Building Fact Fluency

A TOOLKIT FOR ADDITION & SUBTRACTION

By Graham Fletcher and Tracy Johnston Zager

CORRELATION TO

Indiana Academic Standards for Mathematics

CONTENTS

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Indiana Academic Standards for Mathematics

– PROCESS STANDARDS FOR MATHEMATICS, GRADES K–12 –

PS.1: Make sense of problems and persevere in solving them.	***Building Fact Fluency:*** Embedded throughout the toolkit, especially in these routines: · Contextualized Practice Problems · Anchor Problems · 3-Act Math Tasks Journaling and Reflection
PS.2: Reason abstractly and quantitatively.	***Building Fact Fluency:*** Embedded throughout the toolkit, especially in these routines: · Image Talks · Tool Talks · Number Talks · Contextualized Practice Problems · Anchor Problems · 3-Act Math Tasks · Games · Journaling and Reflection
PS.3: Construct viable arguments and critique the reasoning of others.	***Building Fact Fluency:*** Embedded throughout the toolkit, especially in problem-based lesson discussions, student representations, and the following routines: · Image Talks · Tool Talks · Number Talks · Contextualized Practice Problems · Anchor Problems · 3-Act Math Tasks
PS.4: Model with mathematics.	***Building Fact Fluency:*** Embedded throughout the toolkit, especially in these problem-based routines: · Contextualized Practice Problems · Anchor Problems · 3-Act Math Tasks
PS.5: Use appropriate tools strategically.	***Building Fact Fluency:*** Embedded throughout the toolkit, especially in these routines: · Tool Talks · Games · Anchor Problems · Contextualized Practice Problems

PS.6: Attend to precision.	***Building Fact Fluency:*** Embedded throughout the toolkit, especially in these routines: · Image Talks · Tool Talks · Number Talks · Contextualized Practice Problems · Anchor Problems · 3-Act Math Tasks · Games
PS.7: Look for and make use of structure.	***Building Fact Fluency:*** Embedded throughout the toolkit, especially in these routines: · Image Talks · Tool Talks · Number Talks · Games · Journaling and Reflection
PS.8: Look for and express regularity in repeated reasoning.	***Building Fact Fluency:*** Embedded throughout the toolkit, especially in these routines: · Image Talks · Tool Talks · Number Talks · Anchor Problems · Games · Journaling and Reflection

Indiana Academic Standards for Mathematics

– KINDERGARTEN –

NUMBER SENSE	
K.NS.4 Say the number names in standard order when counting objects, pairing each object with one and only one number name and each number name with one and only one object. Understand that the last number describes the number of objects counted and that the number of objects is the same regardless of their arrangement or the order in which they were counted.	***Building Fact Fluency:*** Emphasized in all Image Talks and Tool Talks. Number Talks build off the more concrete counting experiences in Image and Tool Talks, encouraging connections between symbolic representations and quantities.
K.NS.5 Count up to 20 objects arranged in a line, a rectangular array, or a circle. Count up to 10 objects in a scattered configuration. Count out the number of objects, given a number from one to 20.	***Building Fact Fluency:*** Every Image and Tool Talk has 1–20 objects to count in different configurations, including lines (e.g., marbles, markers, bears, rekenreks, blocks, linking cubes, lemonade), arrays (e.g., buttons, toy cars, shells, apples, coins, eggs, ten frames), circles (e.g., pizza, beads on a ring, peppers), or scattered configurations (e.g., crayons, dice, dominoes, tennis balls, pattern block flowers).
K.NS.9 Correctly use the words for comparison, including: one and many; none, small and all; more and less; most and least; and equal to, more than and less than.	***Building Fact Fluency:*** The Image Talks, Tool Talks, and Number Talks involve strings of connected problems where the quantities increase, decrease, or stay the same from one problem to the next, so students naturally compare quantities in everyday contexts, with tools, and with numbers. Because these routines are discussion-based, there are multiple opportunities for comparison language development.
K.NS.11 Develop initial understandings of place value and the base 10 number system by showing equivalent forms of whole numbers from 10 to 20 as groups of tens and ones using objects and drawings.	***Building Fact Fluency:*** The Markers (5), Pizza (11), and Coins (15) Lesson Strings explicitly focus on the “Ten and Some More” numbers. Anchor Problems and Contextualized Practice Problems provide opportunities for students to work within 20, and also to work with multidigit numbers and notice connections between “10 and some more” and “20 and some more,” and so on. The Teen Game provides additional practice.

