Bridging for Math Strength Resources

Standards of Learning Curriculum Framework (SOL)

Standard of Learning (SOL) 5.6b Solve single-step practical problems involving multiplication of a whole number, limited to 12 or less, and a proper fraction, with models



Student Strengths	Bridging Concepts	Standard of Learning
Students can represent equivalent fractions through twelfths, using region/area models, set models, and measurement/length models.	Students can use a set model to determine the fraction of a whole using only unit fractions.	Students can solve single-step practical problems involving multiplication of a whole number, limited to 12 or less, and a proper fraction, with models.

Understanding the Learning Trajectory

Big Ideas:

- Previously students have seen that 3 x 7 can be represented as the number of objects in 3 groups of 7 objects, and write this as 7 + 7 + 7. Students apply this understanding to fractions, seeing $\frac{1}{3} + \frac{1}{3} + \frac{1}{3} + \frac{1}{3} + \frac{1}{3}$ as 5 x $\frac{1}{3}$. This allows students to give meaning to the product of a whole number and a fraction (Common Core Writing Team, 2019, p. 14).
- All fractions are a sum of their unit fractions. For example, ¾ = ¼ + ¼ + ¼ .
- Fraction operation should begin with Multiplying a whole number by a fraction-specifically a whole number by unit fractions (e.g., 3 x $\frac{1}{3}$) then move to multiplication by whole number by non unit fractions (e.g., 3 x $\frac{2}{3}$)
- Multiplying unit fraction by a whole number can be related to dividing the whole number by the denominator of the fraction. For example, $\frac{1}{3}$of 6 is equivalent to 2. This understanding forms a foundation for learning how to multiply a whole number by a proper fraction (5th grade Curriculum Framework, p. 21).
- Multiplying a whole number times its reciprocal will result in a product of one whole. (Example 5 x $\frac{1}{5} = \frac{5}{5}$ or 1; $\frac{1}{6}$ x 6 = $\frac{6}{6}$ or 1).

Formative Assessment:

- Just in Time Mathematics Quick Check 5.6b PDF
- Just in Time Mathematics Quick Check 5.6b Desmos

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Important Assessment Look Fors:

- The student can write repeated addition of a fraction as the product of a fraction and a whole number.
- The student can create concrete and pictorial models to represent and simplify an expression.
- The student can interpret concrete and pictorial models to represent and solve an expression.
- The student can use the model to justify why the solution makes sense.
- The student can simplify their answer.

Purposeful Questions:

- What do you notice about the product of a fraction and a whole number? Why? (Students should notice it is smaller than the original whole because they are taking only PART of that whole).
- How does your picture represent repeated addition? Where do you see multiplication?
- Where do you see division in your model? How does this relate to the expression/equation you wrote? How does this represent the story in the problem?

Bridging Activity to Support Standard	Instructional Tips
Routines: Notice and Wonder	Make sure to use notice and wonders that hit all the models students are expected to use: area, number line, set, and numerical representations.
Rich Tasks: Pencil Supplies Stephanie Kessinger	Students find the number of pencils each student used by finding the fraction of a whole using a set model. Having actual pencils on hand may help students visualize but many other manipulatives can be used. If students need support, start with $\frac{1}{2}$ and onward. $\frac{3}{4}$ is included at the end in order to create a fruitful discussion that will lead fully into the 5th grade standard.
Games/Tech: Flipping pancake fraction from Education.com Desmos 5.6b Multiplying Fractions	This game uses a set model to flip a set of the pancake collection. Have students play with a partner and say the fraction problem. For example in this figure, it says flip ⅓ of the total pancake. The partner should say flip ⅓ of 15 which is 5 pancakes. The visual of the array makes it easy for students to see ⅓ of the collection. In this activity students explore contexts and models that build an understanding of fraction multiplication (whole number multiplied by a proper fraction).

Other Resources:

- Number Talks or Number Strings: Use number talks or number strings to introduce repeated fraction addition and its relationship to multiplication.
  Ex: $\frac{1}{2}+\frac{1}{2}$
  $\frac{1}{3}+\frac{1}{3}+\frac{1}{3}$
  $\frac{1}{4}+\frac{1}{4}+\frac{1}{4}+\frac{1}{4}$
- Matching: Match the visual to the expression.
- Lesson: Extending Multiplication from Whole Numbers to Fractions (Illustrative Mathematics). Students write a story problem for 5x4, draw diagrams, and then look for which diagram can also be used to solve 5 x $\frac{2}{3}$.
- 3 Act Tasks by Graham Fletcher:

    - Do the Dew: How many cups of sugar in a case of Mountain Dew?
    - The Juicer: How many grapefruits will fill the cup? ($\frac{1}{2}$ x 6) Also introduce metric measurement for visualization.
    - The Shrink-O-Matic rich task: Students look for a pattern in using the Shrink-o-Matic.
- Multiplying Fractions Desmos by Maria Swartzentruber
- "Mixed Numbers Calculator"
    - Citation: Furey, Edward "Mixed Numbers Calculator"; CalculatorSoup
- VDOE Mathematics Instructional Plans (MIPS)
    - 5.6ab – Enough Room: Adding and Subtracting Fractions (Word)/PDF Version
    - 5.6b – Multiplying Fractions and Whole Number (Word)/PDF Version
    - 5.6b – Multiplying Fractions with Proper Fractions (Word)/PDF Version
- VDOE Co-Teaching Mathematics Instruction Plans (MIPS)
    - 5.6b – Multiplying Fractions by Whole Number (Word)/PDF Version
- VDOE Algebra Readiness Formative Assessments
    - SOL 5.6b (Word)/PDF Version
- VDOE Algebra Readiness Remediation Plans
    - Problem Solving – Strategies for Finding the Hidden Question (Word)/PDF Version
- VDOE Word Wall Cards: Grade 5 (Word and PDF)
    - Unit Fraction Multiplication
- Desmos Resource
    - Multiplying Fractions - In this activity, students explore contexts and models that build an understanding of fraction multiplication (whole number multiplied by a proper fraction).

Learning Trajectory Resources:

Charles, R. (2005). Big ideas and understandings as the foundation for elementary and middle school mathematics. *Journal of Mathematics Education Leadership*, *7*(3), NCSM.

Common Core Standards Writing Team. (2019). Progressions for the Common Core State Standards for Mathematics. Tucson, AZ: Institute for Mathematics and Education, University of Arizona.

Van De Walle, J., Karp, K. S., & Bay-Williams, J. M. (2018). *Elementary and Middle School Mathematics: Teaching Developmentally.* (10th edition) New York: Pearson (2019:9780134802084)

VDOE Curriculum Framework for All Grades - Standard of Learning Curriculum Framework (SOL)