

## Introduction

Assign twenty pre-algebra problems to middle school students and you get looks and body language that screams “Boring!” But take the same twenty problems and turn them into a puzzle and suddenly it becomes a game. For some students it is a challenge, for others it is a fun and engaging activity. **Pathway to Pre-Algebra Proficiency** is a collection of thirty pre-algebra puzzles and mini-lessons I have developed and used with my sixth-, seventh-, and eighth-grade students during the last several years. When using these puzzles and mini-lessons, I have witnessed my students’ attitude change from “Boring!” to “Cool!” Over the years, I have shared the puzzles and mini-lessons with my friends and colleagues, who in turn have provided me with important feedback, suggestions and ideas. Teachers at my school use the puzzles contained in this book for practice, review, homework and for substitute days. Likewise, I utilize them as review and practice during school breaks. I use the mini-lessons to enrich my students’ learning experience and to provide engaging activities that assist students in making connections within or between pre-algebra concepts.

The reader will quickly note that, except for the puzzles involving integers, the problems involve only positive whole numbers. In general, the computations students need to perform are easy. The reason for this is simple. As students solve the pre-algebra problems in each puzzle, I want them to focus on the mathematical concept and not be bogged down by the computations. In my experience it is easier for students to solve pre-algebra problems using fractions and decimals once they have mastered the pre-algebra concept using only positive whole numbers.

**Pathway to Pre-Algebra Proficiency** contains thirty puzzles and mini-lessons that focus on essential pre-algebra concepts. All puzzles contain twenty clues ranging in difficulty from easy to difficult, and except for the puzzles involving integers, all the answers to the clues are positive whole numbers. The title of each puzzle helps students focus on the concept. Each puzzle has a few easy clues to get students started and motivated as well as two or three challenging clues to encourage them to go beyond what they have learned. The puzzles are grouped by topic and not by difficulty level. The answer

key to each puzzle is located on the back of the puzzle for easy access. In addition to the answer key, each puzzle includes a mini-lesson to help students make connections within or between algebraic concepts. The mini-lessons can be completed in ten to twenty minutes. The Appendix includes a Word Bank to assist English Language Learners and Special Needs students with the spelling of numbers, and the Order of Operations rules.

### **Using the puzzles in class**

After teaching a pre-algebra concept, I select two or three problems of average difficulty and have students solve them in pairs. Next, I ask two or three students to share their answers, and the steps they used to solve the problems with the rest of the class. Following the demonstration, I assign one or two additional problems for students to solve independently. After I check the answers, the rest of the problems are class-work for the students to solve individually or in pairs. Whatever is not finished in class then becomes homework.

The puzzles are designed for students to practice pre-algebra problems in a context that gives them immediate feedback on the correctness of their answers. Once the puzzle is completed, I ask students leading questions that help them reflect on the underlying concepts beyond the computations.

For example:

- 1) What strategies did you use to solve problem x?
- 2) How are problems x and y similar? How are they different?
- 3) What problem or problems were you able to solve mentally?

The mini-lesson specific to each puzzle is included on the back of the puzzle, together with the answer key. Each one consists of an activity that enable students to make connections within or between mathematical concepts. It takes ten to twenty minutes to complete a mini-lesson, which is ideal for a fill-in at the end of a period.