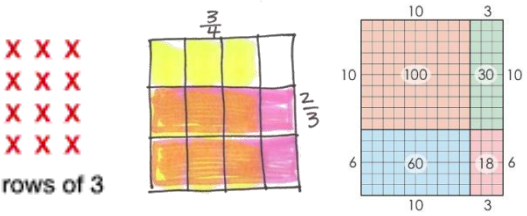
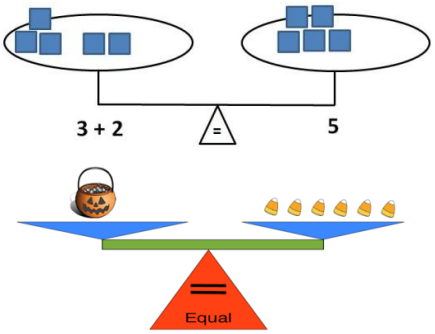
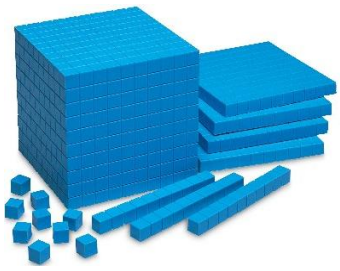
Mathematics Instructional Connections for Physical and Visual Representations

This document serves as a resource to assist teachers in connecting physical and visual representations to mathematical content. It is not meant to be an exhaustive list, nor does it mean that these representations may only be used with the identified content. Challenges or limitations may arise when using some representations to model content.

Representation	Content Connections
Algebra Tiles 	• Operations with integers and polynomial expressions • Model and factor linear and quadratic expressions *Challenges or limitations could include:* • Modeling expressions other than linear and quadratic • Factoring non-factorable quadratic expressions
Arrays 	• Multiplication and division of whole numbers • Operations with fractions • Area and perimeter • Distributive Property • Commutative Property
Balance Scale 	• Properties of equality • Equality • Model one-variable equations • Solve one-variable equations
Base Ten Blocks 	• One-to-one correspondence • Count and skip count • Place value • Represent whole numbers and decimals • Compare and order compare whole numbers and decimals • Operations with whole numbers and decimals • Powers of 10 *Challenges or limitations could include:* • Modeling large numbers • Interlocking cubes most appropriate for PreK-Grade 1

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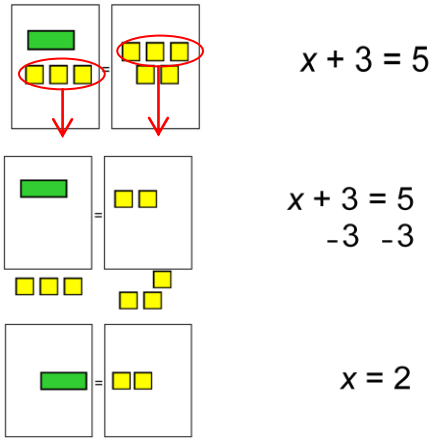
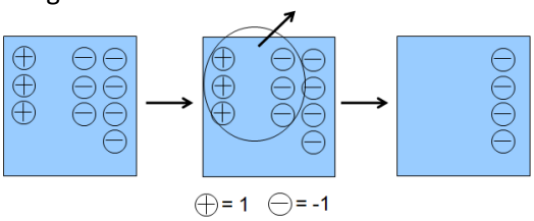
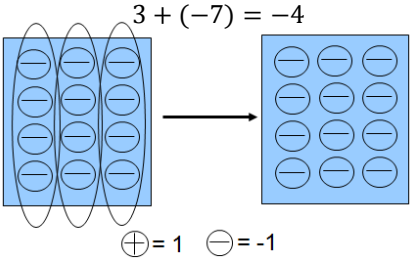
Representation	Content Connections
Counters 	• One-to-one correspondence • Count and skip count • Odd and even numbers • Compose and decompose numbers • Operations with whole numbers • Ratios and fractions (set model) • Probability • Measurement
Cubes 	• One-to-one correspondence • Count and skip count • Ratios and fractions (set model) • Probability • Construct two- and three-dimensional figures, perspective drawings • Measurement
Equation Mats  $x + 3 = 5$ $x + 3 = 5$ $-3 \quad -3$ $x = 2$ Integer Mats  ⊕ = 1 ⊖ = -1 $3 + (-7) = -4$  ⊕ = 1 ⊖ = -1 $3 \cdot (-4) = -12$ three groups of -4	• Model equations • Solve equations • Model operations with integers *Challenges or limitations could include:* • Modeling multiplication versus division (motion may be required to build understanding of division) • Modeling division by negative integers

This document is not an exhaustive list of representations and content connections.