COMPUTATION AND ALGEBRAIC THINKING	
K.CA.1 Use objects, drawings, mental images, sounds, etc., to represent addition and subtraction within 10.	***Building Fact Fluency:*** Students discuss the actions of addition and subtraction in every Image, Tool, and Number Talk, with teachers recording a variety of representations. Anchor Problems, Contextualized Practice Problems, and 3-Act Tasks invite students to create their own representations and learn from one another's representations through discussion. Journaling and reflection are opportunities for connections and metacognitive representations of the big ideas within addition and subtraction.
K.CA.2 Solve real-world problems that involve addition and subtraction within 10 (e.g., by using objects or drawings to represent the problem).	***Building Fact Fluency:*** The Contextualized Practice Problems and Anchor Problems provide ample practice with word problems of every problem type. Numbers are offered within 5, 10, 20, and multidigit, so students can solve problems of appropriate challenge.
K.CA.3 Use objects, drawings, etc., to decompose numbers less than or equal to 10 into pairs in more than one way, and record each decomposition with a drawing or an equation (e.g., 5 = 2 + 3 and 5 = 4 + 1). [In Kindergarten, students should see equations and be encouraged to trace them, however, writing equations is not required.]	***Building Fact Fluency:*** The Image, Tool, and Number Talks intentionally encourage this decomposition throughout. For example, the Peppers Lesson String Image Talk shows 10 peppers on two plates: 6 red and 4 yellow, then 4 red and 6 yellow, 7 red and 3 yellow, 3 red and 7 yellow, and so on. Teachers record representations and equations.
K.CA.4 Find the number that makes 10 when added to the given number for any number from one to nine (e.g., by using objects or drawings), and record the answer with a drawing or an equation.	***Building Fact Fluency:*** The Buttons (4), Markers (8), and Peppers (10) Lesson Strings are explicitly focused on the "Combinations for Ten" strategy, with plenty of embedded practice. The two "Partners for Ten" games specifically target this standard.

Indiana Academic Standards for Mathematics

– GRADE 1 –

NUMBER SENSE	
1.NS.2 Understand that 10 can be thought of as a group of ten ones — called a "ten." Understand that the numbers from 11 to 19 are composed of a ten and one, two, three, four, five, six, seven, eight, or nine ones. Understand that the numbers 10, 20, 30, 40, 50, 60, 70, 80, 90 refer to one, two, three, four, five, six, seven, eight, or nine tens (and 0 ones).	***Building Fact Fluency*:** The Combinations for Ten, Ten and Some More, and Make-10/Pretend-10 Lesson Strings emphasize the bundling of ones into tens, including numeric representation of tens and ones. The multidigit numbers in Contextualized Practice Problems encourage extension of these ideas into higher ten. The Markers (5), Pizza (11), and Coins (15) Lesson Strings contain problems, games, and tasks that encourage students to understand the structure of the teen numbers. In additional Lesson Strings, ten-frames, linking cubes, and rekenreks build on students' understanding of ten and extend into the teen numbers. Wherever appropriate, the Contextualized Practice Problems include a multidigit option that encourages students to extend their understanding of addition, subtraction, and place value into larger tens (e.g., number selection might include 4 + 6, 14 + 6, 24 + 6).
COMPUTATION AND ALGEBRAIC THINKING	
1.CA.1 Demonstrate fluency with addition facts and the corresponding subtraction facts within 20. Use strategies such as counting on; making ten (e.g., 8 + 6 = 8 + 2 + 4 = 10 + 4 = 14); decomposing a number leading to a 10 (e.g., 13 – 4 = 13 – 3 – 1 = 10 – 1 = 9); using the relationship between addition and subtraction (e.g., knowing that 8 + 4 = 12, one knows 12 – 8 = 4); and creating equivalent but easier or known sums (e.g., adding 6 + 7 by creating the known equivalent 6 + 6 + 1 = 12 + 1 = 13). Understand the role of 0 in addition and subtraction.	***Building Fact Fluency:*** Every single task in *Building Fact Fluency* aligns to this standard.

