

Unlocking the Learning to Build Resilient Learners in Math

Pre-Workshop Overview and Support



Activity Book

Institute for the Professional Development of Adult Educators

WEBINAR ACTIVITY BOOK

Unlocking the Learning to Build Resilient Learners in Math

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Agenda

- I. Why Manipulatives?
- II. What are Fraction Squares?
- III. Getting Familiar with Fraction Squares
- IV. Adding and Multiplying Fractions
- V. Simplifying Fractions
- VI. Comparing Fractions
- VII. Other Concepts Developed by Fraction Squares
- VIII. What's to Expect in Regional Workshops
- IX. IPDAE Resources

Guiding Questions

Slide(s)	Guiding Questions	My Thoughts
6-7	What are some examples of manipulatives used in ancient times?	
8	How did the works of Froebel and Montessori led to the development of math manipulatives we use now?	
10	At what stage of learning are manipulatives used best?	
11-12	What math skills are developed by using math manipulatives?	
14	What are fraction squares?	
29	What topics in math are best taught using fraction squares?	

Objectives

- I. Use manipulatives to develop number sense and conceptual understanding of fractions.
- II. Model interactive and engaging strategies that enhance conceptual understanding and retention in mathematics vocabulary.

Proponents of Using Manipulatives



Friedrich Froebel

Use the Internet to find out Friedrich Froebel's views in the use of manipulatives in education.

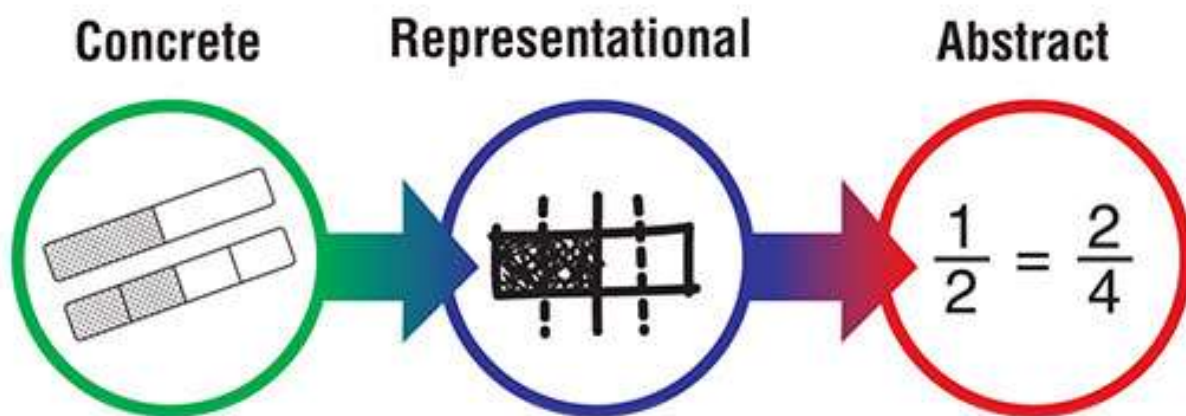
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Maria Montessori

Use the Internet to find out Maria Montessori's views in the use of manipulatives in education.

