Reviewing Using the IMET: Mathematics

Module 101: Focus and Coherence (Non-Negotiable Criteria 1 and 2)
Participant Materials

Essential Questions:

- How does the **Instructional Materials Evaluation Tool (IMET)** reflect the major features of the Standards and the Shifts?

- What understandings support high-quality, accurate application of the IMET metrics?

Goals:

- ✓ Understand how aligned materials embody the shifts inherent in the Common Core State Standards

- ✓ Understand the precise meaning of each metric of the IMET

- ✓ Recognize examples and non-examples related to each metric of Non-Negotiables 1 and 2 of the IMET

Common Core State Standards Shifts in Mathematics

1. **Focus** strongly where the Standards focus

Focus: The Standards call for a greater focus in mathematics. Rather than racing to cover topics in a mile-wide, inch-deep curriculum, the Standards require us to significantly narrow and deepen the way time and energy is spent in the math classroom. We focus deeply on the major work* of each grade so that students can gain strong foundations: solid conceptual understanding, a high degree of procedural skill and fluency, and the ability to apply the math they know to solve problems inside and outside the math classroom.

2. **Coherence**: **think** across grades, and **link** to major topics within grades

Thinking across grades: The Standards are designed around coherent progressions from grade to grade. Learning is carefully connected across grades so that students can build new understanding onto foundations built in previous years. Each standard is not a new event, but an extension of previous learning.

Linking to major topics: Instead of allowing additional or supporting topics to detract from the focus of the grade, these concepts serve the grade level focus. For example, instead of data displays as an end in themselves, they are an opportunity to do grade-level word problems.

3. **Rigor**: in major topics* pursue:
   - **conceptual understanding**,
   - procedural skill and **fluency**, and
   - **application** with equal intensity.

Conceptual understanding: The Standards call for conceptual understanding of key concepts, such as place value and ratios. Students must be able to access concepts from a number of perspectives so that they are able to see math as more than a set of mnemonics or discrete procedures.

Procedural skill and fluency: The Standards call for speed and accuracy in calculation. Students are given opportunities to practice core functions such as single-digit multiplication so that they have access to more complex concepts and procedures.

Application: The Standards call for students to use math flexibly for applications in problem-solving contexts. In content areas outside of math, particularly science, students are given the opportunity to use math to make meaning of and access content.

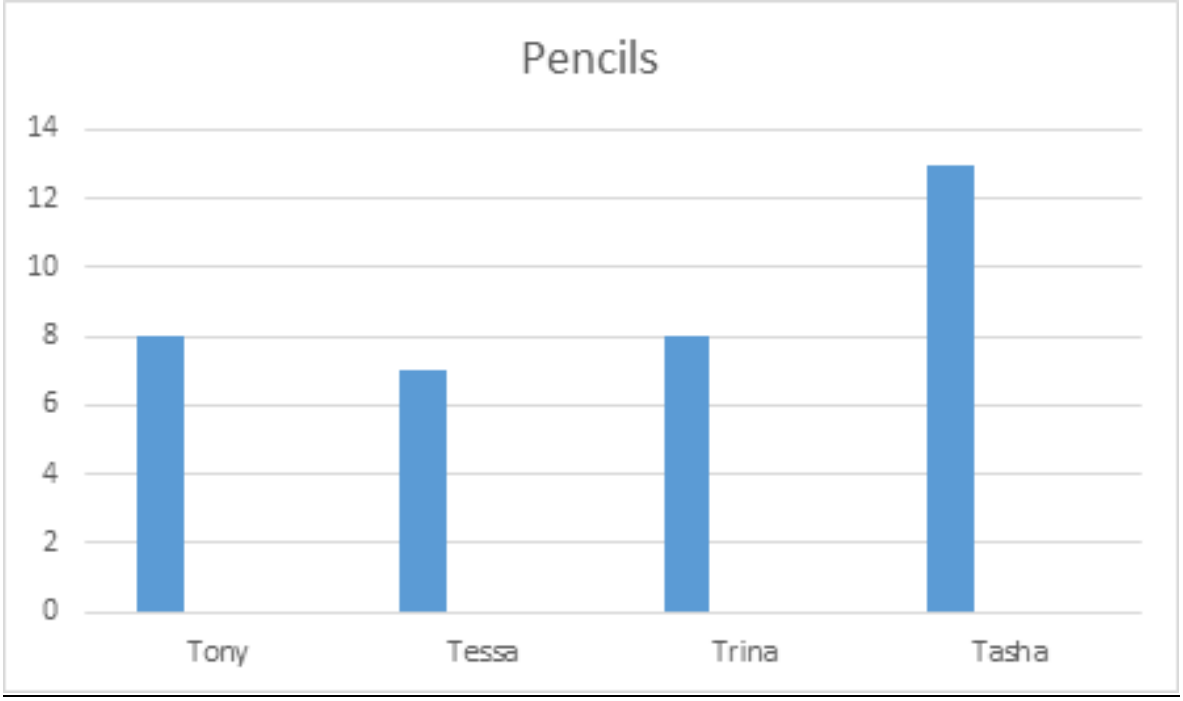
High-level Summary of Major Work in Grades K–8

