

Building Problem Solving Strategies

by Leanne Luttrell

Do you want to inspire your students to love problem-solving? Have you been searching for a way to improve problem-solving skills but are overwhelmed by the materials and choices available? This set includes 18 problems that are designed to be used with other types of problems to create a year-long program for your students! We will be discussing the other types of materials to use and how to implement all of these most effectively in my blog.

These problems are challenging and introduce a variety of problem-solving strategies. Each level includes 18 problems and an answer key. Levels C, D, and E are aligned by strategy, which makes it much easier to differentiate! For example, the focus strategy of the second problem in each set is finding patterns, and the focus strategy of the 17th problem is working backwards. Read the questions and answers on the next few pages and download the free sample to decide which set is best for you!

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Building Problem Solving Strategies

What problem solving strategies are emphasized?

A chart with the focus strategies is included in this introduction. Although one problem may be solved using a variety of strategies, these are the strategies you will see listed as ‘focus strategies’:

- 🔗 Find a pattern (or predict continuing patterns)
- 🔗 Work Backwards
- 🔗 Use a picture to find an algebraic pattern (or make a table)
- 🔗 Use a Venn diagram
- 🔗 Draw a picture
- 🔗 Use bar modeling (algebraic model)

There is also one example of a visual/spatial puzzle in each set. Visit amazing-minds.com to find suggestions for places to find additional visual/spatial puzzles.

Why is ‘guess and check’ not included?

Guess and check is typically used as a strategy in elementary school when students that age do not have the knowledge to write and apply algebraic equations.

Have you used bar modeling? It is also called ‘Singapore Method of Problem Solving’. This strategy is a visual representation of algebra, and it is amazing! Although it can (and I believe it should) be introduced in elementary school, it should definitely be used in middle school. *(If you want more instruction on how to use this model, look for videos on amazing-minds.com!)*

When students understand this, ‘guess and check’ is no longer necessary.

My students used to do a ‘No More Guess and Check’ dance every time they used this strategy! Your students will love it!



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Why is 'find a simpler problem' not included?

This strategy is definitely included, but it is not listed as a focus strategy. There are several problems where taking a smaller part of the problem or using different (easier) numbers is effective and helpful! However, because this is done in addition to other strategies, the other strategies are listed as the focus. 'Find a simpler problem' might be the only focus in some application problems, but those are not included here.

What level should I purchase?

Students can start level C as early as third grade. If you are a third grade teacher, level C is my recommendation! In that level, there are two options for the first problem. One is for students who have had experience in second grade with these types of strategies, and the other is for those who have not. (Levels A and B for younger students will be available soon!)

If you teach fourth grade or above, the set that is most appropriate should be determined by the experience of your students. Level E, for example, builds on the strategies from levels C and D. The levels allow students to learn and develop true problem-solving strategies, and the challenges increase in difficulty and build on prior knowledge as students move through the levels. Fifth grade students who have not had a lot of experience or exposure to problem-solving strategies would be frustrated with level E. For fifth grade students without much exposure, I would recommend level C or D. Sixth grade could use level E problems, but for older students, I have other suggestions. You will find those in my blog! The samples included should help you determine which level is best for your students. You can always use more than one level and differentiate!



More than one strategy may be used, but the detailed solutions show these strategies.

	Strategy
1	Using pictures to find patterns (or make a table); <i>Finding a maximum or minimum is helpful!</i>
2	Finding Patterns (focus on strategies moving to algebraic patterns)
3	Working Backwards (B,C); Bar Models: Algebraic Box Drawings (D,E)
4	Visual Algebra Puzzle
5	Venn Diagram
6	Draw a picture
7	Bar Models: (algebraic box models)
8	Predicting continuing patterns (C, D); Using patterns to find solutions (E)
9	Visual Puzzles
10	Bar Models to understand difference (algebraic box models)
11	Draw a Picture; Level E could also create a table
12	Visual Algebra Puzzle
13	Use pictures to find algebraic patterns (or make a table)
14	Bar Models: (algebraic box models); <i>Level E: fraction bar model</i>
15	Venn Diagram
16	Draw a Picture (for Understanding)
17	Work Backwards
18	Drawing a Picture



Challenge 4 from level C, D, and E

Strategy:

Visual Algebra Puzzle

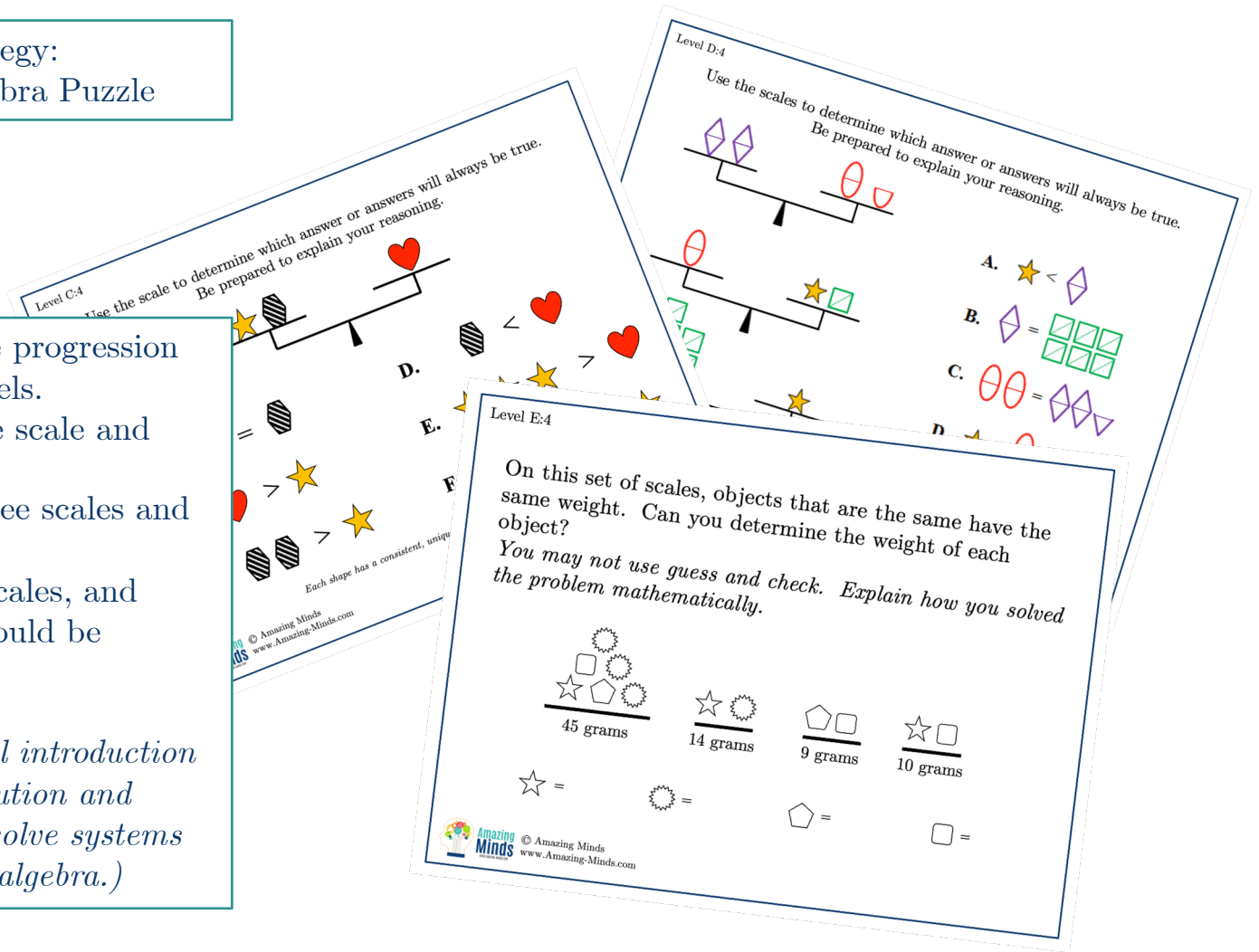
You can see the progression through the levels.

Level C has one scale and options.

Level D has three scales and given options.

Level E has 4 scales, and exact values should be determined.

(This is a visual introduction to using substitution and elimination to solve systems of equations in algebra.)



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Challenge 7 from level C, D, and E

Strategy: Bar Models

You can see the progression through the levels.