Theory of Learning

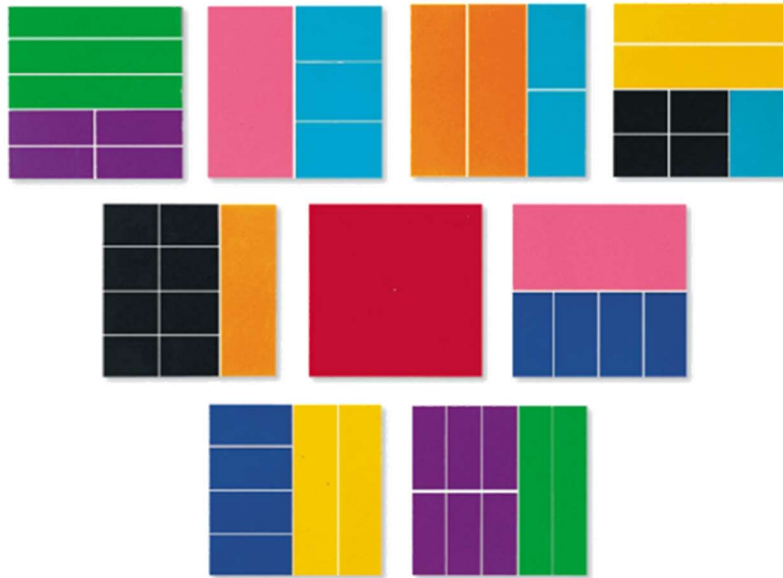


Concrete stage	Representational stage	Abstract stage
A mathematical concept is introduced with manipulatives; students explore the concept using the manipulatives in purposeful activity.	A mathematical concept is represented using pictures of some sort to stand for the concrete objects (the manipulatives) of the previous stage; students demonstrate how they can both visualize and communicate the concept at a pictorial level.	Mathematical symbols (numerals, operation signs, etc.) are used to express the concept in symbolic language; students demonstrate their understanding of the mathematical concept using the language of mathematics.

Skills Targeted by Manipulatives

- Sorting — a pre-mathematical skill that aids in comprehension of patterns and functions
- Ordering — a pre-mathematical skill that enhances number sense and other math-related abilities
- Distinguishing Patterns — the foundation for making mathematical generalizations
- Recognizing Geometric Shapes (and understanding relationships among them)
- Making Measurements (using both nonstandard and standard units with application to both two and three-dimensional objects)
- Understanding the Base-Ten System of Numbers
- Comprehending Mathematical Operations — addition, subtraction, multiplication, division
- Recognizing Relationships Among Mathematical Operations
- Exploring and Describing Spatial Relationships
- Identifying and Describing Different Types of Symmetry
- Developing and Utilizing Spatial Memory
- Learning About and Experimenting with Transformations
- Engaging in Problem-Solving
- Representing Mathematical Ideas in a Variety of Ways
- Connecting Different Concepts in Mathematics
- Communicating Mathematical Ideas Effectively