K–2	Addition and subtraction—concepts, skills, and problem solving; place value
3–5	Multiplication and division of whole numbers and fractions—concepts, skills, and problem solving
6	Ratios and proportional relationships; early expressions and equations
7	Ratios and proportional relationships; arithmetic of rational numbers
8	Linear algebra and linear functions

*For a list of major, additional and supporting clusters by grade, please refer to 'Focus in Math' at achievethecore.org/focus pp. 4–12

STUDENT ACHIEVEMENT PARTNERS

NN Metric 1A: Materials reflect the basic architecture of the Standards by not assessing the topics listed below* before the grade level indicated.
Grade 3



If Mrs. Brown collects all of the pencils from the students and shares them equally among the students, how many pencils will each student get?

What is the average number of pencils the students have?

STUDENT ACHIEVEMENT PARTNERS

NN Metric 2A: In each grade K–8, students and teachers using the materials as designed devote the large majority of time to the Major Work of the grade.
Grade 4

The chart below lists chapter titles from various grade 4 programs. It is **not** a table of contents for a particular program.

Chapter Title	Major work of Grade 4	Supporting/ Additional Work of Grade 4	Not in grade 4	Unclear; Need to look at whether…
Multiplying Greater Numbers				
Adding and Subtracting Fractions				
Measurement Conversions				
Big Numbers, Estimation and Computation				
Decimals and their Uses				
Dividing by 1-digit Numbers				
Flips, Slides and Turns				
Comparing with Multiplication				
Number Patterns				
Multiply Fractions by Whole Numbers				
Rates				

NN Metric 2A: In each grade K–8, students and teachers using the materials as designed devote the large majority of time to the Major Work of the grade.

Grade 4 Correlated Curriculum

The following table shows how the Grade 4 ☒☒☒☒☒ curriculum covers all of the Grade 4 Common Core State Standards. All of the lessons in the Grade 4 Teacher's Guide and Assessment & Practice Books are listed, along with the Grade 4 Common Core State Standards they address. Note: the table of contents is subject to minor revision.

Domain

- OA Operations and Algebraic Thinking
- NBT Number and Operations in Base Ten
- NF Number and Operations—Fractions
- MD Measurement and Data
- G Geometry

Grade 4 Part 1

Unit 1: Patterns

Lesson Number	Lesson Title	Common Core State Standards
OA4-1	Increasing Sequences	Prep for 4.OA.C.5, 4.OA.A.3, 4.NBT.B.4
OA4-2	Decreasing Sequences	Prep for 4.OA.C.5, 4.OA.A.3
OA4-3	Increasing and Decreasing Sequences	Prep for 4.OA.C.5, 4.OA.A.3
OA4-4	Pattern Rules	4.OA.C.5
OA4-5	Introduction to T-tables	4.OA.C.5
OA4-6	T-tables	4.OA.C.5
OA4-7	Patterns Involving Time	4.OA.C.5, 4.OA.A.3
OA4-8	Problem Solving with Patterns	4.OA.C.5, 4.OA.A.3
OA4-9	Arrays	Prep for 4.MD.A.2, 4.OA.A.1
OA4-10	Multiplication and Addition	Prep for 4.MD.A.2, 4.OA.A.1
OA4-11	Multiplying by Skip Counting	Prep for 4.MD.A.2, 4.OA.A.1
OA4-12	Times as Many	4.OA.A.1

Unit 2: Place Value, Addition, and Subtraction

Lesson Number	Lesson Title	Common Core State Standards
NBT4-1	Place Value—Ones, Tens, Hundreds, and Thousands	4.NBT.A.2
NBT4-2	Place Value	4.NBT.A.2, 4.NBT.A.1
NBT4-3	Writing Numbers	4.NBT.A.2
NBT4-4	Representation with Base Ten Materials	4.NBT.A.2
NBT4-5	Representation in Expanded Form	4.NBT.A.2
NBT4-6	Comparing and Ordering Numbers	4.NBT.A.2
NBT4-7	Differences of 1, 10, 100, 1,000, 10,000, and 100,000	4.NBT.A.2

