Partnership for Inquiry Learning

COMPUTATION AND ALGEBRAIC THINKING (GRADE 2)
ALGEBRAIC THINKING (GRADES 3-5)

REAL-WORLD ADDITION AND SUBTRACTION PROBLEMS

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The Indiana Academic Standards place a high priority on contextualizing the mathematics students study. This series of videos examines how educators can assist students in seeing addition and subtraction in the world around them. Rather than reviewing specific strategies or tools students use in solving these problems, these videos address ways educators can construct problems for students to solve. In addition, a variety of contexts for Grades 2-5 is discussed so the problems students complete are real-world but also realistic and relevant to their lives.

GRADE 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 decide whether answers are reasonable in addition problems. (2.CA.2)

Unpacking the Standard

As they engage with real-world mathematics, second-grade students should be provided with examples that contain "unknowns in all parts of the addition or subtraction problem." This means that problems using a traditional structure (28 + 25 = ☐; Dominique has 28 markers. Tyler has 25 markers. How many do they have altogether?) provide just one way of thinking about addition or subtraction. As the variable moves within the problem, complexity increases (35 + ☐ = 72; Dominique has 35 markers. Tyler has some markers, too. If there are 72 markers altogether, how many markers does Tyler have?).

Considerations for Lessons and Assessment

This video supports teachers in understanding that rather than working with just one problem type at a time (such as 28 + 25 = ☐), students should be given problems with different structures on a regular basis (28 + 25 = ☐ and 35 + ☐ = 72 on the same day, for example). This ensures students avoid the rut of "following the rules." Lessons and assessments in second grade should require students to comprehend the problems, choose appropriate mathematics for the situations, and create viable arguments to justify answers (an important aspect of Process Standard 3 at each grade level).

GRADE 3

Solve real-world problems involving addition and subtraction of whole numbers within 1,000 (e.g., by using drawings and equations with a symbol for the unknown number to represent the problem) (3.AT.1)

Unpacking the Standard
Building on their experiences within 100 in second grade, third-grader students should be given opportunities to add and subtract numbers within 1,000. The hope is that teachers will begin with numbers within 100 (to identify strengths brought from second grade) before gradually increasing the numbers to meet the expectations for third grade.

Considerations for Lessons and Assessment
As in second grade, daily lessons—as well as formative and summative assessments—at the third-grade level should provide a variety of problem structures. This allows for unknowns to appear in different places as students move from one problem to the next (58 + 25 = ☐; 300 + ☐ = 520; ☐ + 150 = 665). In this video, teachers will see that by the end of the addition and/or subtraction unit, third-grade students should compute answers to problems with numbers within 1,000 fluently (demonstrating flexibility, efficiency, and accuracy).

GRADE 4

Solve real-world problems involving addition and subtraction of multi-digit whole numbers (e.g., by using drawings and equations with a symbol for the unknown number to represent the problem). (4.AT.1)

Unpacking the Standard
Multi-digit whole numbers move past 100 (second grade) and 1,000 (third grade) into numbers in the ten thousands, hundred thousands, millions, and beyond. It is important for educators to remember that these numbers are the end-of-year expectation, not a starting point for addition and/or subtraction units. Fourth-grade students should first engage with numbers within 1,000, identify strategies that can be translated to larger numbers, and then move to numbers beyond 1,000.

Considerations for Lessons and Assessment
This video explains the importance of fourth-grade teachers continuing to address the second-grade standard of presenting unknowns in different parts of the problem (4,582 + 3,276 = ☐; 75,125 + ☐ = 93,775; ☐ + 7,500,000 = 9,300,000). As in previous grades, lessons and assessments in fourth grade should allow students to demonstrate their mathematical understandings with a variety of problem structures and situations as the number sizes increase.

GRADE 5

Solve real-world problems involving addition, subtraction, multiplication, and division with decimals to hundredths, including problems that involve money in decimal notation (e.g. by using equations, models or drawings and strategies based on place value or properties of operations to represent the problem). (5.AT.5)

Unpacking the Standard
After mastering addition and subtraction of multi-digit whole numbers in fourth grade, fifth-grade students begin to work with decimals. Most students have significantly less experience with decimals (as compared to exposure to whole numbers); therefore, fifth-grade teachers should take great care to ensure students have strong number sense with decimals up to the hundredths prior to asking them to solve real-world problems containing these numbers.

Considerations for Lessons and Assessment
As in prior grades, unknowns should appear in different parts of the problems offered to fifth-grade students (2.3 + 1.6 = ☐; 5.25 + ☐ = 8.75; ☐ + 3.80 = 6.85). This video explains that lessons and assessments in fifth grade should include familiar contexts (e.g., money and other forms of measurement, statistics from sporting events) and strategies or tools with which students are comfortable (e.g., place value blocks, number lines, partial sums/differences). This comfort can be leveraged as students translate this knowledge to numbers containing decimals.

ADDITIONAL RESOURCES

Carpenter, T.P., Fennema, E., Franke, M. L., Levi, L., & Empson, S. B. (2014). *Children's mathematics: Cognitively guided instruction* (2nd ed.). Heinemann.
Empson, S. B., & Levi, L. (2011). *Extending children's mathematics: Fractions and decimals.* Heinemann.
Partnership for Inquiry Learning (n.d.). http://partnershipforinquirylearning.org.