Fraction Squares



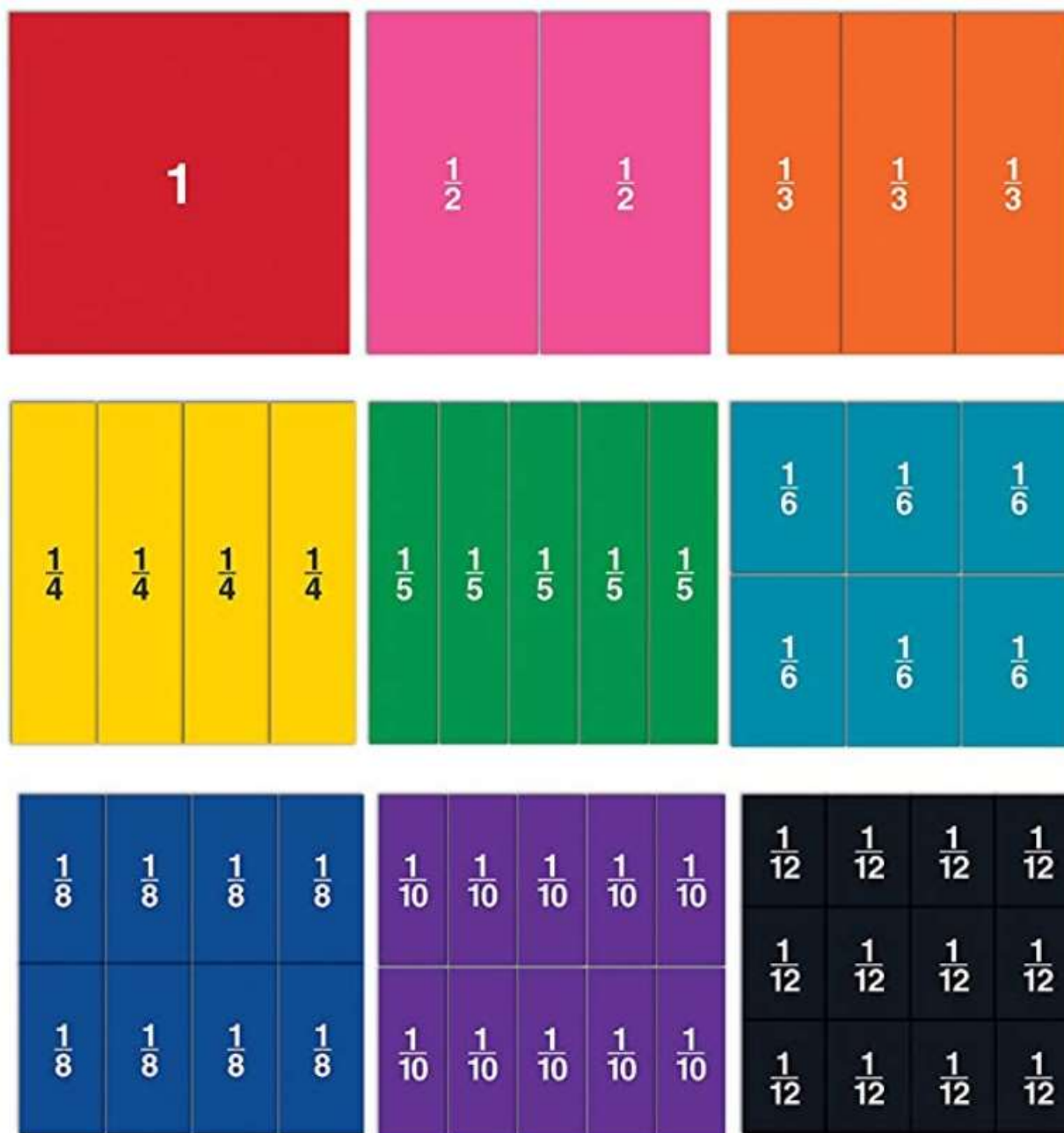
Questions:

- What are fraction squares?

