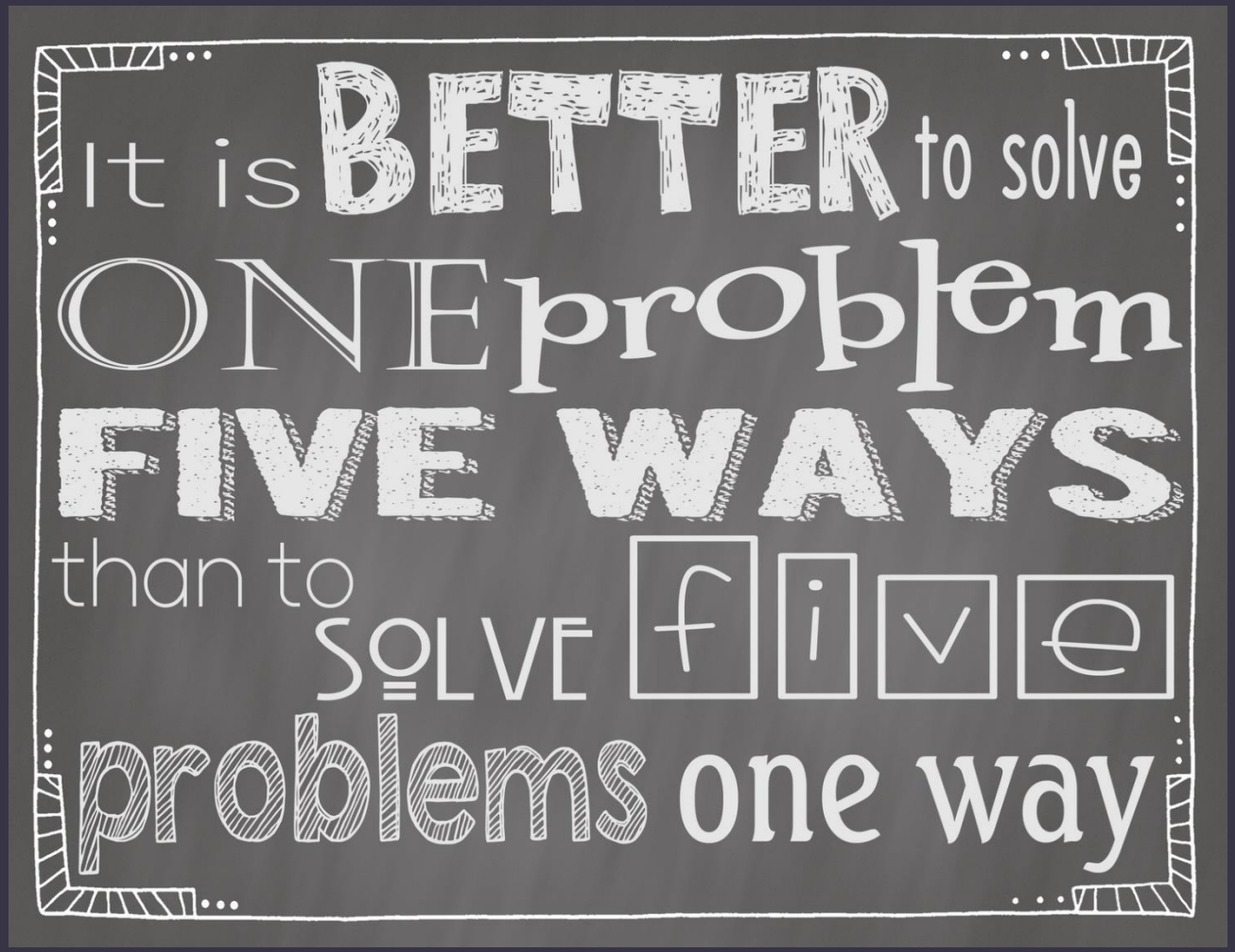
6 Bags




5
5
5
5
5
6×5=30
5+5+5+5+5+5=30
5
5 10 15 20 25 30
1 2 3 4 5 6


5
10
15
20
25
30
5×6=30


6 bags
Ms. Davis has 30. Ms. Davis has 0 now
30-5-5-5-5-5-5=0
5 5 5 5 5 5
30-5-5-5-5-5-5=0 ← the total



"Research shows that when students are expected to describe their strategies in detail with the teacher and with each other, they demonstrate higher mathematical achievement (see Webb et al. 2008 and 2009).
-Children's Mathematics, Cognitively Guided Instruction