1.CA.2 Solve real-world problems involving addition and subtraction within 20 in situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all parts of the addition or subtraction problem (e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem).	***Building Fact Fluency:*** The Contextualized Practice Problems and Anchor Problems provide ample practice with word problems of every problem type. Numbers are offered within 5, 10, 20, and multidigit so students can solve problems of appropriate challenge. Students represent the operations with objects, drawings, and equations. The Image, Tool, and Number Talks build in a series that often involves counting up or down by some number and invites the connection to addition. The Shells (2), Bears (6), and Blocks (13) Lesson Strings focus specifically on adding or subtracting 0, 1, or 2. Many of the games invite this relationship using dice, ten-frames, or numerals.
1.CA.3 Create a real-world problem to represent a given equation involving addition and subtraction within 20.	***Building Fact Fluency:*** The Facilitator's Guide includes six types of journaling prompts, including "storytelling" prompts in which students write mathematical stories to match addition and subtraction equations within 20.
1.CA.4 Solve real-world problems that call for addition of three whole numbers whose sum is within 20 (e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem).	***Building Fact Fluency:*** The Contextualized Practice Problems provide practice opportunities in every problem type, with unknowns in all positions.
1.CA.5 Add within 100, including adding a two-digit number and a one-digit number, and adding a two-digit number and a multiple of 10, using models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; describe the strategy and explain the reasoning used. Understand that in adding two-digit numbers, one adds tens and tens, ones and ones, and that sometimes it is necessary to compose a ten.	***Building Fact Fluency:*** Wherever possible, Contextualized Practice Problems include multidigit number choices where students add and subtract within 100 in context. Students are encouraged to represent their thinking in a variety of ways and discuss the strategies they develop, as well as reflect on the bigger ideas through journaling and reflection.
1.CA.6 Understand the meaning of the equal sign, and determine if equations involving addition and subtraction are true or false (e.g., Which of the following equations are true and which are false? 6 = 6, 7 = 8 – 1, 5 + 2 = 2 + 5, 4 + 1 = 5 + 2).	***Building Fact Fluency:*** The connections from Image to Tool to Number Talk invite much discussion about the symbolic representation of addition and subtraction. In addition, there are many opportunities to compare expressions, leading to equations such as 5 + 3 = 3 + 5 and 7 + 3 = 8 + 2, which invite relational thinking about the equal sign (as opposed to thinking the equal sign means "the answer comes next").

Indiana Academic Standards for Mathematics

– GRADE 2 –

COMPUTATION AND ALGEBRAIC THINKING	
2.CA.1 Add and subtract fluently within 100.	***Building Fact Fluency:*** Every single task in *Building Fact Fluency* is designed to build fluency within 20 while building conceptual understanding of addition and subtraction. The multidigit options of the Contextualized Practice Problems and Anchor Problems offer hundreds of opportunities to practice adding and subtracting within 100 using strategies based on place value, the properties, and relationships between the operations.
2.CA.2 Solve real-world problems involving addition and subtraction within 100 in situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all parts of the addition or subtraction problem (e.g., by using drawings, and equations with a symbol for the unknown number to represent the problem). Use estimation to determine whether answers are reasonable in addition problems.	***Building Fact Fluency:*** The *Building Fact Fluency* problem-based lessons—Contextualized Practice Problems, Anchor Problems, and 3-Act Tasks—provide hundreds of opportunities for students to solve addition and subtraction word problems within 100 in all problem types and with unknowns in all positions. Students' representations of their work are core to these lessons and to formative assessment within the toolkit.
2.CA.6 Show that the order in which two numbers are added (commutative property) and how the numbers are grouped in addition (associative property) will not change the sum. These properties can be used to show that numbers can be added in any order.	***Building Fact Fluency:*** The assessment strategies in *Building Fact Fluency*—including metacognitive journaling and reflection, student self-assessment, observations during games and problem-based lessons, and interviews—offer students multiple opportunities to articulate and explain the meaning of the operations, their properties, and solution strategies. In addition, all the Lesson String components (Image Talks, Tool Talks, Number Talks, Anchor Problems, Contextualized Practice Problems, 3-Act Tasks, and Games) invite discussion about the meaning of the operations and provide opportunities for students to explain their thinking in both writing and talk.

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