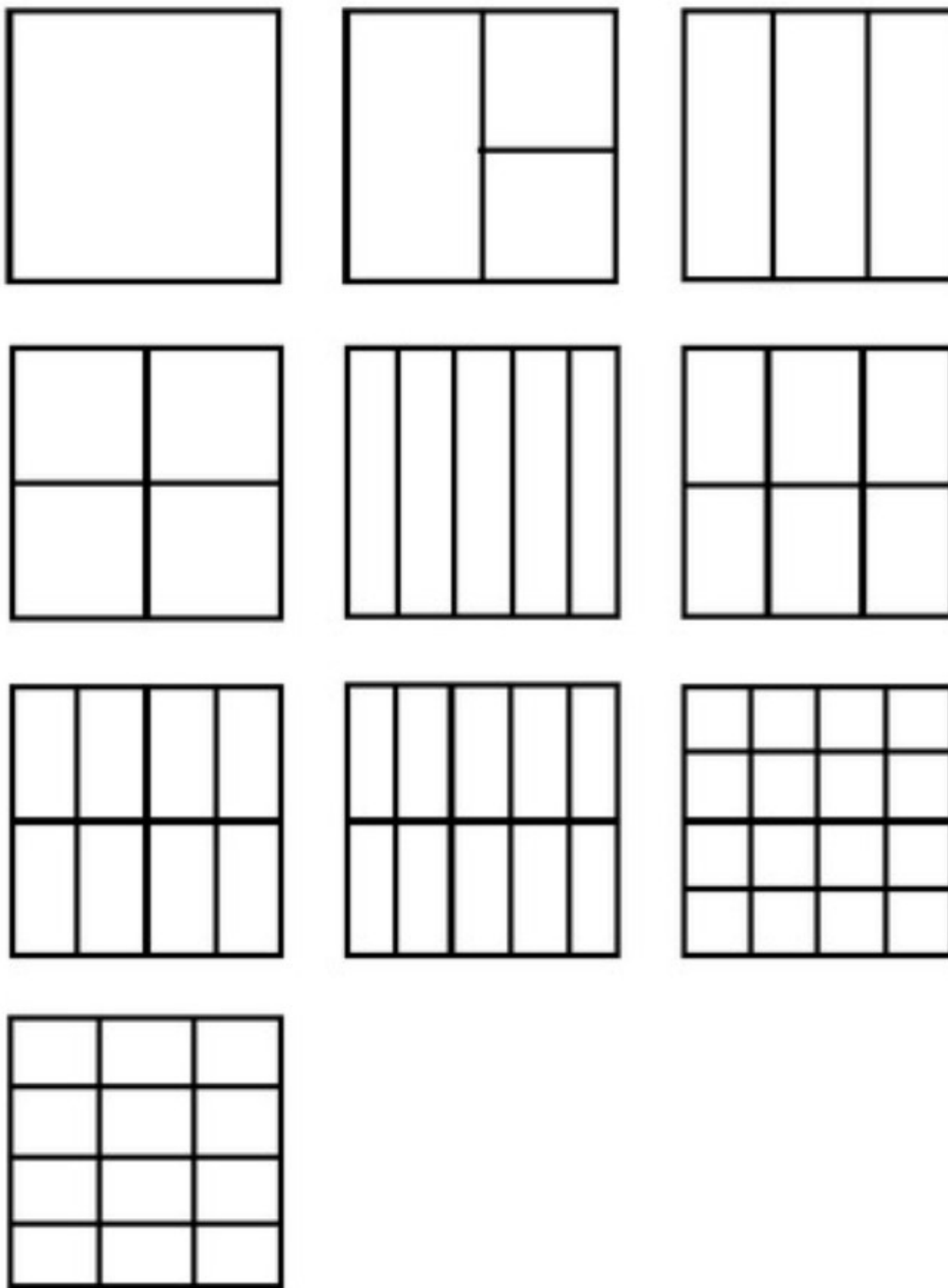
- Name the different fraction square tiles.

- How many total pieces make up a complete set of fraction squares?

Fraction Squares Blackline (Color)