NBT4-8	Counting by 10s, 100s, and 1,000s	4.NBT.A.2
NBT4-9	Comparing Numbers (Advanced)	4.NBT.A.2
NBT4-10	Counting Coins	Prep for 4.NBT.B.4
NBT4-11	Which Coins Are Missing?	4.MD.A.2, Prep for 4.NBT.B.4
NBT4-12	Least Number of Coins	4.MD.A.2, Prep for 4.NBT.B.4
NBT4-13	Making Change Using Mental Math	4.MD.A.2, Prep for 4.NBT.B.4
NBT4-14	Regrouping	4.NBT.B.4
NBT4-15	Adding 2-Digit Numbers	4.NBT.B.4
NBT4-16	Adding with Regrouping	4.NBT.B.4
NBT4-17	Adding 3-Digit Numbers	4.NBT.B.4
NBT4-18	Adding Larger Numbers	4.NBT.B.4
NBT4-19	Subtraction	4.NBT.B.4
NBT4-20	Subtraction with Regrouping	4.NBT.B.4
NBT4-21	Subtraction with Regrouping (Advanced)	4.NBT.B.4
NBT4-22	Parts and Totals	Prep for 4.OA.A.3
NBT4-23	Parts and Totals (Advanced)	4.OA.A.3
NBT4-24	Fact Families	4.OA.A.3
NBT4-25	Sums and Differences	4.NBT.B.4
NBT4-26	Larger Numbers (Review)	4.NBT.B.4
NBT4-27	Concepts in Number Sense	4.NBT.B.4
Unit 3: Rounding		
Lesson Number	**Lesson Title**	**Common Core State Standards**
OA4-13	Rounding on a Number Line	4.NBT.A.3
OA4-14	Rounding on a Number Line (Hundreds and Thousands)	4.NBT.A.3
OA4-15	Rounding	4.NBT.A.3
OA4-16	Rounding on a Grid	4.NBT.A.3
OA4-17	Estimating Sums and Differences	4.OA.A.3
Unit 4: Multiplication		
Lesson Number	**Lesson Title**	**Common Core State Standards**
NBT4-28	Multiplying by Adding On	Prep for 4.NBT.B.5
NBT4-29	Multiplying Tens, Hundreds, and Thousands	4.NBT.A.1
NBT4-30	Mental Math	4.NBT.B.5
NBT4-31	Using Doubles to Multiply	Prep for 4.NBT.B.5
NBT4-32	Standard Method for Multiplication (No Regrouping)	4.NBT.B.5
NBT4-33	Multiplication with Regrouping	4.NBT.B.5
NBT4-34	Multiplying with the 6, 7, 8, and 9 Times Tables	4.NBT.B.5
NBT4-35	Multiplying a Multi-Digit Number by a 1-Digit Number	4.NBT.B.5

NBT4-36	Word Problems with Multiplying	4.NBT.B.5, 4.OA.A.2
NBT4-37	Multiplying 2-Digit Numbers by Multiples of 10	4.NBT.B.5
NBT4-38	Multiplying 2-Digit Numbers by 2-Digit Numbers	4.NBT.B.5
NBT4-39	Topics in Multiplication	4.NBT.B.5, 4.OA.A.2

Unit 5: Division

Lesson Number	Lesson Title	Common Core State Standards
OA4-18	Sets and Sharing	Prep for 4.NBT.B.6, 4.OA.A.3
OA4-19	Sharing When You Know the Number in Each Set	Prep for 4.NBT.B.6, 4.OA.A.3
OA4-20	Two Ways of Sharing	Prep for 4.NBT.B.6, 4.OA.A.3
OA4-21	Division, Addition, and Multiplication	Prep for 4.OA.A.2, 4.OA.A.3
OA4-22	Dividing by Skip Counting	Prep for 4.NBT.B.6
OA4-23	The Two Meanings of Division	Prep for 4.NBT.B.6, 4.OA.A.3
OA4-24	Division and Multiplication	4.NBT.B.6, 4.OA.A.3, 4.OA.A.2
OA4-25	Knowing When to Multiply or Divide	4.OA.A.2

Unit 6: Metric Units, Perimeter, and Time

Lesson Number	Lesson Title	Common Core State Standards
MD4-1	Centimeters	Prep for 4.MD.A.1
MD4-2	Millimeters	4.MD.A.1, 4.OA.A.2
MD4-3	Centimeters and Millimeters	4.MD.A.2, 4.OA.A.2
MD4-4	Centimeters and Millimeters (Advanced)	4.MD.A.2, 4.OA.A.2
MD4-5	Meters	4.MD.A.1, 4.OA.A.2
MD4-6	Meters (Advanced)	4.MD.A.1, 4.OA.A.2
MD4-7	Kilometers and Meters	4.MD.A.1, 4.OA.A.2, 4.NBT.B.4, 4.OA.A.3
MD4-8	Ordering and Assigning Appropriate Units	4.MD.A.1, 4.MD.A.2, 4.OA.A.2
MD4-9	Length (Review)	4.MD.A.1, 4.MD.A.2, 4.OA.A.2
MD4-10	Perimeter	Prep for 4.MD.A.3
MD4-11	Exploring Perimeter	4.MD.A.3, 4.OA.A.3
MD4-12	Measuring Perimeter	4.MD.A.3, 4.OA.A.3
MD4-13	Telling Time to the Minute	Prep for 4.MD.A.2
MD4-14	Elapsed Time	4.MD.A.1, 4.NBT.B.4
MD4-15	Elapsed Time (Advanced)	4.MD.A.2, 4.OA.A.3
MD4-16	Time Intervals	4.MD.A.1, 4.MD.A.2, 4.OA.A.2
MD4-17	Topics in Time	4.MD.A.1, 4.MD.A.2, 4.OA.A.3, 4.NBT.B.4

