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The Value of This Book

Understanding equations and solving word problems has never been easier or more fun! Introducing algebra through balanced scales is a natural and exciting way to conceptually master fundamental algebraic ideas. The book's visually-simple approach, where the scale itself represents an equal sign and geometric shapes are used for the unknowns, engages students intuitively in step by step thinking. The puzzle-like problems ensure students are cognitively-involved while they hone their techniques of simplifying, substituting, and writing proofs to solve simultaneous equations.

Teaching Suggestions

In order to be successful with these pages, students must be familiar with the basic properties of balance scales. These mathematical attributes are noted in the Balance Tip chart on pages 53-54 and are practiced on the first two pages in this book. It is important that students complete these pages and fully comprehend the reasoning involved in these six Proofs, as these logical-mathematical ideas are used in every solution in this text.

Balance Math™ Teaches Algebra is designed to move from simple to complex, with lessons scaffolding on earlier learning. And like its predecessors, *Balance Math™ and More!*, these problems also involve critical thinking and computation. To students, however, these problems are more like puzzles, with just enough challenge to forget they are doing math!   Once solved, students record their thinking by completing the formal Proof that accompanies each problem. Conversely, should a student need a jumpstart in solving a puzzle, they can simply follow the first step(s) in the Proof.

About the Author

Robert Femiano is a Seattle public school elementary educator and has been for much of his 35 year teaching career. During more than a decade of this time, he was also adjunct faculty at Seattle Pacific University. Publications include *Quick Thinks Math*, *Balance Benders™*, and *Balance Math™ and More!* books and software by The Critical Thinking Co.™, along with *Algebraic Problem Solving in the Primary Grades* in the National Council for Teachers of Mathematics journal. In 2002, he won the highest honor in education, the Presidential Award for Excellence in Mathematics and Science Teaching.
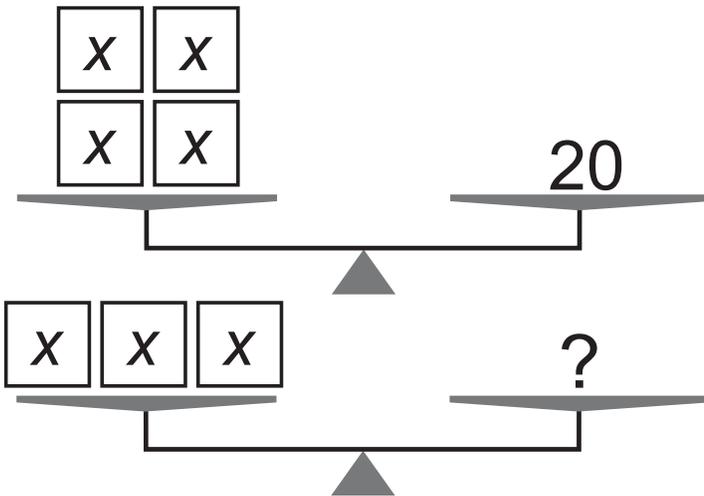
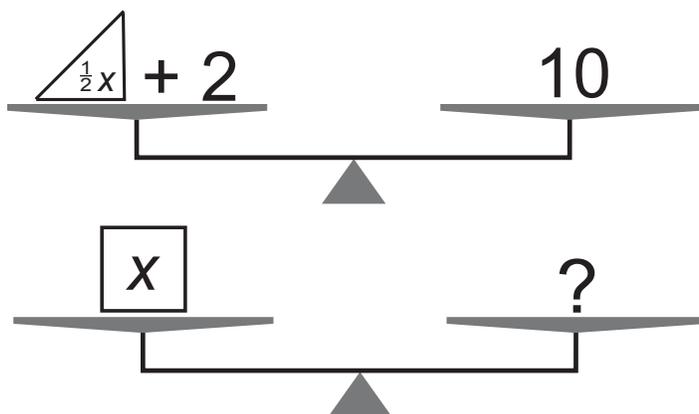# Write the answers in the box, then fill in the blanks in the proof.

x

50

x x

?
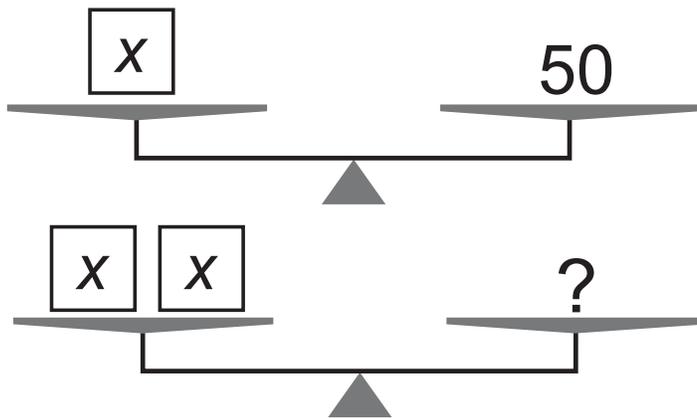
Problem 1

x = ...

? = ...

