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The Value of *Balance Math* and More!

These activities sharpen students' critical thinking skills, computational skills, and develop algebraic reasoning. The first book in the series (Level 1) focuses on addition and subtraction of whole numbers.   The second book (Level 2) focuses on multiplication and division of whole numbers, but has a few problems involving fractions. The third book (Level 3) involves addition, subtraction, division, and multiplication, as well as fractions and decimals. The spiraling difficulty level within each book is designed to scaffold a students' conceptual understanding of the targeted operations from beginning to advanced. Try one of these intriguing puzzles—and then try to stop!

Teaching Suggestions

Balance Math™ and More! activities are unique because their solution requires mathematical reasoning, critical thinking, and computational skills. This makes these problems fun, but challenging. I recommend teachers review the directions with students on all three types of puzzles (Inside-Out Math, Tic Tac Math, and Balance Math™) and jointly work through some of each, until students can demonstrate how to correctly solve them independently. After that, should students become stumped, I first encourage perseverance or 'think time' by reminding them that people do puzzles because they enjoy being puzzled. I also praise the effort and determination of students even more than the correct answer. But like all puzzlers, they may occasionally need a hint. For Inside-Out Math or Tic Tac Math puzzles, use the answer pages to provide them with the correct number needed next. You can jumpstart their thinking for Balance Math™ puzzles by using the hints provided on page 38.

Balance Math™: Students should examine the balanced scales to deduce and calculate the value of any one shape which can then be substituted on another balance and so on, until the solution is found. These puzzles are great stepping-stones to showing students the basics of balancing and solving algebraic equations.

Inside-Out Math: Students need to reverse their thinking, using the inverse relationships between addition and subtraction and multiplication with division to solve the puzzles.

Tic Tac Math: Three, four or five in a row wins, but can you figure out the correct order to complete all rows, columns, and diagonals?

About the Author

A longtime puzzle fan, Robert Femiano is a Seattle public school elementary educator and has been for most of his 35-year teaching career. For more than a decade of this time, he was also adjunct faculty at Seattle Pacific University, conducting math methods courses. His publications include *Algebraic Problem Solving in the Primary Grades* in the National Council for Teachers of Mathematics peer-reviewed journal and *Balance Benders*™ by The Critical Thinking Co.™. In 2002, he won the highest honor in education, the Presidential Award for Excellence in Mathematics and Science Teaching.

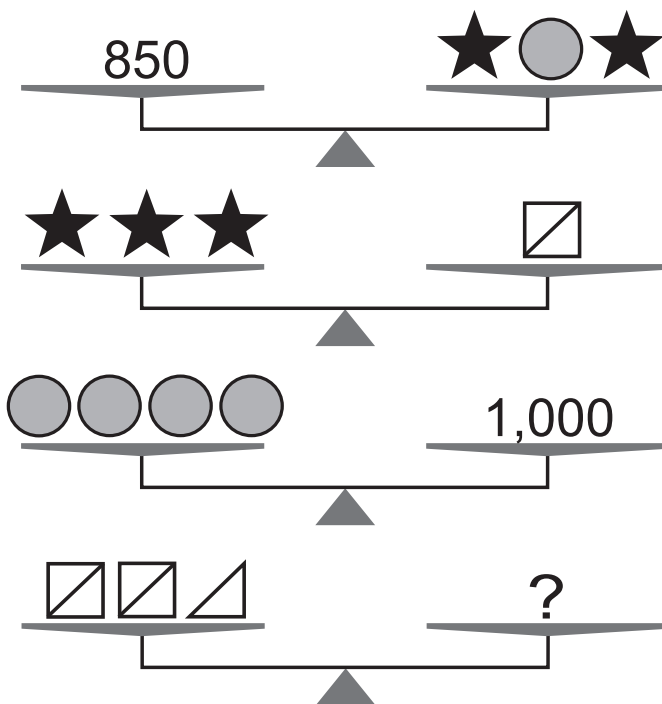# Balance Math

Use the balanced scales to find the missing numbers.

■ ○ ◇ = 2,000

○ ○ ○ = 2,100

■ ■ ○ = 1,000

◇ = ?

Problem 1

? = ...

850 = ★ ● ★

★ ★ ★ = ▱

● ● ● ● = 1,000

▱ ▱ ◹ = ?
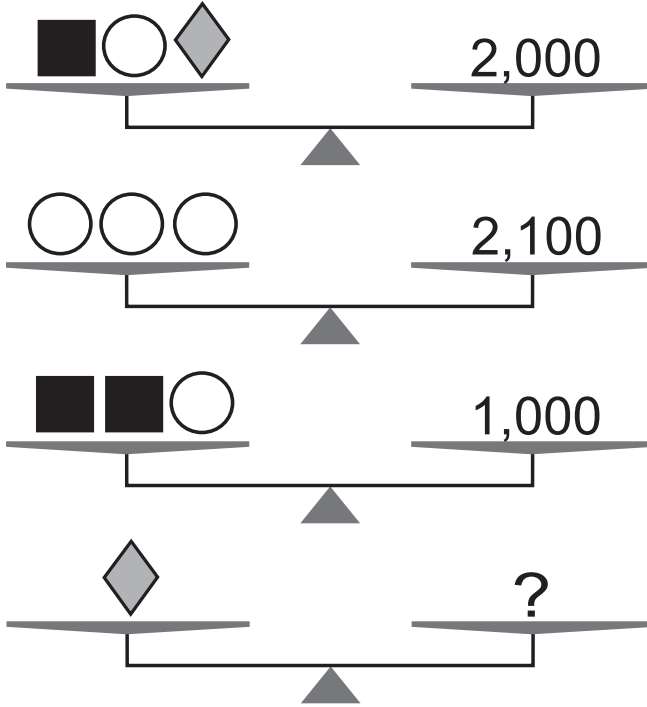
Problem 2

? = ...

INSIDE-OUT MATH

Use the clues to find the missing values.

Problem 1

a	a-c	a-d
10,000	....	8,990
b	**b-c**	**b-d**
....	28,889	28,990

c	d
....	....

Problem 2

a	a-c	a-d
....	245	....
b	**b-c**	**b-d**
804	326	448

c	d
....	....

Problem 3

a	a-c	a-d
....	3,675	344
b	**b-c**	**b-d**
....	....	2,407

c	d
2,367	....

Problem 4

a	a-c	a-d
....	7,728	1,649
b	**b-c**	**b-d**
....	10,761	....

c	d
....	11,358

Problem 5

a	a-c	a-d
$\frac{1}{2}$	$\frac{1}{4}$	....
b	**b-c**	**b-d**
....	$\frac{1}{2}$	$\frac{5}{8}$

c	d
....	....

Problem 6

a	a-c	a-d
....	$\frac{1}{4}$	$1\frac{1}{12}$
b	**b-c**	**b-d**
....	....	$1\frac{1}{4}$

c	d
$2\frac{1}{12}$	....

Tic Tac Math

All rows, columns, and three numeral diagonals must add up to the same sum. Write the total and then fill in the empty spaces.

Problem 1

	730	
1,090	70	1,030

Total: _____

Problem 2

	104	120
	136	
152		

Total: _____

Problem 3

119		
	413	
	203	707

Total: _____

Problem 4

	27.2	19.2
	18.4	
	9.6	

Total: _____

Problem 5

		0.94
	1.27	
1.6	0.83	

Total: _____

Problem 6

0.619	1.039	1.459
		0.409

Total: _____