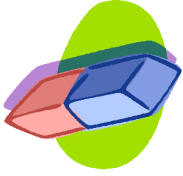
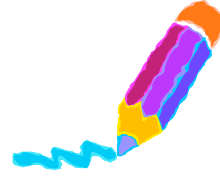


**2<sup>nd</sup> grade****Task 2****Pencils and Erasers**

<b>Student Task</b>	Find the amounts of money spent at the teacher's store. Determine what items could have been purchased for \$.60.
<b>Core Idea 2 Number Operations</b>	<b>Understand the meanings of operations and how they relate to each other, make reasonable estimates, and compute fluently</b> <ul style="list-style-type: none"><li>• Demonstrate fluency in adding and subtracting whole numbers</li><li>• Communicate reasoning using pictures, numbers and/or words.</li></ul>
<b>Core Idea 1 Number Properties</b>	<b>Understand numbers, ways of representing numbers, relationships among numbers, and number systems</b> <ul style="list-style-type: none"><li>• Understand whole numbers and use them in flexible ways such as relating, composing, and decomposing numbers</li><li>• Communicate reasoning using pictures, numbers and/or words.</li></ul>



# Pencils and Erasers



**Leticia's teacher sells erasers for 15¢ and pencils for 10¢.**

1. On Monday, Leticia bought 1 eraser and 2 pencils.

How much did she spend on the eraser? \_\_\_\_\_

How much did she spend for two pencils? \_\_\_\_\_

How much did she spend all together? \_\_\_\_\_

2. On Tuesday, Leticia bought 4 things from her teacher.  
What did she buy?

1.

2.

3.

4.

How much did she spend to buy these four things? \_\_\_\_\_

**Remember:**

**Leticia's teacher sells erasers for 15¢ and pencils for 10¢.**

3. On Wednesday, Leticia spent 60¢. What did she buy?  
Show how you figured out that she spent 60¢.

Pencils and Erasers		Grade 2		Rubric	
The core elements of the performance required by this task are: <ul style="list-style-type: none"> <li>• Demonstrate fluency in adding and subtracting whole numbers.</li> <li>• Understand whole numbers and use them in flexible ways such as relating, composing, and decomposing numbers.</li> <li>• Communicate reasoning using pictures, numbers and/or words.</li> </ul>					
Based on these credit for specific aspects of performance should be assigned as follows				points	section points
1	Gives these three answers:  One eraser costs <b>15¢</b>  Two pencils cost <b>20¢</b>  She spent <b>35¢</b> altogether	<b>1</b>  <b>1</b>  <b>1ft</b>			<b>3</b>
2	Lists <b>four</b> permutations of pencils and/or erasers  Gives the correct total for the four items: 4 erasers <b>60¢</b> 3 erasers, 1 pencil <b>55¢</b> 2 erasers, 2 pencils <b>50¢</b> 1 eraser, 3 pencils <b>45¢</b> 4 pencils <b>40¢</b>  cent sign is not required	<b>1</b>  <b>1ft</b>			<b>2</b>
3	Shows work <b>such as</b> :  Lists items totally 60¢ <b>4 erasers</b> or <b>6 pencils</b> or <b>3 pencils and 2 erasers</b>  Shows work <b>such as</b> : <b>15¢+ 15¢+15¢+ 15¢</b> or <b>10¢+ 10¢+10¢+ +10¢+ 10¢+ 10¢</b> or <b>10¢+ 10¢+10¢+15¢+ 15¢</b> cent sign is not required	<b>1</b>  <b>1</b>			<b>2</b>
<b>Total Points</b>					<b>7</b>

## Looking At Student Work – Pencils and Erasers:

The key to success with this task is to use the information given to solve all three subsequent parts. 37% of our students were able to meet all the demands of this task. In part 1, Student A gives the correct answers and shows how she arrived at the answers. In part 2, Student A gives the answers and provides justification for the answers. In part 3, not only are the answers and calculations given but an explanation of the process as well.

