07. Multiplication and Division

Content Area: **Math**
Course(s):
Time Period: **Full Year**
Length: **5 weeks**
Status: **Published**

General Overview, Course Description or Course Philosophy

In this unit, students will deepen their understanding of multiplication and division. They will apply that knowledge to mentally solve number stories and multiply larger factors.

OBJECTIVES, ESSENTIAL QUESTIONS, ENDURING UNDERSTANDINGS

Essential Questions:

- How can one use properties as strategies to solve problems?
- How can one use multiplication to help solve division problems?

Enduring Understanding:

- Multiplication and division are inverse operations.
- Using properties can make problems easier.

CONTENT AREA STANDARDS

3.NBT

A. Use place value understanding and properties of operations to perform multi-digit arithmetic

3.NF

A. Develop understanding of fractions as numbers

3.M

A. Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects

B. Geometric measurement: understand concepts of area and relate area to multiplication and to addition

C. Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.3.OA.A.1	Interpret products of whole numbers, e.g., interpret 5 × 7 as the total number of objects in 5 groups of 7 objects each.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.3.OA.A.2	Interpret whole-number quotients of whole numbers, e.g., interpret 56 ÷ 8 as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each.
MA.3.OA.A.3	Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.
MA.K-12.4	Model with mathematics.
MA.3.OA.A.4	Determine the unknown whole number in a multiplication or division equation relating three whole numbers.
MA.3.OA.B.5	Apply properties of operations as strategies to multiply and divide.
MA.3.OA.B.6	Understand division as an unknown-factor problem.
MA.K-12.8	Look for and express regularity in repeated reasoning.
MA.3.OA.C.7	Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 × 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.
MA.3.NBT.A.2	Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.
MA.3.NBT.A.3	Multiply one-digit whole numbers by multiples of 10 in the range 10–90 (e.g., 9 × 80, 5 × 60) using strategies based on place value and properties of operations.
MA.3.NF.A.1	Understand a fraction $1/b$ as the quantity formed by 1 part when a whole is partitioned into b equal parts; understand a fraction a/b as the quantity formed by a parts of size $1/b$.
MA.3.NF.A.2a	Represent a fraction $1/b$ on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into b equal parts. Recognize that each part has size $1/b$ and that the endpoint of the part based at 0 locates the number $1/b$ on the number line.
MA.3.NF.A.2b	Represent a fraction a/b on a number line diagram by marking off a lengths $1/b$ from 0. Recognize that the resulting interval has size a/b and that its endpoint locates the number a/b on the number line.
MA.3.NF.A.3	Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size.
MA.3.NF.A.3c	Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers.
MA.3.NF.A.3d	Compare two fractions with the same numerator or the same denominator by reasoning about their size. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model.
MA.3.MD.A.2	Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem.
MA.3.MD.B.4	Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units— whole numbers, halves, or quarters.
MA.3.MD.C.7b	Multiply side lengths to find areas of rectangles with whole number side lengths in the

	context of solving real world and mathematical problems, and represent whole-number products as rectangular areas in mathematical reasoning.
MA.3.MD.C.7c	Use tiling to show in a concrete case that the area of a rectangle with whole-number side lengths a and $b + c$ is the sum of $a \times b$ and $a \times c$. Use area models to represent the distributive property in mathematical reasoning.
MA.3.MD.C.7d	Recognize area as additive. Find areas of rectilinear figures by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts, applying this technique to solve real world problems.

RELATED STANDARDS (Technology, 21st Century Life & Careers, ELA Companion Standards are Required)

LA.K-12.NJSLSA.R1	Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
LA.K-12.NJSLSA.SL1	Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
LA.K-12.NJSLSA.SL4	Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.
CS.K-12.3	Recognizing and Defining Computational Problems
CS.K-12.5	Creating Computational Artifacts
CS.K-12.6	Testing and Refining Computational Artifacts
TECH.9.4.5.CT	Critical Thinking and Problem-solving
TECH.9.4.5.CT.1	Identify and gather relevant data that will aid in the problem-solving process (e.g., 2.1.5.EH.4, 4-ESS3-1, 6.3.5.CivicsPD.2).
TECH.9.4.5.IML.2	Create a visual representation to organize information about a problem or issue (e.g., 4.MD.B.4, 8.1.5.DA.3).