Unit 7: Shapes

Lesson Number	Lesson Title	Common Core State Standards
G4-1	Introduction to Classifying Data	Prep for 4.G.A.2
G4-2	Venn Diagrams	Prep for 4.G.A.2
G4-3	Sides and Vertices of 2-D Shapes	Prep for 4.G.A.2

G4-4	Right Angles	4.G.A.2
G4-5	Parallel Lines	4.G.A.1
G4-6	Quadrilaterals	Prep for 4.G.A.2
G4-7	Properties of Shapes	4.G.A.2
G4-8	Special Quadrilaterals	4.G.A.2
G4-9	Symmetry	Prep for 4.G.A.3
G4-10	More Symmetry	4.G.A.3
G4-11	Comparing Shapes	4.G.A.2
G4-12	Sorting and Classifying Shapes	4.G.A.2
G4-13	Puzzles and Problems	4.G.A.2

Grade 4 Part 2

Unit 1: More Patterns

Lesson Number	Lesson Title	Common Core State Standards
OA4-26	Patterns in the Times Tables	4.OA.C.5
OA4-27	Advanced Patterns	4.OA.C.5

Unit 2: Remainders

Lesson Number	Lesson Title	Common Core State Standards
NBT4-40	Remainders	Prep for 4.OA.A.3, 4.NBT.B.6
NBT4-41	Finding Remainders on Number Lines	Prep for 4.OA.A.3, 4.NBT.B.6
NBT4-42	Checking Division When There Is a Remainder (Advanced)	Prep for 4.NBT.B.6
NBT4-43	Dividing Using Tens, Hundreds, and Thousands	4.NBT.B.6
NBT4-44	Long Division—2-Digit by 1-Digit	4.NBT.B.6
NBT4-45	Long Division—Multi-Digit by 1-Digit	4.NBT.B.6, 4.MD.A.2
NBT4-46	Concepts in Multiplication and Division	4.NBT.B.6, 4.MD.A.2
NBT4-47	Mental Math	4.NBT.A.1, 4.NBT.B.6
NBT4-48	Mental Math (Advanced)	4.NBT.B.6
NBT4-49	Interpreting Remainders	4.OA.A.3
NBT4-50	Interpreting Remainders (Advanced)	4.OA.A.3
NBT4-51	Extending and Predicting Patterns	4.OA.C.5

Unit 3: Word Problems

Lesson Number	Lesson Title	Common Core State Standards
OA4-28	Introduction to Algebra—Addition	Prep for 4.OA.A.3
OA4-29	Introduction to Algebra—Multiplication	Prep for 4.OA.A.3
OA4-30	Totals and Equations	Prep for 4.OA.A.3
OA4-31	Differences and Equations	Prep for 4.OA.A.3
OA4-32	Addition and Subtraction Word Problems	4.OA.A.3
OA4-33	Problems with Diagrams	4.OA.A.3

OA4-34	Models and Times as Many	4.OA.A.2
OA4-35	Equations with Multiplication and Division	4.OA.A.1, 4.OA.A.2, 4.OA.A.3
OA4-36	More Totals and Differences (Advanced)	4.OA.A.1, 4.OA.A.2, 4.OA.A.3
OA4-37	Comparisons (Advanced)	4.OA.A.1, 4.OA.A.2, 4.OA.A.3
OA4-38	Multistep Word Problems	4.OA.A.1, 4.OA.A.2, 4.OA.A.3
Unit 4: Fractions		
Lesson Number	**Lesson Title**	**Common Core State Standards**
NF4-1	Naming Fractions	Prep for 4.NF.A.1, 4.NF.A.2
NF4-2	Comparing Fractions (Introduction)	Prep for 4.NF.A.1, 4.NF.A.2
NF4-3	Equal Parts and Models of Fractions	4.NF.A.2
NF4-4	Fractions on Number Lines	Prep for 4.NF.A.1, 4.NF.A.2
NF4-5	More Comparing Fractions	Prep for 4.NF.A.2
NF4-6	Equivalent Fractions and Multiplication	4.NF.A.1
NF4-7	Comparing Fractions Using Benchmarks (Advanced)	4.NF.A.2
NF4-8	Comparing Fractions Using Equivalent Fractions	4.NF.A.2
NF4-9	Problems and Puzzles (Advanced)	4.NF.A.2
NF4-10	Adding Fractions	4.NF.B.3a
NF4-11	Adding and Subtracting Fractions	4.NF.B.3a, 4.NF.B.3b, 4.NF.B.3d
NF4-12	Improper Fractions and Mixed Numbers (Introduction)	4.NF.B.3c
NF4-13	Improper Fractions and Mixed Numbers	4.NF.B.3c
NF4-14	Adding and Subtracting Mixed Numbers	4.NF.B.3c, 4.NF.B.3d
NF4-15	Equal Parts of a Set	Prep for 4.NF.B.4c
NF4-16	Fractions of Whole Numbers	4.NF.B.4c
NF4-17	Multiplying a Fraction by a Whole Number	4.NF.B.4a, 4.NF.B.4b
NF4-18	Problems and Puzzles	4.NF.B.3b, 4.NF.B.4c
Unit 5: Mass and Capacity		
Lesson Number	**Lesson Title**	**Common Core State Standards**
MD4-18	Grams and Kilograms	4.MD.A.1
MD4-19	Changing Units of Mass	4.NBT.B.4, 4.NBT.B.5, 4.MD.A.1, 4.MD.A.2
MD4-20	Problems Involving Mass	4.NBT.B.4, 4.NBT.B.5, 4.MD.A.1, 4.MD.A.2
MD4-21	Pounds and Ounces	4.MD.A.1
MD4-22	Converting Pounds to Ounces	4.NBT.B.4, 4.NBT.B.5, 4.NBT.B.6, 4.MD.A.1, 4.MD.A.2
MD4-23	Capacity	4.NBT.B.4, 4.MD.A.1
MD4-24	Problems with Capacity and Mass	4.NBT.A.1, 4.NBT.B.4, 4.NBT.B.5, 4.NF.B.3d, 4.NF.B.4, 4.MD.A.2