### Student A



## Pencils and Erasers



**Leticia's teacher sells erasers for 15¢ and pencils for 10¢.**

1. On Monday, Leticia bought 1 eraser and 2 pencils.

How much did she spend on the eraser? 15¢ ✓

How much did she spend for two pencils?  $20¢ + 10¢$  ✓

How much did she spend all together?  $35¢$  ✓

$$\begin{array}{r} 20¢ \\ + 15¢ \\ \hline 35¢ \end{array}$$

2. On Tuesday, Leticia bought 4 things from her teacher.  
What did she buy?

1. eraser ✓
2. eraser ✓
3. pencil
4. pencil

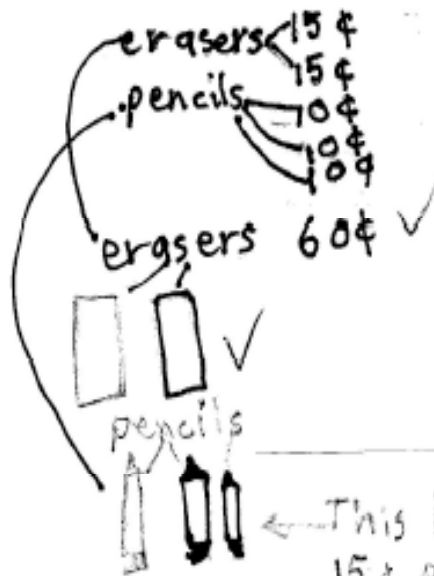
How much did she spend to buy these four things? 50¢

$$\begin{array}{r} 15¢ \\ + 15¢ \\ + 10¢ \\ + 10¢ \\ \hline 50¢ \end{array}$$

**Remember:**

**Leticia's teacher sells erasers for 15¢ and pencils for 10¢.**

3. On Wednesday, Leticia spent 60¢. What did she buy?  
Show how you figured out that she spent 60¢.



← This is an adding problem.  
15¢ plus 15¢ plus 10¢ plus 10¢ plus 10¢  
60¢ You need to regroup.

In Student B's work we again see correct calculations and arithmetic proof. There is, however, an error in notation that is frequently seen in work throughout all grades.

Student B



## Pencils and Erasers



Leticia's teacher sells erasers for 15¢ and pencils for 10¢.

1. On Monday, Leticia bought 1 eraser and 2 pencils.

How much did she spend on the eraser? 15¢ ✓

How much did she spend for two pencils? 20¢ ✓

How much did she spend all together? 35¢ ✓

$$\begin{array}{r} 15¢ \\ + 20¢ \\ \hline 35¢ \end{array}$$

$$\begin{array}{r} 10¢ \\ + 10¢ \\ \hline 20¢ \end{array}$$

2. On Tuesday, Leticia bought 4 things from her teacher.  
What did she buy?

1. pencil
2. pencil ✓
3. eraser ✓
4. eraser

How much did she spend to buy these four things? 50¢

$$\begin{array}{r} + 30¢ \\ + 20¢ \\ \hline 50¢ \end{array}$$

$$\begin{array}{r} 15¢ \\ + 15¢ \\ \hline 30¢ \end{array}$$

$$\begin{array}{r} 10¢ \\ 10¢ \\ \hline 20¢ \end{array}$$

In part 3, Student B has an “EQ” error – an equation error in that the parts between equal signs are not equal. Our work will need to focus on correct notation of partial sum additions such as:

$$15 + 15 = 30$$

$$30 + 15 = 45$$

$$45 + 15 = 60$$

**Remember:**

**Leticia’s teacher sells erasers for 15¢ and pencils for 10¢.**

3. On Wednesday, Leticia spent 60¢. What did she buy? *4 erasers*  
Show how you figured out that she spent 60¢.

$$15 + 15 = 30 + 15 = 45 + 15 = 60$$

*Eq*

Student C also met all the demands of this task. In addressing part 3, Student C used the work he had done in part 2 to correctly find an answer for part 3.

**Student C**

2. On Tuesday, Leticia bought 4 things from her teacher.  
What did she buy?

1. Pencils
2. eraser
3. eraser
4. pencils

How much did she spend to buy these four things?

50¢ ✓

Pencils 10¢ +10¢ ----- 20¢	Eraser 15¢ +15¢ ----- 30¢	Eraser 30¢ +20¢ ----- 50¢
--	---------------------------------------	---------------------------------------

teacher

**Remember:**

Leticia's teacher sells erasers for 15¢ and pencils for 10¢.

