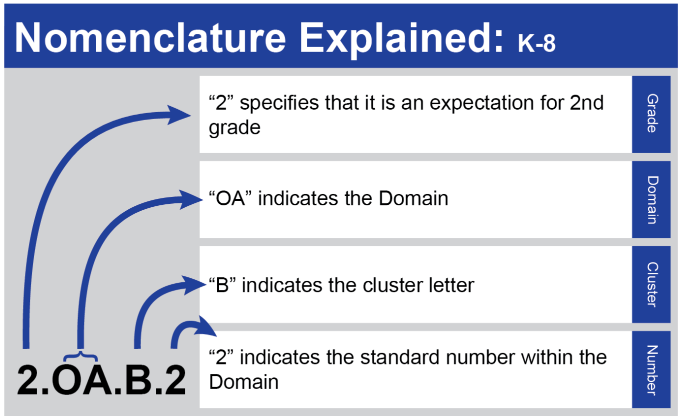
Arkansas Mathematics Standards
3rd Grade
2022

Introduction to the Grades K-8 Arkansas Mathematics Standards

When the Division of Elementary and Secondary Education (DESE) began the process of revising math standards, a diverse group of qualified educators from across the state came together to craft Arkansas standards specific to the schools and students in the state. The result of this work, the Arkansas Mathematics Standards, is contained in this document. These standards reflect what educators across the state know to be best for Arkansas students.

Standards Organization: The revision committee maintained the organizational structure and nomenclature of the previous standards. K-8 Arkansas Mathematics Standards are categorized into domains, clusters, and standards.

- **Domains** represent the big ideas to be studied at each grade level and sometimes across grade bands. These big ideas support educators in determining the proper amount of focus and instructional time to be given to each of these topics.
- **Clusters** represent collections of standards grouped to help educators understand the building blocks of rich and meaningful instructional units. These units help students make connections within clusters and avoid seeing mathematics as a discrete list of skills they must master.
- **Standards** represent the foundational building blocks of math instruction. The standards outlined in this document work together to ensure that students are college and career ready and on track for success.



Standards Support: The revision of the Arkansas Mathematics Standards represent the work of the committee to provide greater clarity, strength, and support of the standards. Additionally, the revised mathematics standards are designed to help educators better understand the areas of emphasis and the focus within the standards. Educators should address the bulleted content as more than a checklist of items that they must teach individually. Content is bulleted to provide specificity of learning expectations included within some extensive standards. In some instances, the standard document includes Arkansas examples, teacher notes, specifications, and italicized words to assist educators with planning, teaching, and student learning.

- **Examples** included in the original standards were either changed for clarity or separated from the body of the actual standard. The examples included in the body of the standards document in no way reflect all of the possible examples. Likewise, these examples do not mandate curriculum or problem types. Local districts are free to select the high-quality curricula and instructional methods that best meet the needs of their students.
- **Teacher notes** offer clarification of the standards. These notes are intended to clarify, for teachers, what the expectations are for the learner. Likewise, these notes provide instructional guidance and limitations so that educators can better understand the scope of the standard. This will help with determining what is developmentally appropriate for students when working with specific standards.
- **Standard specifications** are to strengthen standards. The specifications are precise statements highlighting the need for mastery or function-type parameters for specific standards. This will assist educators in pinpointing the best opportunities for students to gain and master the knowledge and skills needed to succeed in a progression.
- **Italicized words** are defined in the glossary.

Finally, the Arkansas Mathematics Standards will be a living document. As these standards are implemented across schools in the state, DESE welcomes further suggestions related to notes of clarification, examples, professional development needs, and future revisions of the standards.

K-12 Standards for Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Third Grade Standards: Overview

Abbreviations: The following abbreviations are for the domains for the Arkansas Mathematics Standards.

Operations and Algebraic Thinking – OA

- Represent and solve problems involving multiplication and division
- Understand properties of multiplication and the relationship between multiplication and division
- Multiply and divide within 100
- Solve problems involving the four operations, and identify and explain patterns in arithmetic

Number and Operations in Base Ten – NBT

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

Number and Operations – Fractions – NF

- Develop understanding of fractions as numbers
    - Note: Grade 3 expectations in this domain are limited to *fractions* with *denominators* 2, 3, 4, 6, and 8

Measurement and Data – MD

- Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of object
- Represent and interpret data
- Geometric measurement: understand concepts of area and relate area to multiplication and to addition
- Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures

Geometry – G

- Reason with shapes and their attributes

3 - 5 Grade Band Teacher Note:

Multiplication is represented with the • symbol instead of an x. This is to eliminate confusion between the multiplication symbol and the variable x.