Unit 6: Factors		
Lesson Number	**Lesson Title**	**Common Core State Standards**
OA4-39	Organized Lists	4.OA.B.4
OA4-40	Factors	4.OA.B.4
OA4-41	Finding Factors	4.OA.B.4, 4.NBT.B.6
OA4-42	Factor Pairs	4.OA.B.4, 4.NBT.B.6
OA4-43	Prime Numbers and Composite Numbers	4.OA.B.4, 4.NBT.B.6
OA4-44	Problem Solving with Factors (Advanced)	4.OA.B.4
Unit 7: Decimals		
Lesson Number	**Lesson Title**	**Common Core State Standards**
NF4-19	Dollar Notation and Cent Notation	Prep for 4.NF.C.6
NF4-20	More Dollar Notation and Cent Notation	Prep for 4.NF.C.7
NF4-21	Tenths and Hundredths (Fractions)	4.NF.C.5, 4.NF.C.7
NF4-22	Decimal Tenths and Hundredths	4.NF.C.6, 4.NF.C.7
NF4-23	Comparing Decimal Tenths and Hundredths	4.NF.C.7
NF4-24	Combining Tenths and Hundredths	4.NF.C.6, 4.NF.C.7
NF4-25	Decimals and Money	4.NF.C.6, 4.NF.C.7
NF4-26	Adding Tenths and Hundredths	4.NF.C.5
NF4-27	Decimals Greater Than 1	4.NF.C.5
NF4-28	Different Wholes (Advanced)	4.NF.C.7
NF4-29	Problems and Puzzles	4.NF.C.7
Unit 8: US Customary Units and Area		
Lesson Number	**Lesson Title**	**Common Core State Standards**
MD4-25	Inches	4.MD.A.1
MD4-26	Quarters of an Inch	4.NF.B.3, 4.NF.B.4
MD4-27	Eighths of an Inch	4.NF.B.3, 4.NF.B.4, Prep for 4.MD.B.4
MD4-28	Feet	4.NBT.B.5, 4.MD.A.1
MD4-29	Feet and Inches	4.NBT.B.5, 4.MD.A.1
MD4-30	Measuring in Feet and Inches	4.NBT.B.5, 4.MD.A.1
MD4-31	Yards	4.NBT.B.5, 4.MD.A.1
MD4-32	Inches, Feet, and Yards (Review)	4.NBT.B.5, 4.MD.A.1, 4.MD.A.2
MD4-33	Area in Square Centimeters	Prep for 4.MD.A.3
MD4-34	Area of Rectangles	4.NBT.B.5, 4.MD.A.1, 4.MD.A.2
MD4-35	Problems with Area and Perimeter of Rectangles	4.NBT.B.5, 4.MD.A.1, 4.MD.A.2
MD4-36	Area (Advanced)	4.NBT.B.5, 4.MD.A.1, 4.MD.A.2
MD4-37	Problems and Puzzles	4.NBT.B.5, 4.MD.A.1, 4.MD.A.2
MD4-38	Line Plots (Review)	4.MD.B.4
MD4-39	Fractions on Line Plots	4.NF.B.3, 4.MD.B.4
MD4-40	Line Plots (Advanced)	4.NF.B.3, 4.MD.B.4