3. On Wednesday, Leticia spent 60¢. What did she buy?  
Show how you figured out that she spent 60¢.

On my other I got 50¢ ✓  
and here I need to add 10¢  
equiling 60¢ (Pencil)

1. Eraser
2. eraser
3. Pencil ✓
4. pencil
5. pencil

The work of Student D shows the strategies she used to add the amounts together to achieve correct calculations. This work also illustrates a common mistake in part 1 – that of not doubling the cost of one pencil to arrive at the cost for two pencils.

**Student D**



## Pencils and Erasers



**Leticia's teacher sells erasers for 15¢ and pencils for 10¢.**

1. On Monday, Leticia bought 1 eraser and 2 pencils.

How much did she spend on the eraser? 15¢ ✓

How much did she spend for two pencils? 10¢ ✗

How much did she spend all together? 25¢ ✓

$$10¢ + 5¢ = 15¢$$

$$15¢ + 10¢ = 25¢$$

While part 2 allows for students to simply give an answer for the total cost of four items, part 3 requires some proof or justification of how 60 cents was spent. Student E correctly draws two erasers and three pencils which names a correct combination but does not complete the constraint of showing the work.

**Student E**

2. On Tuesday, Leticia bought 4 things from her teacher.  
What did she buy?

- 1.
- 2.
- 3.
- 4.

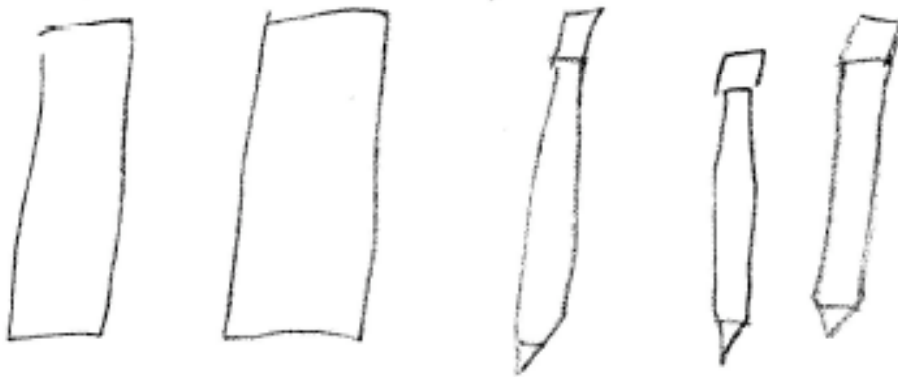


How much did she spend to buy these four things? 50

**Remember:**

**Leticia's teacher sells erasers for 15¢ and pencils for 10¢.**

3. On Wednesday, Leticia spent 60¢. What did she buy?  
Show how you figured out that she spent 60¢.



Students F and G have complete work and have followed the constraints of each part of the task. They have, however, made common calculation errors around regrouping. It appears that Student F is mixing up the algorithms for addition and subtraction when regrouping and that Student G lost a ten while adding.

**Student F**

2. On Tuesday, Leticia bought 4 things from her teacher.  
What did she buy?

1. pencil
2. pencil
3. pencil ✓
4. eraser

$$\begin{array}{r}
 30 \\
 + 15 \\
 \hline
 55
 \end{array}$$

How much did she spend to buy these four things? 55¢

**Student G**

2. On Tuesday, Leticia bought 4 things from her teacher.  
What did she buy?

1. Pencils
2. Erasers that ✓
3. pencil holder things and ✓
4. Erasers

How much did she spend to buy these four things? 40¢

$$\begin{array}{r}
 15 \\
 + 10 \\
 \hline
 25
 \end{array}
 \quad
 \begin{array}{r}
 10 \\
 + 10 \\
 \hline
 20
 \end{array}
 \quad
 \begin{array}{r}
 25 \\
 + 25 \\
 \hline
 40
 \end{array}$$

For many students, following the constraints of each part of this task proved difficult. Student H and I struggled with listing four items. Student H decided to buy five items and incorrectly added the amounts. Student I decided that three items were enough and chose “nothing” for the fourth item. The total was correct for the three items.

Student J used a creative approach in part 2 to choose four items and gave a correct total. Rather than addressing the part 3 question, the proof for part two was given there.