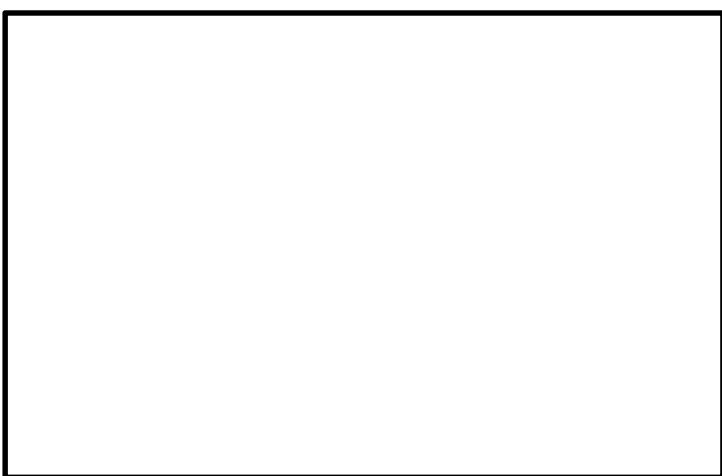
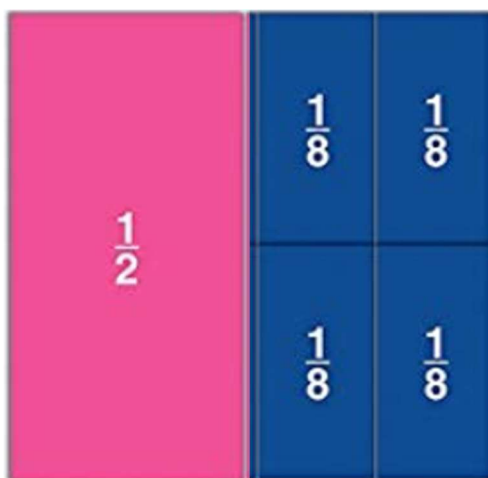
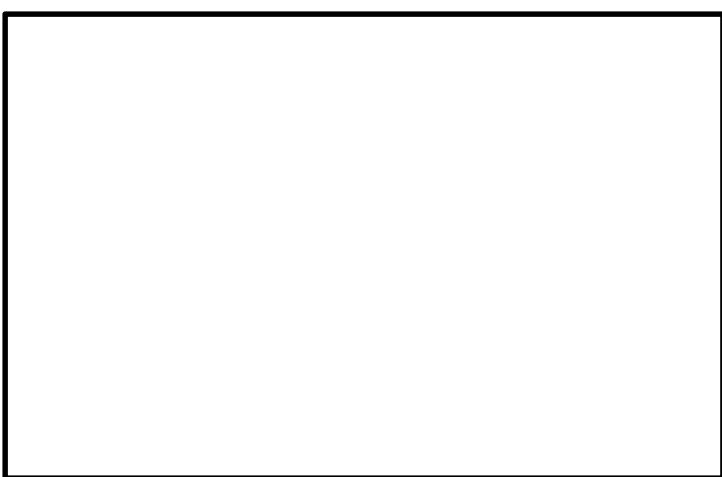
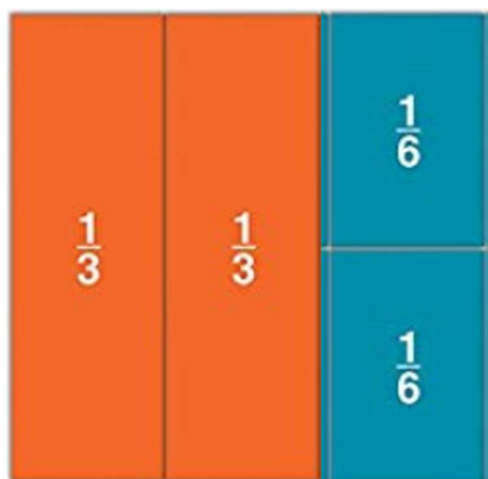
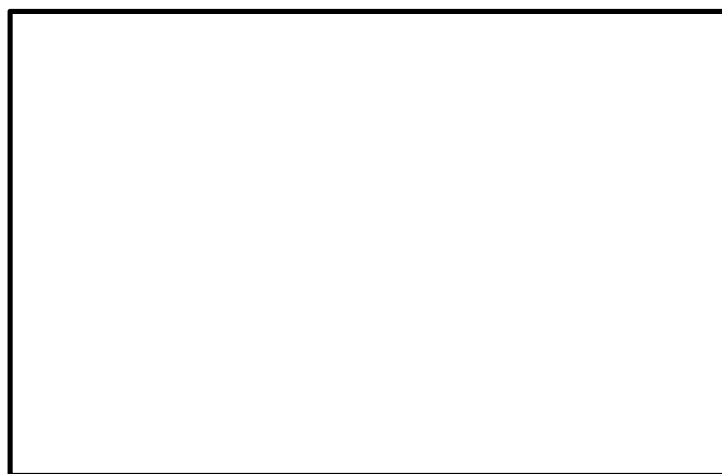
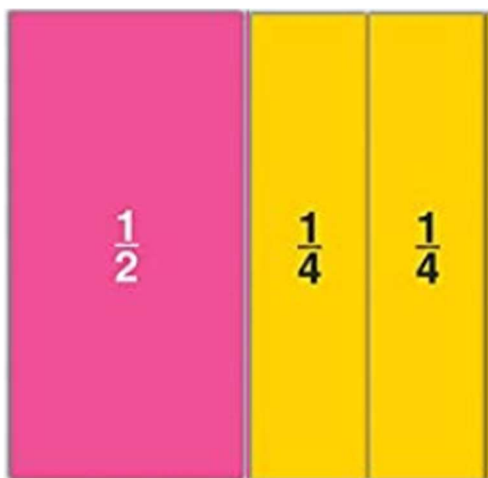


