Grade 5 - Unit A - Expressions, Equations and Volume

Unit Focus

In this unit, students use the study of volume to review and extend a host of skills and concepts related to multiplication. Students investigate a scenario in which they find different ways to arrange 24 cubes into a rectangular prism. This prompts a deeper look at the associative and commutative properties of multiplication as students use expressions with parentheses to represent different rectangular prisms. Students develop major multi-digit multiplications strategies to solve real world and mathematical problems in elegant and efficient ways. The link between multiplication and division is revisited through the lens of the area model.

Stage 1: Desired Results - Key Understandings

Standard(s)

Standards

- Common Core
  - *Mathematics: 5*
    - Write and interpret numerical expressions.
    - Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols. *(CCSS.MATH.CONTENT.5.OA.A.1)*
    - Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. For example, express the calculation add 8 and 7, then multiply by 2 as 2 × (8 + 7). Recognize that 3 × (18932 + 921) is three times as large as 18932 + 921, without having to calculate the indicated sum or product. *(CCSS.MATH.CONTENT.5.OA.A.2)*
    - Perform operations with multi-digit whole numbers and with decimals to hundredths.
    - Fluently multiply multi-digit whole numbers using the standard algorithm. *(CCSS.MATH.CONTENT.5.NBT.B.5)*
    - Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models. *(CCSS.MATH.CONTENT.5.NBT.B.6)*
    - Recognize volume as an attribute of solid figures and understand concepts of volume measurement. *(CCSS.MATH.CONTENT.5.MD.C.3)*
    - A cube with side length 1 unit, called a unit cube, is said to have one cubic unit of volume, and can be used to measure volume. *(CCSS.MATH.CONTENT.5.MD.C.3A)*
    - A solid figure which can be packed without gaps or overlaps using n unit cubes is said to have a volume of n cubic units. *(CCSS.MATH.CONTENT.5.MD.C.3B)*
    - Geometric measurement: understand concepts of volume.

Transfer

Students will be able to independently use their learning to...

T1 Apply models to solve problems.
T2 Choose appropriate tools to make reaching solutions more efficient, accessible and accurate.
T3 Demonstrate fluency with mathematical computations and definitions.

Meaning

Understanding(s)	Essential Question(s)
Students will understand that... **U1** Mathematicians calculate efficiently and accurately while using appropriate symbols and labels. **U2** Mathematicians create or use models to generalize, represent, and solve problems. **U3** Mathematicians strategically use different tools to build conceptual knowledge or solve problems.	*Students will keep considering...* **Q1** How do I check my work for accuracy and completeness? **Q2** What can I do to make my solution sufficiently clear? **Q3** How can constructing and deconstructing help me understand volume? **Q4** How are area and volume similar and different?

Acquisition of Knowledge and Skill

Knowledge	Skill(s)
Students will know... **K1** the difference between an expression and an equation **K2** how to calculate volume	*Students will be skilled at...* **S1** interpreting numerical expressions without evaluating them

Stage 1: Desired Results - Key Understandings

▪ Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units. *(CCSS.MATH.CONTENT.5.MD.C.4)* ▪ Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume. *(CCSS.MATH.CONTENT.5.MD.C.5)* ▪ Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold whole-number products as volumes, e.g., to represent the associative property of multiplication. *(CCSS.MATH.CONTENT.5.MD.C.5A)* ▪ Mathematical Practices ▪ Model with mathematics. *(CCSS.MATH.MP.4)* ▪ Use appropriate tools strategically. *(CCSS.MATH.MP.5)* ▪ Attend to precision. *(CCSS.MATH.MP.6)* **Madison Public Schools Profile of a Graduate** Analyzing: Examining information/data/evidence from multiple sources to identify possible underlying assumptions, patterns, and relationships in order to make inferences. *(POG.1.2)*	**K3** the methods for multiplying multi-digit numbers (area model, partial products, doubling and halving, over and under strategy) **K4** strategies for dividing multi-digit numbers (area model, partial quotients) **K5** Vocabulary: equation, factor, product, multiple, expression, evaluate, volume, dimension, associative property of multiplication, commutative property of multiplication, quotient, remainder	**S2** solving multiplication problems (two 2-digit numbers) using multiple methods **S3** using strategies to solve multi-step expressions mentally. **S4** solving multi-digit division problems **S5** finding the volume of rectangular prism **S6** evaluating expressions **S7** writing expressions based on a written statement **S8** solving story problems involving division with remainders