

# CHAPTER 1: TEACHER/PARENT GUIDE

## PART 1: COMMON CORE STATE STANDARDS

The puzzles in this book are designed to be easily integrated into any curriculum, especially one based on the Common Core State Standards for mathematics. As recommended by the Common Core State Standards Initiative, the puzzles were created to facilitate “[connecting] the mathematical practices to mathematical content in mathematics instruction.” Each of the two areas (content and practices) will be discussed separately below, but they cannot be separated in the process of solving the puzzles.

The following chart summarizes the specific content standards covered by each type of puzzle. Puzzle types are listed in order of increasing difficulty. Standards are indicated for the recommended grade level and up.

	BTN	LS	PP	CN	KEN	AL	KAK	BZ	TF	TS
4.OA.A	XX	XX	XX							
4.NBT.A	XX	XX								
4.NBT.B	XX	XX								
5.OA.A				XX		XX				
5.NBT.A	XX	XX								
5.NBT.B	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX
6.NS.B	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX
6.EE.A.2	XX					XX			XX	
6.EE.B.5	XX	XX			XX	XX	XX	XX	XX	XX
6.EE.B.6		XX	XX	XX	XX		XX			XX
6.EE.B.7		XX	XX	XX	XX		XX	XX		XX
6.EE.B.8	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX

### Puzzle names are abbreviated as:

BTN = By the Numbers

LS = Lost Sums

PP = Picture Puzzles

CN = Cross Numbers

KEN = KenKen

AL = Addition Logic

KAK = Kakuro

BZ = Buzzippers TF = Transformers

TS = TriSquares

In my earliest experience with gifted elementary students, I learned that they master content more quickly and more effectively when it is embedded within exercises requiring reasoning. Puzzles provide the perfect format in which this mastery can take place. Each of the puzzles in this book provides practice in the content standards. And every puzzle on every page requires the use of at least one of the practice standards in order to solve it. Following is a brief discussion of how the puzzles relate to each of the Standards for Mathematical Practice.

MP1. “Make sense of problems and persevere in solving them. . . analyze. . . plan a solution path-

way. . . monitor and evaluate their progress. . . identify correspondences between different approaches.”

By their very nature, gifted children are drawn to puzzles. They enjoy the challenge of making sense of the problems and seeking a solution that requires more than simply performing calculations. Thus, they will be motivated to persevere in solving these puzzles. In addition, the “Helps” provide just enough support to enable them to persevere when the going gets tough.

Analysis and planning are essential to the solving process. The puzzle format allows the students to monitor and evaluate their own progress – if one answer is incorrect, it will impact another answer within the same puzzle. Every puzzle allows for different approaches, providing a platform for the solvers to discuss those approaches and analyze where they correspond.

MP2. “Reason abstractly and quantitatively. . . make sense of quantities and their relationships . . . attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations.”

Each puzzle in this book requires abstract and quantitative reasoning in addition to computation. But the reasoning used is not simply a means of solving an isolated puzzle; it is designed to deepen the child’s understanding of quantities and their relationships, providing a foundation that the students will continue to build on as they progress to higher and higher levels of mathematics.

While completing the puzzles, the solvers will need to exercise flexibility in using different properties of operations. They will gain a greater appreciation for the meaning of those properties as they apply them to solving the problems.

MP3. “Construct viable arguments and critique the reasoning of others. . . make conjectures. . . justify their conclusions, communicate them to others. . . listen [to] or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.”

These puzzles are a perfect vehicle for strengthening elementary gifted children’s abilities related to this standard. Every puzzle requires building viable arguments and critiquing mathematical reasoning. Because each of them can be approached from a variety of angles, there will be rich opportunities for groups of any size to discuss their arguments and conclusions, determine if they make sense, and ask a variety of questions related to those arguments.

MP4. “Model with mathematics. . . apply the mathematics they know to solve problems arising in everyday life, society, and the workplace.”

None of the problems presented in these puzzles is based on a problem in everyday life. However, by solving the puzzles, the students will build mathematical reasoning strategies that will serve them for the rest of their lives, enabling them to apply those strategies to problems in life, society, and the workplace long after an individual puzzle has been successfully solved.

MP5. “Use appropriate tools strategically.”

While solving the puzzles, the children should be encouraged to use the tools available to them, such as a calculator. A chart of the basic multiplication facts will be a helpful tool in finding the patterns that lead to the answers in some of the puzzles.

MP6. “Attend to precision. . . communicate precisely to others. . . calculate accurately and efficiently.”

These puzzles provide many opportunities for the children to explain their reasoning to each other. In the process, they will learn to use greater precision and clear definitions in order to make themselves understood.

The pleasure of solving the puzzles will motivate the students to become more accurate and efficient in their calculations. In my first experience in teaching mathematically gifted third graders, some of them were resistant to learning the basic multiplication facts because it seemed so tedious. They continued to use repeated addition to determine the products that they had not yet memorized, long after they should have known the facts by heart. Being gifted, they were quite capable of learning them much more quickly, but (being gifted!) they resisted making the effort.

When we moved on to long division, they were suddenly motivated to commit the basic facts to memory in record time. In the same way, since puzzle solving is a challenging and enjoyable activity for this population and since one error can impact many different parts of the same puzzle, the students will be motivated to calculate more accurately and efficiently in order to solve the puzzles correctly.

MP7. “Look for and make use of structure. . . discern a pattern or structure.”

Discovering the patterns in the mathematics needed to solve the puzzles is essential to finding the correct solutions. Two examples are: finding the patterns in calculating with odd and/or even numbers, and observing that the greatest amount that can be carried when adding a column of numbers is one less than the number of addends in the column.

MP8. “Look for and express regularity in repeated reasoning. . . look both for general methods and for shortcuts. . . maintain oversight of the process, while attending to the details.”

These puzzles provide many opportunities for children to discover regularity in repeated reasoning. For example, in solving “Picture Puzzles” the students will use repeated reasoning to develop shortcuts for determining which squares must be filled in and which ones must be empty.

Solving each of the puzzles requires maintaining oversight of the process while attending to the details. This will occur both within the individual problems that make up a puzzle and within the puzzle as a whole.

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