**Student H**

2. On Tuesday, Leticia bought 4 things from her teacher. What did she buy?

1. 1 eraser
2. 2 pencils
3. 1 pencil
4. 1 eraser

How much did she spend to buy these four things? 55¢ X



**Student I**

2. On Tuesday, Leticia bought 4 things from her teacher. What did she buy?

1. Eraser
2. Eraser
3. Eraser
4. nothing

How much did she spend to buy these four things? 45¢ ✓

**Student J**

2. On Tuesday, Leticia bought 4 things from her teacher.  
What did she buy?

1. brown pencil for 10¢
2. blue pencil for 10¢ ✓
3. red eraser that cost 15¢
4. colorful eraser for 15¢

How much did she spend to buy these four things? 50¢ ✓

**Remember:**

**Leticia's teacher sells erasers for 15¢ and pencils for 10¢.**

3. On Wednesday, Leticia spent 60¢. What did she buy? *she bought*  
Show how you figured out that she spent 60¢. *two pencils and two erasers.* ✗

$$\begin{array}{r} 10¢ \\ + 10¢ \times \\ + 15¢ \\ + 15¢ \\ \hline 50¢ \end{array}$$



23% of our students were unable to meet standards on this task. About half of the students were able to answer the first part of this task but struggled with part 2 and part 3. Some, like Student K and L, represented four items either with pictures or words, but could not find correct totals for these four items nor for a solution path to 60 cents for part 3. Many students' work, like that of Student M, shows confusion between 60 cents and 60 items.

**Student K**



## Pencils and Erasers



Leticia's teacher sells erasers for 15¢ and pencils for 10¢.

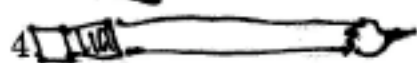
1. On Monday, Leticia bought 1 eraser and 2 pencils.

How much did she spend on the eraser? 15¢ ✓

How much did she spend for two pencils? 20¢

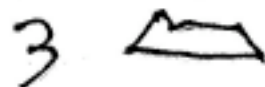
How much did she spend all together? 35 ✓

2. On Tuesday, Leticia bought 4 things from her teacher.  
What did she buy?



How much did she spend to buy these four things? 70 ✗

3. On Wednesday, Leticia spent 60¢. What did she buy?  
Show how you figured out that she spent 60¢.



Student L

2. On Tuesday, Leticia bought 4 things from her teacher.  
What did she buy?

1. pencil ✓
2. pencil
3. pencil
4. pencil

How much did she spend to buy these four things? 60¢

3. On Wednesday, Leticia spent 60¢. What did she buy?  
Show how you figured out that she spent 60¢.

I figured that out  
because the four things  
she bought was four  
pencils.

Student M

**Remember:**

**Leticia's teacher sells erasers for 15¢ and pencils for 10¢.**

3. On Wednesday, Leticia spent 60¢. What did she buy?  
Show how you figured out that she spent 60¢.

25 eraser  
10 pencils  
5 eraser  
10 pencils  
10 eraser

$$\begin{array}{r} +25 \\ 10 \\ 5 \\ 10 \\ 10 \\ \hline 60 \end{array}$$

In approximately 13% of 2<sup>nd</sup> graders work, there was little if any relationship between the questions posed and the answers given. In the work of Student N it is difficult to see a relationship between the answers in part one and the information given to solve those three questions. It is interesting to ask - Where did the 20 and 51 cents come from? and Did Leticia spend 35 cents or 71 cents altogether? Parts two and three reflect a similar disconnect between the items, their cost and the total. Student O answers part one with costs of 1, 2, and 3. In adding up four (or more) items, the eraser costing one cent, the pencil(s) costing two cents and toys and candy costing 50 cents, Student O correctly adds these partial sums to get 103 cents. Part 3, shows some addition but does not answer how 60 cents was spent. Again, little of the work answers the constraints of each part of the task.

**Student N**



**Pencils and Erasers**



**Leticia's teacher sells erasers for 15¢ and pencils for 10¢.**

1. On Monday, Leticia bought 1 eraser and 2 pencils.

How much did she spend on the eraser? 20¢ ✗

How much did she spend for two pencils? 51¢ ✗

How much did she spend all together? 35¢ ✓

$$\begin{array}{r} 51¢ \\ 20¢ \\ \hline 71¢ \end{array}$$

2. On Tuesday, Leticia bought 4 things from her teacher. What did she buy?

1. 2 erasers ✓

2. 2 pencils

3.

4.

$$\begin{array}{r} 24 \\ +43 \\ \hline 67¢ \end{array} \quad \text{✗}$$

How much did she spend to buy these four things? 67¢

Student O



## Pencils and Erasers



Leticia's teacher sells erasers for 15¢ and pencils for 10¢.