Unit 9: Angles		
Lesson Number	**Lesson Title**	**Common Core State Standards**
G4-14	Lines, Line Segments, and Rays	4.G.A.1
G4-15	Angles	4.MD.C.5, 4.G.A.1
G4-16	Measuring Angles	4.MD.C.6
G4-17	Drawing Angles	4.MD.C.6
G4-18	Adding Angles	4.MD.C.7
G4-19	Adding Angles (Advanced)	4.MD.C.7, 4.OA.A.3
G4-20	Angles as Fractions of a Circle	4.MD.A.2, 4.MD.C.5, 4.NF.B.3, 4.NF.B.4
G4-21	Angles in Shapes	4.MD.C.6, 4.G.A.2
G4-22	Classifying Shapes	4.G.A.2

STUDENT ACHIEVEMENT PARTNERS

NN Metric 2B: Supporting Work enhances focus and coherence simultaneously by also engaging students in the Major Work of the grade.

Standard/Cluster: 4.MD.A.2 Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.

4.OA.A.1 Interpret a multiplication equation as a comparison, e.g., interpret $35 = 5 \times 7$ as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations.

Elena has a cat with a mass of 4 kilograms. Ginger's cat has a mass that is 2 times as much as Elena's cat. What is the mass of Ginger's cat in grams?

STUDENT ACHIEVEMENT PARTNERS

NN Metric 2C: Materials base content progressions on the grade-by-grade progressions in the Standards. Content from previous or future grades does not unduly interfere with or displace on-grade-level content.

Standard/Cluster: 4.NBT.B.5 Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

BIG IDEA 1 Multiplication with Tens and Hundreds

Common Core State Standards 4.NBT.1, 4.NBT.5

1 **Arrays and Area Models**
ACTIVITIES Arrays of Ones • Arrays of Tens

2 **Connect Place Value and Multiplication**
ACTIVITIES Discuss a Product of Tens • Arrays of Hundreds

3 **Mental Math and Multiplication**
ACTIVITIES Review Multiplication with Tens • Mental Multiplication

BIG IDEA 2 Multiply by One-Digit Numbers

Common Core State Standards 4.OA.3, 4.NBT.2, 4.NBT.3, 4.NBT.5, 4.MD.2

4 **Model One-Digit by Two-Digit Multiplication**
ACTIVITIES Multiplication Modeling • Practice Multiplication • Multiplication with Dollars

5 **Estimate Products**
ACTIVITIES Estimate Products • Practice Estimation

6 **Use Place Value to Multiply**
ACTIVITIES Model the Place Value Sections Method • Model the Expanded Notation Method

7 **Algebraic Notation Method**
ACTIVITIES The Distributive Property and Multiplication • Connect Models and the Distributive Property

8 **Compare Methods of One-Digit by Two-Digit Multiplication**
ACTIVITIES Multiplication Methods • Practice Multiplication

9 **Discuss Different Methods**
ACTIVITIES Compare Multiplication Methods • Analyze the Shortcut Method

10 **One-Digit by Three-Digit Multiplication**
ACTIVITIES Multiply One-Digit Numbers by Hundreds • Use the Area Model to Multiply Hundreds • Practice One-Digit by Three-Digit Multiplication

BIG IDEA 3 Multiplication with Two-Digit Numbers

Common Core State Standards 4.OA.3, 4.NBT.2, 4.NBT.5

12 **Two-Digit by Two-Digit Multiplication**
ACTIVITIES Represent Multiplication • Practice Multiplication

13 **Different Methods for Two-Digit Multiplication**
ACTIVITIES Multiply Two-Digit Numbers • The Shortcut Multiplication Method

14 **Check Products of Two-Digit Numbers**
ACTIVITIES Compare Methods • Estimate Products of Two-Digit Numbers • Practice Multiplication

NN Metric 2C: Materials base content progressions on the grade-by-grade progressions in the Standards. Content from previous or future grades does not unduly interfere with or displace on-grade-level content.

Standard/Cluster: 4.NBT.B Use place value understanding and properties of operations to perform multi-digit arithmetic

1)

► Properties and Algebraic Notation

equation
simplify
term

An **expression** is one or more numbers, variables, or numbers and variables with one or more operations. Examples: 4 $6x$ $6x - 5$ $7 + 4$	An **equation** is a statement that two expressions are equal. It has an equal sign. Examples: $40 + 25 = 65$ $(16 \div 4) - 3 = 1$

We **simplify** an expression or equation by performing operations to combine like **terms**.

Use the Identity Property to simplify each expression.

1. $n + 5n =$ _____
2. $17t + t =$ _____
3. $x + 245x =$ _____
4. $9e - e =$ _____
5. $8c + c + c =$ _____
6. $(5z - z) - z =$ _____

Solve.