STUDENT LEARNING TARGETS

- I can compare two fractions with the same numerator or the same denominator by reasoning about their size.
- I can justify the conclusions of fraction comparisons and record the results.
- I can apply properties of operations (Commutative, Associative, and Distributive) as strategies to multiply and divide.
- I can determine the unknown whole number in a multiplication or division equation relating three whole numbers.
- I can express whole numbers as fractions.
- I can find areas of rectilinear figures by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts.
- I can interpret products of whole numbers.
- I can interpret whole-number quotients of whole numbers.
- I can measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l).
- I can multiply whole-number side lengths to find areas of rectangles in the context of solving real

world and mathematical problems.
- I can represent a fraction 1/b on a number line diagram.
- I can represent a fraction a/b on a number line diagram.
- I can show measurement data by making a line plot.
- I can solve real world area problems by decomposing rectlinear figures and adding the areas of the non-overlapping parts.
- I can solve word problems (using multiplication and division within 100) in situations involving equal groups, arrays, and measurement quantities.
- I can understand a fraction 1/b as the quantity formed by 1 part when a whole is partitioned into b equal parts.
- I can understand a fraction a/b as the quantity formed by a parts of size 1/b.
- I can understand division as an unknown-factor problem.
- I can use area models to represent the distributive property in mathematical reasoning.
- I can use tiling to show in a concrete case that the area of a rectangle with whole-number side lengths a and b + c is the sum of a x b and a x c.
- I can add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units.
- I can fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.
- I can generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch.
- I can know from memory all products of two one-digit numbers (by the end of third grade).
- I can multiply and divide within 100 fluently.
- I can multiply one-digit whole numbers by multiples of 10 in the range 10-90 using strategies based on place value and properties of operations.
- I can recognize fractions that are equivalent to whole numbers.
- I can recognize that comparisons of two fractions are valid only when the two fractions refer to the same whole.

Declarative Knowledge

Students will understand that:

- Apply properties of operations (Commutative, Associative and Distributive) as strategies to multiply and divide
- Determine the unknown whole number in a multiplication or division equation relating three whole numbers
- Express whole numbers as fractions
- Interpret products of whole numbers
- Interpret whole number quotients of whole numbers
- Multiply whole number side lengths to find areas of rectangles in the context of solving real world and mathematical problems
- Represent a fraction 1/b on a number line diagram
- Represent fraction a/b on a number line diagram
- Solve word problems (using multiplication and division within 100) in situations involving equal groups, arrays and measurement quantities
- Understand a fraction 1/b as the quantity formed by one part when 1 whole is partitioned into b equal

parts
- Understand a fraction a/b as the quantity formed by a parts of size 1/b
- Understand division as an unknown factor problem
- Add, subtract, multiply or divide to solve one-step word problems involving masses or volumes that are given in the same units
- Fluently add and subtract within 1000 using strategieas and algorithms based on place value, properties of operations, and or the relationship between addition and subtraction
- Know from memory all products of two one-digit numbers (by the end of third grade)
- Multiply and divide within 100 fluently
- Multiply one digit whole numbers by multiples of 10 in the range 10-90 using strategies based on place value and properties of operations
- Recognize fractions that are equivalent to whole numbers
- Recognize that comparisons of two fractions are valid only when the two fractions refer to the same whole

Procedural Knowledge

Students will be able to:

- Compare two fractions with the same numerator or the same denominator by reasoning about their size
- Justify the conclusions of fraction comparisons and record the results
- Find areas of rectiliniar figures by decomposing them into non-overlapping rectangles and adding the areas of non-overlapping parts
- Solve real world area problems by decomposing rectilinear figures and adding the areas of the non-overlapping parts
- Use area models to represent the distributive property in mathematical reasoning
- Use tiling to show in a concrete case that the area of a rectangle with whole number side lengths a and b + c is the sum of a x b and a x c

EVIDENCE OF LEARNING

Refer to the 'Formative Assessments, Summative, and Benchmark Assessments' sections.

Alternate Assessments

- Portfolios

- Verbal Assessment (instead of written)

- Multiple choice

- Modified Rubrics

- Performance Based Assessments

Summative Assessments

- End of Unit Assessment
- Projects

Formative Assessments

- Journal Pages
- Math Boxes
- Math Talks
- Oen Response Activities
- Stdent Friendly Proficiency Scales
- Exit/Entrance Tickets
- Performance Tasks
- Teacher Observations

Benchmark Assessments

- IXL Screener / Diagnostic Snapshot BOY
- Interim Assessment 1
- IXL Diagnostic Snapshot MOY
- Interim Assessment 2
- IXL Diagnostic Snapshot EOY

RESOURCES (Instructional, Supplemental, Intervention Materials)

- Core Instructional Materials:

  - Everyday Math Unit 3 Resources
    - Math Masters
    - Student Journal Volume 1
    - ConnectED

Supplemental Materials:

- IXL
- Illustrative Math Tasks
- EM Games

EM Lessons:

- 8.2
- 8.3
- 8.4
- 8.5
- 8.6
- 9.1
- 9.2
- 9.3
- 9.5
- 9.6

INTERDISCIPLINARY CONNECTIONS

ACCOMMODATIONS & MODIFICATIONS FOR SUBGROUPS

- Repeat directions
- Provide scaffolds
- Use graphic organizers
- Use wait time
- Provide manipulatives, grid paper
- Provide additional time

See link to Accommodations & Modifications document in course folder.