1. On Monday, Leticia bought 1 eraser and 2 pencils.

How much did she spend on the eraser? 1 x

How much did she spend for two pencils? 2 x

How much did she spend all together? 3 x

- 
2. On Tuesday, Leticia bought 4 things from her teacher.  
What did she buy?

1. eraser 0

2. pencils 2 x

3. toys 50¢

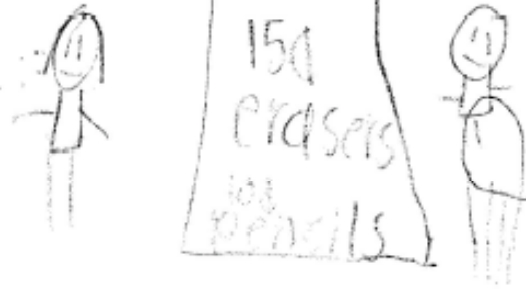
4. candy 50¢

How much did she spend to buy these four things? 103  $\frac{1}{2}$ ¢

3. On Wednesday, Leticia spent 60¢. What did she buy?  
Show how you figured out that she spent 60¢.

She is buying x 0  
erasers and pencils

$$\begin{array}{r} 60 \\ + 60 \\ \hline 120 \times \end{array}$$



**Teacher Notes:**

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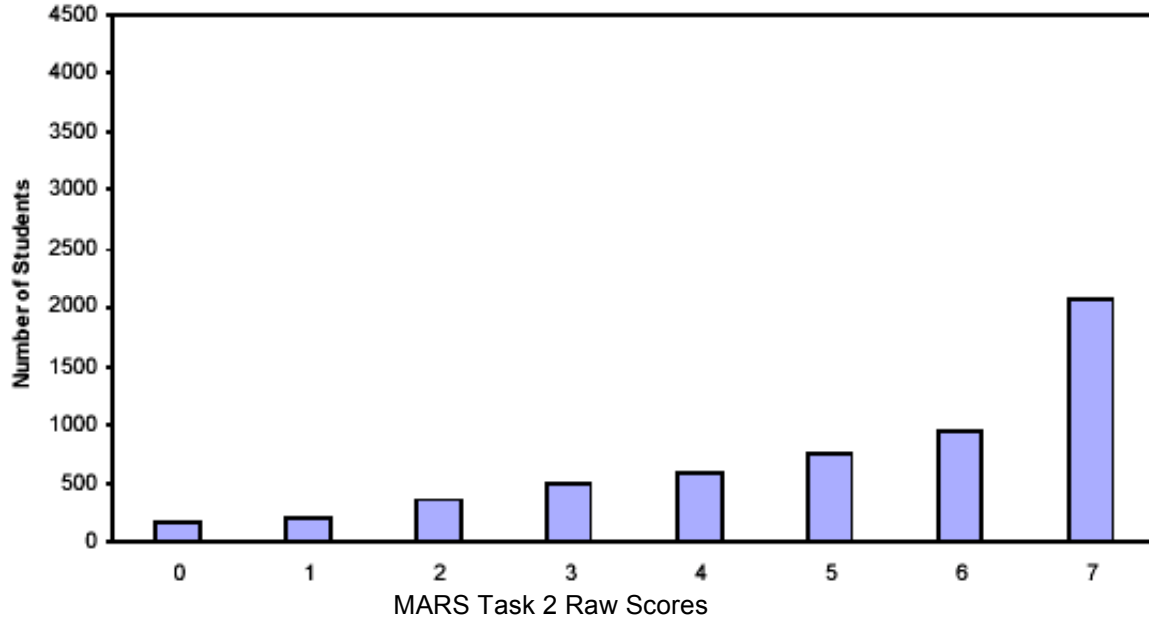
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## Frequency Distribution for Task 2 – Grade 2 – Pencils and Erasers

### Pencils and Erasers

Mean: 5.14      StdDev: 2.00



Score:	0	1	2	3	4	5	6	7
Student Count	169	201	357	495	580	747	946	2065
% < =	3.0%	6.7%	13.1%	22.0%	32.4%	45.8%	62.9%	100.0%
% > =	100.0%	97.0%	93.3%	86.9%	78.0%	67.6%	54.2%	37.1%

The maximum score available for this task is 7 points.

The cut score for a level 3 response is 4 points.