7. $30 \div (35 \div 7) =$ _____
8. $(72 \div 9) \div 4 =$ _____
9. $80 \div (32 \div 8) =$ _____
10. $13 - (9 - 1) =$ _____

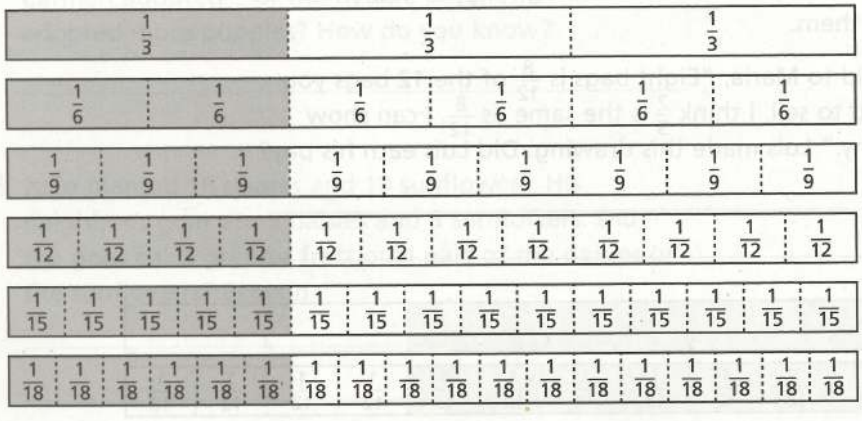
Standard/Cluster: 4.NF.A Extend understanding of fraction equivalence and ordering. (Grade 4 expectations in this domain are limited to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100.)

2)

► Use Fraction Bars to Find Equivalent Fractions

3. How do these fraction bars show equivalent fractions for $\frac{1}{3}$?

_____



5. Tell whether the fractions are equivalent.

a. $\frac{1}{6}$ and $\frac{2}{12}$ _____ b. $\frac{3}{6}$ and $\frac{5}{9}$ _____ c. $\frac{6}{12}$ and $\frac{8}{15}$ _____

STUDENT ACHIEVEMENT PARTNERS

NN Metric 2F: Review of material from previous grades is clearly identified as such to the teacher, and teacher and students can see what their specific responsibility is for the current year.

B – Bridging: Materials were designed to help schools transition to the Standards. We have assumed that students entering a particular grade may not have fully learned all of the material in the Standards from the previous grade. Thus, we have included some lessons that cover Standards from previous grades that students must know to succeed at grade level. These lessons are labeled with "B" in the annotated table of contents and are also clearly identified in the lesson plans. (Mathematical Practice Standards are rarely flagged in Bridging lessons.) We are developing a set of supplementary materials that teachers can use to replace bridging lessons when schools have fully adopted the Standards.

If the majority of students in your class already know the material in a bridging lesson well, then you might only teach the lesson to small groups of students who need the review; otherwise, we recommend that you cover the lesson quickly with the whole class. Your class will cover more material during the year if you start at a level that allows every student to succeed.

NN Metric 2E: Materials relate on-grade-level concepts explicitly to prior knowledge from earlier grades.
Standard/Cluster: 4.NBT.B Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

How Many in This Array?

Math Focus Points for Discussion

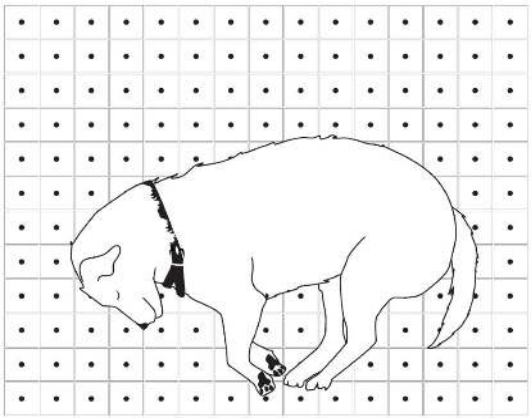
- Breaking an array into parts to find the product represented by the array
- Finding the multiples of a number by skip counting

Begin by telling students that their first topic of study in mathematics this year will be multiplication.

Tell pairs of students to turn to *Student Activity Book* page 1.

This page has a picture of a tiled floor, but a dog is sleeping on top. How can we figure out how many tiles are on this floor, including the ones that we can't see?

Give students time to solve the problem in pairs. Then bring them back together to discuss how they found their solutions.



Students use the structure of an array to determine the total number of items in that array.

Possible strategies students may have used include these:

- Finding the number of tiles in half of the array and doubling that number
- Rasoning from known multiplication combinations
- Breaking the factors apart by place value

STUDENT ACHIEVEMENT PARTNERS

NN Metric 2E: Materials relate on-grade-level concepts explicitly to prior knowledge from earlier grades.
Standard/Cluster: 4.NBT.B Use place value understanding and properties of operations to perform multi-digit arithmetic.

Numbers in the Thousands

LEARN

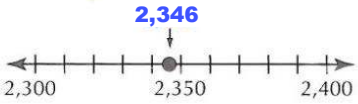
What are some ways to represent numbers in the thousands?