MEASURE
ANALYSIS
ASSESSMENT
EVALUATION
PLAN
RESULT
RESEARCH

Teacher Moves in Assessment

Before

- Weekly assessments
- Assess use of particular strategy
- Assess answer only
- Give test from the book
- Class average

After

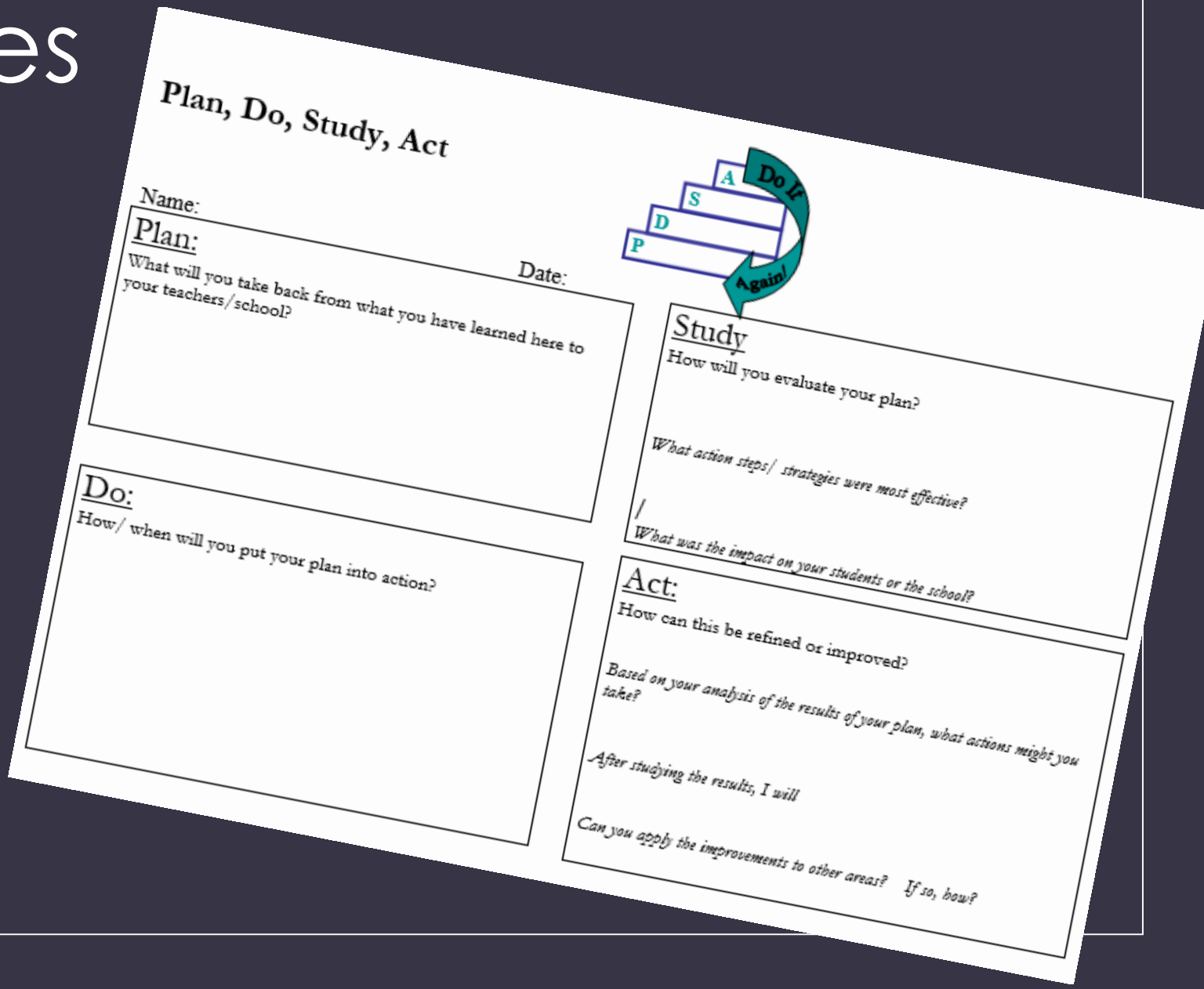
- Daily formative assessments, summative when needed
- Assess understanding and valid problem solving
- Look at use of strategy
- Use of rubrics
- Analyze tests and change to align to standards
- Proficiency of skill/standard

Coach Role

- Standard alignment
- Facilitate conversation/data chats using protocols so all teachers have say/commitment

Plan Your Moves

- What will you take back to your teachers/school?
- How/when will you put your plan into action?




Any Questions?