More than half of the students (58%) could find four items that exactly totaled 60 cents. 52% of the students could justify how the 60 cents was spent using words, pictures, and/or numbers. 78% of the student met the essential demands of the task including doubling single amounts and finding the sums of three and four items. Only 3% of the students scored no points on this task. 100% of the students attempted this task.

## Pencils and Erasers

Points	Understandings	Misunderstandings
<b>0</b>	100% of students attempted this problem.	The most common error was for students to have chosen answers that did not correlate with the information given.
<b>1</b>	Most students were able to answer at least one of the three beginning questions regarding the cost of an eraser, two pencils or the total.	The initial information on the cost of pencils and erasers was often ignored and substituted with other prices.
<b>2 - 3</b>	Many students answered at least two out of the three first questions and listed four items to purchase.	Students struggled to only list only four items or to only choose from pencils and erasers. Errors were made in computation. Students had difficulty in finding items to exactly total 60 cents.
<b>4 - 5</b>	Students were able to either find the four items and their correct cost or to find a correct combination of items that would cost 60 cents.	Many students struggled to correctly calculate the sum for four items. Some students ignored the need to find items that would exactly totaled 60 cents. Most did not show the solution path to this total.
<b>6 - 7</b>	Successful students showed their work and had efficient calculations that were labeled to show partial sums. Each part of their work was justified using picture, words, or number sentences. 37% of our students met all the demands of this task.	Most frequently, students did not show the solution path asked for in finding items to total exactly 60 cents.

***Based on teacher observations, this is what second grade students seemed to know and be able to do:***

*Areas of difficulty for second graders, students struggled with:*

- Addition computation
- a strategy for finding items to total 60 cents
- Using correct prices – 10 cents and 15 cents
- Finding the cost for two pencils
- Use given constraints to answer the questions
- Misunderstood that they could only buy pencils and erasers. Some created their own items
- Knowing that the answers needed to reflect the information given
- Notation for coinage

*Strategies used by successful students:*

- Show their work using number sentence and/or pictures
- Justified their answer using pictures, numbers and/or words
- Mix and match items to come to correct totals
- Used trial and error to come to an answer
- Could identify how much an eraser and a pencil and use addition or multiplication to add up total amount of items
- Could find the sum of two items

**Questions for reflection on Pencils and Erasers**

- What kinds of experiences have your students had with solving problems?
- Do they solve problems as a whole class, in small groups and/or individually?
- What tools are available for problem solving?
- What types of questions do your students answer that focus on understanding the problem before getting to work on the task?
- What opportunities do students have to restate the problem in their own words?
- Do students understand all the expectations for solving problems?
- What guidelines do your students have for explaining or defending their answers?
- Do students have opportunities to develop their own problem solving strategies?
- What opportunities do students have to resolve the problem using their own methods?
- How often do your students talk about their thinking and doing of math? Do they discuss this with you as well as with their peers?
- Are students encouraged to ask questions of other students' strategies and solutions?
- Do students believe that they can make sense of mathematics?

**Teacher Notes:**

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### **Implications for Instruction:**

Understanding should be a goal of all mathematics we teach. Problem solving provides opportunities for our students to focus attention on mathematic ideas and sense making. Successful students are able to use mathematical concepts and procedures to give efficient, correct and justified solutions. First, students need to understand what is being asked in the math problem and identify the special factors required to solve the problem. Experiences in problem solving can be arranged individually, in pairs or in groups so that each participant has the opportunity to hear the thoughts and solutions of others and to strengthen their own skills for understanding problems. Students should be challenged to work with constraints such as those required in this task: the teacher charges 10 cents for pencils and 15 cents for erasers, you must find one way to spend exactly 60 cents. Once the constraints have been identified, they should be applied consistently and correctly. Successful students use a variety of strategies for solving problems such as drawing pictures, finding number patterns, decomposing numbers, making tables and making lists. Often, more than one strategy can be used to solve a problem. During classroom problem solving experiences, provide time for discussions around student solution strategies as well as around ways of testing, checking and proving the work. These discussions can enlarge all students' repertoire of problem solving strategies. If this approach is quite different than the textbook you are currently using, do not throw out the textbook! It can be used as a prime resource to translate or enhance the units and lessons with a problem solving approach. Using the big ideas of each unit of study, many problem solving opportunities can be adapted from the important lessons in those units.

### **Teacher Notes:**

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