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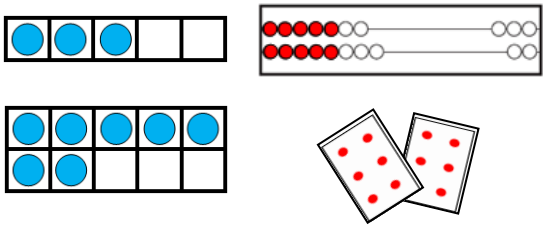
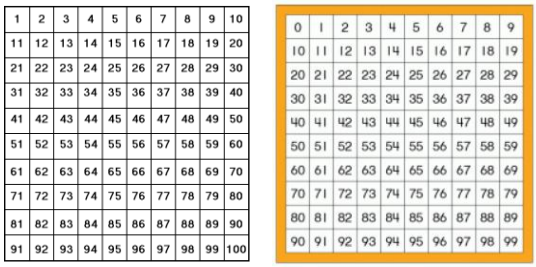
Representation	Content Connections
Five and Ten Frames, Rekenreks, Dot Cards 	• One-to-one correspondence • Count and skip count • Place value • Subitize • Compose and decompose numbers • Related facts (addition and subtraction)
Fraction Models Bars Circles Rods 	• Represent fractions (area or length model) • Equivalent fractions • Compare and order fractions • Operations with fractions *Challenges or limitations could include:* • Modeling certain fractions
Hundred Charts 	• One-to-one correspondence • Count and skip count • Multiples • Odd and even numbers • Prime and composite numbers • Operations with whole numbers
Linking Cubes 	• One-to-one correspondence • Count and skip count • Odd and even numbers • Compose and decompose numbers • Place value • Ratios, fractions (set, area, or length model), and decimals • Operations with whole numbers • Operations with fractions (like denominators only) • Probability and data collection • Construct two- and three-dimensional figures • Measurement

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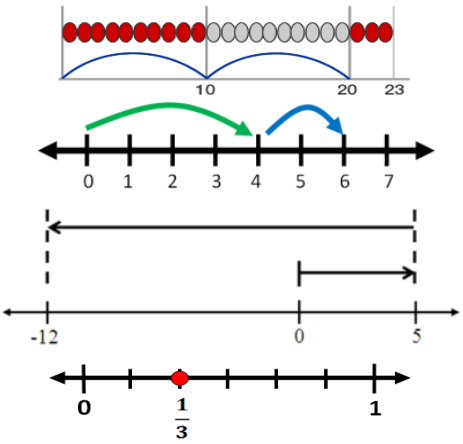
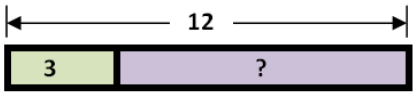
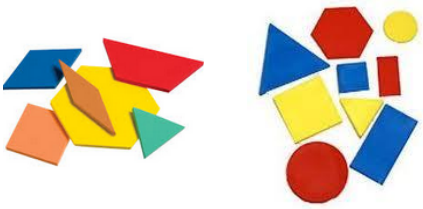
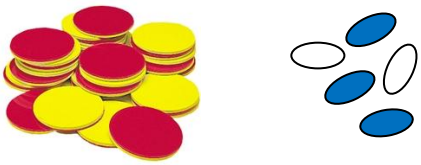
Representation	Content Connections
Number Lines  Bar Model  	• Count and skip count • Place value • Represent fractions (length model), decimals, and integers • Compare, order, and operate with whole numbers, fractions, decimals, and integers • Measurement • Represent data (line plots, balance point/mean) • Probability • Represent absolute value *Challenges or limitations could include:* • Modeling multiplication versus division (motion required to build understanding) • Modeling division by negative integers • Modeling with number 'paths' most appropriate for PreK-Grade 1
Pattern/Attribute Blocks 	• Sort and classify geometric figures (attributes) • Compose and decompose geometric figures • Patterns • Represent fractions (area model) • Equivalent fractions/Compare fractions • Operations with fractions • Ratios *Challenges or limitations could include:* • Modeling certain fractions
Square Tiles 	• One-to-one correspondence • Count and skip count • Compose and decompose numbers • Operations with whole numbers • Ratios and fractions (set or area model) • Probability • Measurement
Two-color Counters 	• One-to-one correspondence • Compose and decompose numbers • Represent Integers • Properties of integers • Operations with whole numbers and integers • Probability • Ratios *Challenges or limitations could include:* • Modeling multiplication and division by negative integers

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