Level C has three variables (items) with no constants.
Level D has four variables (people) with one positive constant.

Level E has four variable (people) with both positive and negative constants.

(For elementary students, the negative is introduced as subtraction. Students at that age may or may not use variables, depending on their knowledge at that time.)

Rescued Rabbits

Don has an animal sanctuary for rescued rabbits! You go there to adopt a rabbit or to play with them. The rabbits are fed grass hay, vegetables, and fruit. Volunteers feed the rabbits twice as many cups of vegetables as fruit. Each day, the rabbits are fed three times as many cups of grass hay as vegetables. How many cups of each food does the rabbit get?



Level D:7

Earning Tokens

At one school, teachers gave tokens to students when they went above and beyond expectations to help others, show respect, or exhibit other positive traits. Students could use the tokens to buy prizes! Angel, Brandon, Chase and Donner had a total of 60 tokens. Donner has 3 times as many tokens as Chase. Angel had 4 more tokens than Brandon. How many tokens did each student have?

Level E:3

Fall Festival

Four friends, Melanie, Caroline, Heather, and Lisa, went to a fall festival! They all bought some of the items that were for sale in the booths. Heather spent \$3 less than Melanie. Lisa spent \$4 more than three times what Caroline spent! Melanie spent \$5 more than twice as much as what Caroline spent. They spent a total of \$93.

How much money did each friend spend at the fall festival?



Solutions

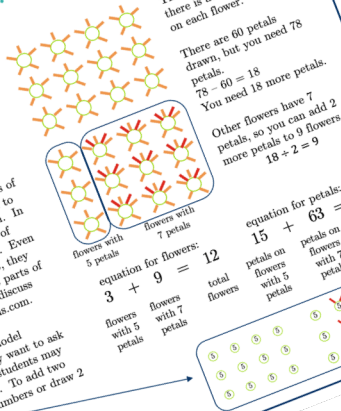
There is a short (1-2 page) answer key with each set for a quick reference.

Also included is a more detailed description of the solution.

Although there are multiple ways to solve problems, at least one solution is shown.

Problem Solving Strategies: Possible Solution Strategies

Before even trying these types of solving systems of equations, students should be asked to identify the problem. In terms of the number of equations, they are different parts of the same system. We will discuss this more as you model the problem. You may want to ask students to draw two equations. Some students may use numbers or draw 2 equations. A sample is given.



Problem Solving Strategies: Possible Solution Strategies

Students may draw one bench and 3 people without a seat.

number of benches	students in the class
1	3
2	8
3	13
4	18
5	23
6	28

When you draw another bench, the 3 do not

E: 11

One strategy for this is to draw a picture. Being able to visualize a problem is an important skill. Both are shown.

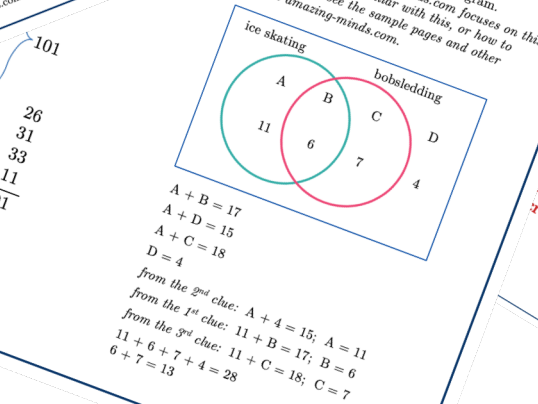
Building Problem Solving Strategies: Possible Solution Strategies

Some students may not realize they should document their work. I do not point this out to them; instead, I just

Some of your students may realize that looking for 3 times as much for crew 1, the mile for crew 2 must be a whole number. If so, they might not complete the other values.

Crew 1		Crew 2	
days	remaining miles	days	remaining miles
0	15	0	15
1	12	1	12
2	9	2	9
3	6	3	6
4	3	4	3
5	0	5	0

Note: For suggestions on solving equations with younger students, visit www.amazing-minds.com.



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Would you prefer a digital format?

When you purchase the PDF, there will be a link that allows you to copy a google slide presentation. The google slides will have all of the problems to make it easy for you to share them with your students digitally!

* Please note that the introduction and the solutions are only in the PDF.



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