From the 1st scale we know: $x = 50$.
Substitute ___ for x in: $2x = ?$ (2nd scale).
So $2(\_\_\_) = 100 = ?$

x x

x x

20

x x x

?

Problem 2

x = ...

? = ...

From the 1st scale we know: $4x = 20$.
Divide both sides of this equation by 4
so $x = \_\_\_$. Substitute ___ for x in:
$3x = ?$ (2nd scale). So $\_\_\_(5) = 15 = ?$

$\frac{1}{2}x$ + 2

10

x

?

Problem 3

$\frac{1}{2}x$ = ...

? = ...
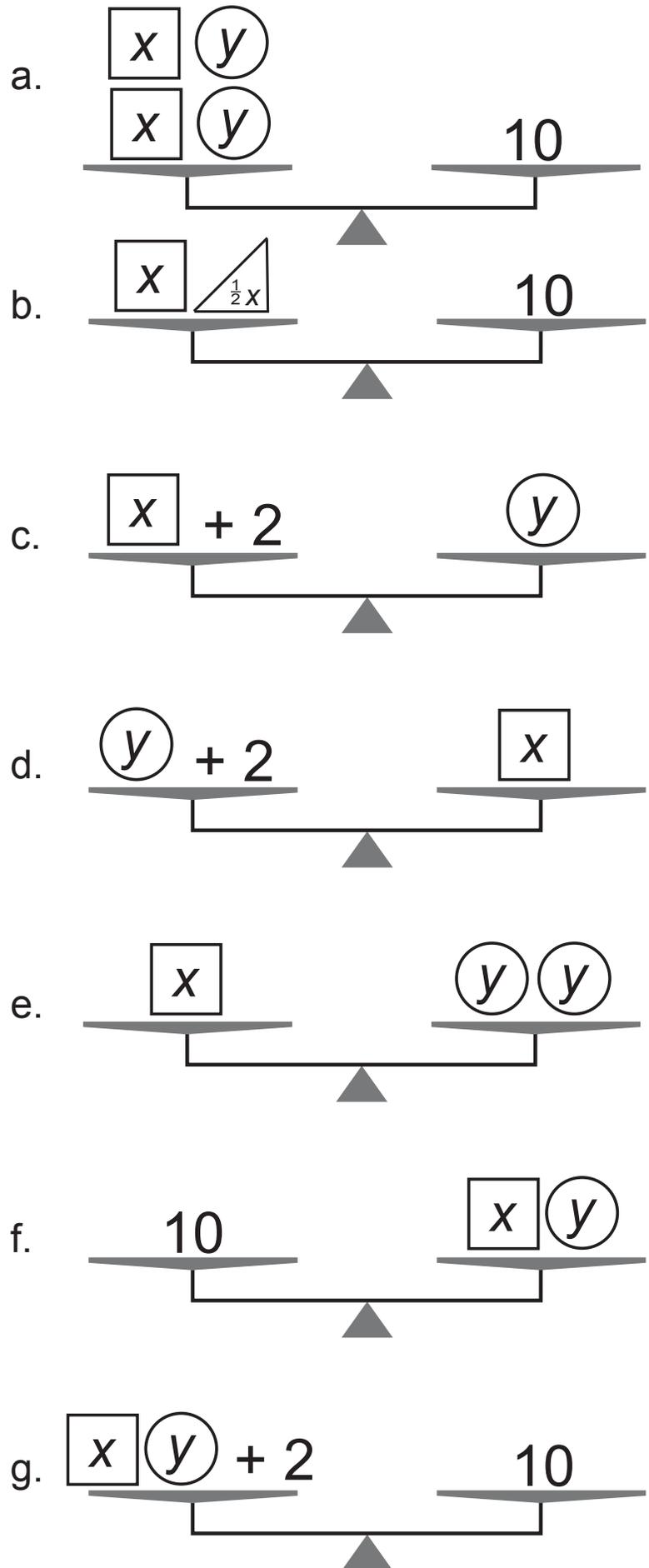
From the 1st scale we know: $\frac{1}{2}x + 2 = 10$.
Subtract ___ from both sides of this
equation so $\frac{1}{2}x = \_\_\_$. Substitute ___ for
each $\frac{1}{2}x$ in: $x = ?$ (2nd scale).
(Note: $1x$ is the same as x.)
So $\_\_\_ + \_\_\_ = \_\_\_ = ?$

Write the letter of the scale that matches each sentence. Which scale is used twice?

___ 1. John x is 2 years older than Gia y.

___ 2. Mohammed x is 2 years younger than Hawa y.

___ 3. Jen's x and Danny's y ages together make 10 years.

___ 4. Double Brian's y age to have Liz's x.

___ 5. Together Joseph x and Ellen y are 2 years shy of 10.

___ 6. Take 2 years away from Larissa's x age and you have Lauren's y age.

___ 7. Double Siong's x and Quang's y ages and together they will be 10.

___ 8. Half of Jane's x age, added to itself, is 10.

Used twice: ___

a.

b.

c.

d.

e.

f.

g.