Fraction Squares Blackline (Grayscale)



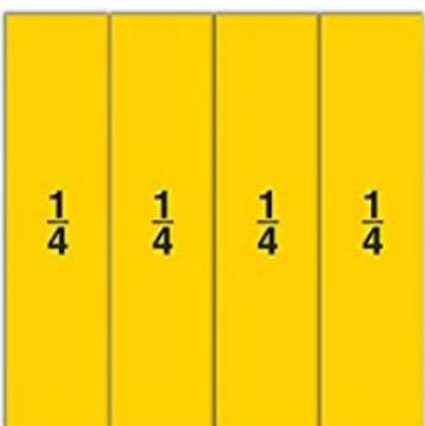
Fraction Sums Equal to a Whole

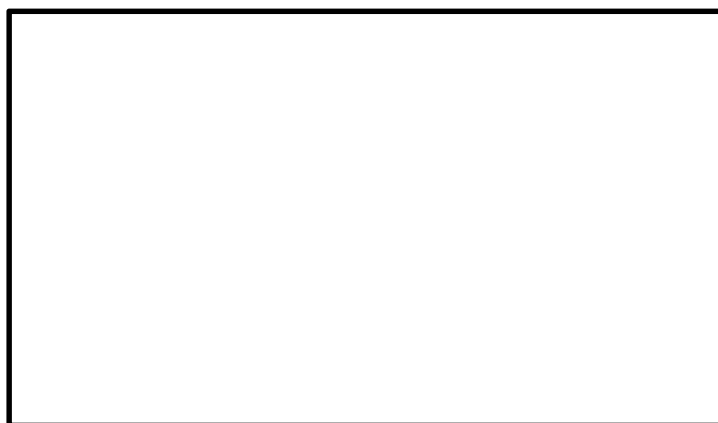
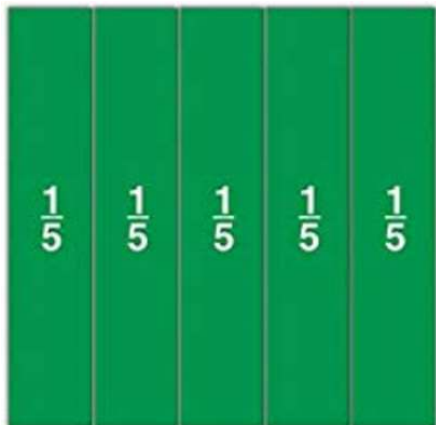
Write the equation represented by each fraction square.



Fractions Products Equal to a Whole

Write the multiplication equation represented by each fraction square.





Products and Sums of Fractions

Model each sum or product of fractions using fraction square tiles.