Here are different ways to represent 2,346.

Place-value blocks:

2 thousands 3 hundreds 4 tens 6 ones

Number line:



Expanded form: 2,000 + 300 + 40 + 6
2 thousands + 3 hundreds + 4 tens + 6 ones
$(2 \times 1{,}000) + (3 \times 100) + (4 \times 10) + (6 \times 1)$

Standard form: 2,346

Word form: two thousand, three hundred forty-six

Digits are the symbols used to write numbers: 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9.

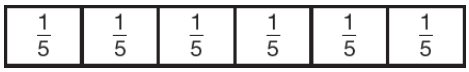
In 2,346, the digit 3 has a **value** of 300 because it is in the hundreds place.

Talk About It

1. Which digit is in the thousands place in 2,346?

Multiplying a Fraction by a Whole Number: Using Models

Write a multiplication equation of a whole number times a fraction to go with the picture.



Find the unit fraction: $\frac{1}{5}$

Count the number of unit fractions: 6

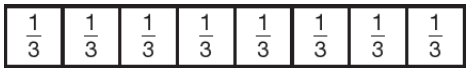
Write a multiplication equation to show the number of unit fractions times the unit fraction. $6 \times \frac{1}{5} = \square$

Multiply to find the product. $6 \times \frac{1}{5} = \frac{6}{5}$

The multiplication equation that goes with the picture is $6 \times \frac{1}{5} = \frac{6}{5}$.

In **1–2**, write a multiplication equation of a whole number and a fraction to go with the picture.

1.



Unit fraction: _____

Number of unit fractions: _____

Multiplication equation: _____

2.

Unit fraction: _____

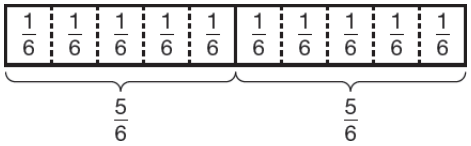
Number of unit fractions: _____

Multiplication equation: _____

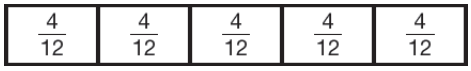
Multiplying a Fraction by a Whole Number: Using Models

For **1–3**, use each model to write a multiplication equation with a whole number and a fraction.

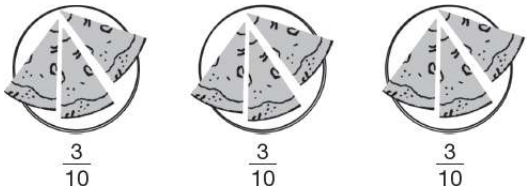
1.



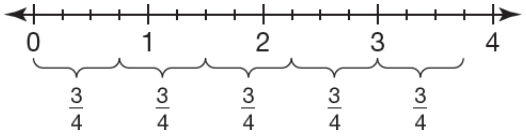
2.



3.

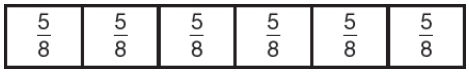


4. Reason Write a multiplication equation of a whole number times a fraction to go with the number line.



5. Model Explain why $4 \times \frac{3}{5} = \frac{(4 \times 3)}{5} = \frac{12}{5}$. Draw a picture.

6. Audrey uses $\frac{5}{8}$ cup of fruit in each smoothie she makes. She makes 6 smoothies to share with her friends. How many cups of fruit does she use?



A $3\frac{3}{8}$ cups

B $3\frac{1}{2}$ cups

C $3\frac{3}{4}$ cups

D $6\frac{5}{8}$ cups

Writing Fraction Equations

Sometimes, you can write more than one multiplication equation of a whole number times a fraction.

The model to the right shows $\frac{8}{6}$.

$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$
$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$

Possible equations: $8 \times \frac{1}{6} = \frac{8}{6} = 1\frac{2}{6} = 1\frac{1}{3}$

$4 \times \frac{2}{6} = \frac{8}{6} = 1\frac{1}{3}$

$2 \times \frac{4}{6} = \frac{8}{6} = 1\frac{1}{3}$

In **1–4**, write as many multiplication equations of a whole number times a fraction as you can to go with each model.

1.

$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$
$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$

_____

_____

2.

$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$
$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$
$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$
$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$

_____

_____

3.

$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$
$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$
$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$

_____

_____

4.

$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$
$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$
$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$
$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$

_____

_____

5. Generalize Explain how you were able to find all the possible multiplication equations of a whole number times a fraction to go with each picture.

_____

STUDENT ACHIEVEMENT PARTNERS

NN Metric 2H: Materials include problems and activities that serve to connect two or more clusters in a domain, or two or more domains in a grade, in cases where these connections are natural and important.

Cluster/Standard:

4.NF.C Understand decimal notation for fractions, and compare decimal fractions.

4.MD.A.2 Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.

4.NF.B.3d Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem.

Which holds more – one yellow watering can or two red watering cans? *Show how you got your answer.*