$$\frac{1}{4} + \frac{2}{8} + \frac{2}{8} =$$



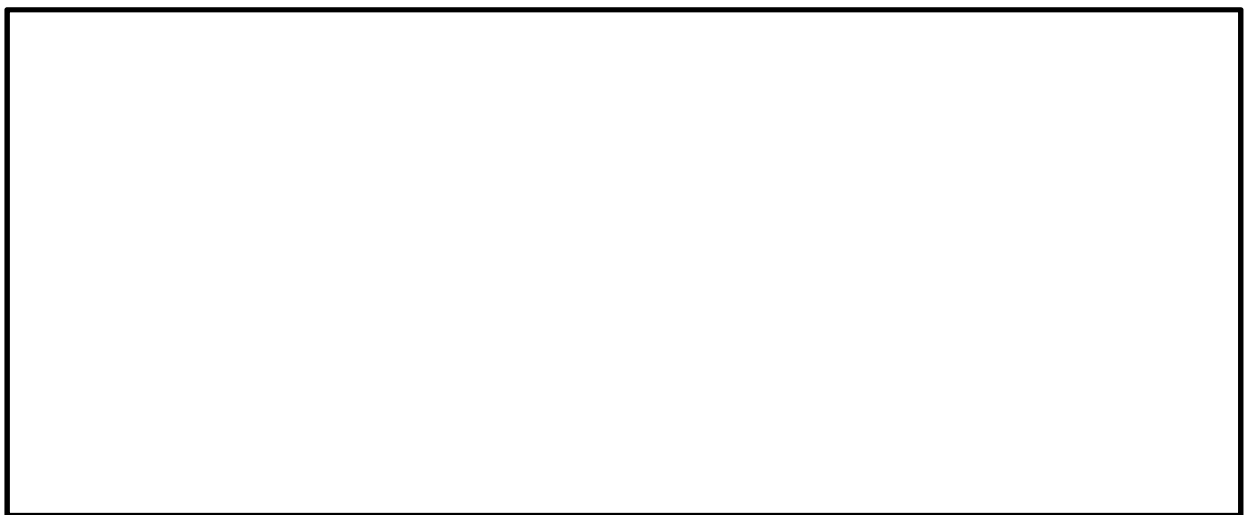
$$\frac{1}{3} + \frac{2}{6} =$$



$$9 \left(\frac{1}{12} \right) =$$



$$6 \left(\frac{1}{10} \right) =$$



Simplifying Fractions

Reduce each fraction to simplest form using fraction square tiles.

$$\frac{6}{12} =$$



$$\frac{4}{6} =$$



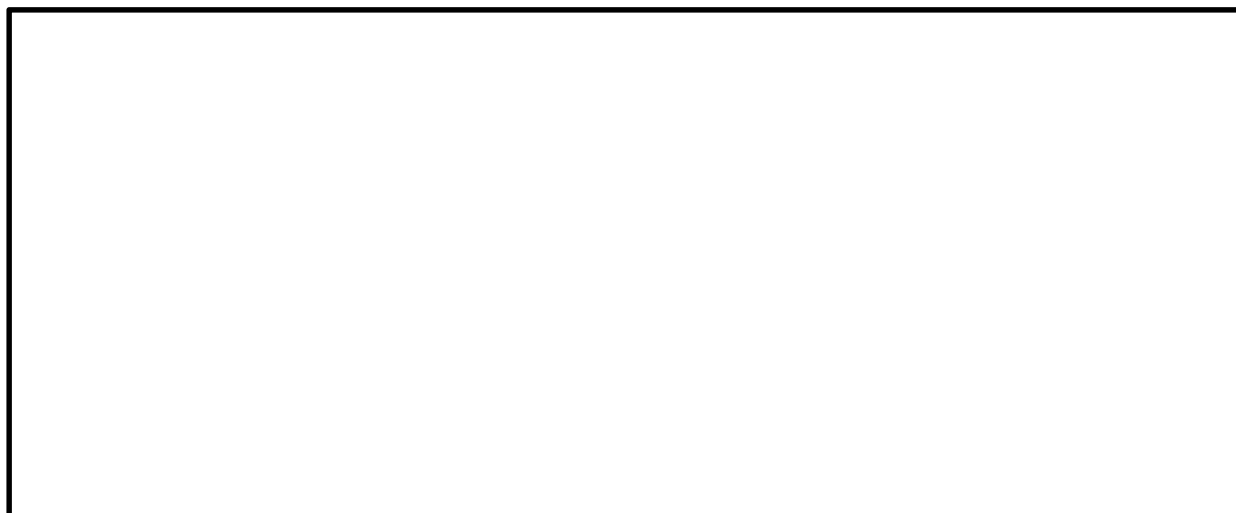
Comparing Fractions

Use fraction square tiles to compare the following fractions.

$$\frac{2}{8} \quad \square \quad \frac{2}{6}$$



$$\frac{1}{2} \quad \square \quad \frac{2}{3}$$



$$\frac{2}{8} + \frac{2}{6} \quad \square \quad \frac{1}{2}$$

$$\frac{1}{2} \quad \square \quad \frac{1}{3} + \frac{1}{4}$$

Math Skills Developed Using Fraction Squares

- Addition of Fractions
- Multiplication of Fractions
- Simplifying Fractions
- Comparing Fractions
- Equivalent Fractions
- Congruence
- Areas of Rectangles
- Composite Shapes (Area Addition)
- Solving (Word) Problems – when used in modeling real-world scenarios with fraction squares

What other math skills can be developed using fraction squares? Explain.

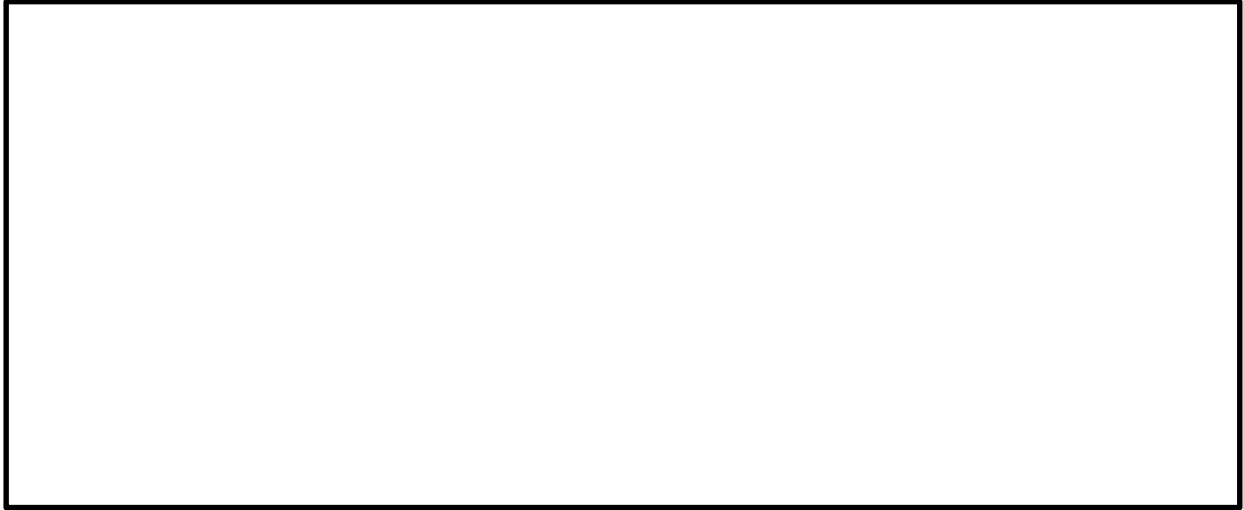
Other Areas Improved by Manipulatives

- verbalizing mathematical thinking
- discussing mathematical ideas and concepts
- relating real-world situations to mathematical symbolism
- working collaboratively
- thinking divergently to find a variety of ways to solve problems
- expressing problems and solutions using a variety of mathematical symbols
- making presentations
- taking ownership of their learning experiences
- gaining confidence in their abilities to find solutions to mathematical problems using methods that they come up with themselves without relying on directions from the teacher

What other skill areas can be developed using fraction squares? Explain.

Create a word problem where students will be using fraction squares to solve. Show detailed solution to solve the word problem.

From the word problem you created, model the solution using fraction squares.

A large, empty rectangular box with a black border, intended for students to draw or model their solution using fraction squares.