Operations and Algebraic Thinking

Cluster A: Represent and solve problems involving multiplication and division.	
AR.Math.Content.3.OA.A.1	Interpret *products* of *whole numbers* (e.g., $4 \bullet 2$as the total number of objects in 4 groups of 2 objects) verbally, pictorially, or using a numerical *equation.* Teacher Note: The *equation* should match the situation (*Commutative Property* is not the focus of this standard $7 \bullet 5 = 35$ not $5 \bullet 7 = 35$).
AR.Math.Content.3.OA.A.2	Interpret whole-number *quotients* of *whole numbers* verbally, pictorially, or using a numerical *equation.* Teacher Note: Example: ● Interpret 35 ÷ 7 as the number of objects in each group when 35 objects are partitioned or shared equally into 7 groups of 5 objects. ● Interpret a number of objects when 35 objects are partitioned or shared equally into 5 groups of 7 objects each.
AR.Math.Content.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 or *variable* for the unknown number to represent the problem). ● Multiplication: *factors* up to and including 10 ● Division: *divisor* and *quotient* up to and including 10 and *dividends* up to and including 100
AR.Math.Content.3.OA.A.4	Determine the unknown *whole number* in a multiplication or division *equation* relating three *whole numbers.* ● Multiplication: *factors* up to and including 10 ● Division: *divisor* and *quotient* up to and including 10 and *dividends* up to and including 100 Teacher Note: Examples: Determine the unknown number that makes the *equation* true in each of the *equations.* ● $8 \bullet n = 48$ ● $5 = n \div 3$ ● $6 \bullet 6 = n$
Cluster B: Understand properties of multiplication and the relationship between multiplication and division.	
AR.Math.Content.3.OA.B.5	Apply *properties of operations* (*Commutative Property of Multiplication, Associative Property of Multiplication, Distributive Property*) as strategies to multiply and divide. Teacher Note: Teachers and students should use the correct terminology for these properties. Examples: ● If $6 \bullet 4 = 24$ is known, then $4 \bullet 6 = 24$ is also known (Commutative Property of Multiplication) ● $3 \bullet 5 \bullet 2$ can be found by $3 \bullet 5 = 15 \rightarrow 15 \bullet 2 = 30$ or by $5 \bullet 2 = 10 \rightarrow 3 \bullet 10 = 30$ (Associative Property of Multiplication) ● Knowing that $8 \bullet 5 = 40$ and $8 \bullet 2 = 16$, one can find $8 \bullet 7$ as $8(5 + 2) = (8 \bullet 5) + (8 \bullet 2) = 40 + 16 = 56$ (Distributive Property of multiplication)

AR.Math.Content.3.OA.B.6	Understand division as an unknown-*factor* problem. Teacher Note: This standard focuses on the *inverse* relationship between multiplication and division. Example: Find 32 ÷ 8 = n by finding the number that makes 32 when multiplied by 8 ($32 = n \bullet 8$).

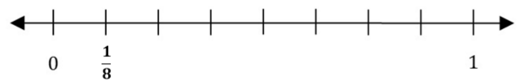
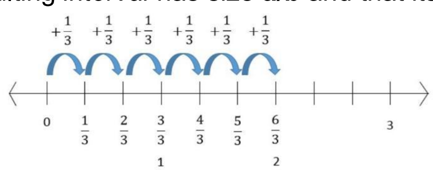
Cluster C: Multiply and divide within 100.	
AR.Math.Content.3.OA.C.7	Using *computational fluency* with multiplication and division within 100. ● Know all products with factors up to and including 10 ● Know the corresponding division facts ● Use strategies such as the relationship between multiplication and division (e.g., Knowing that $8 \bullet 5 = 40$, one knows 40 ÷ 5 = 8) or *properties of operations.* Teacher Note**:** To support student computational fluency use the scaffold as following: begin with basic fact fluency using facts 0, 1, 2, 5, and 10. When applicable, apply knowledge of facts 0, 1, 2, 5, and 10 to find products of 3, 4, 6, 7, 8, 9. ● *Basic fact fluency* - refers to *fluency* with operations involving single-digit numbers. ● *Computational fluency* - refers to having efficient and accurate methods for computing. Students exhibit computational *fluency* when they demonstrate flexibility in the computational methods they choose,understand and can explain these methods, and produce accurate answers efficiently. ● *Mastery* - refers to teaching in a way that students develop a deep understanding of mathematical concepts rather than memorizing key procedures or resorting to rote learning or simple memorization of facts. ● Examples: Students learn $3 \bullet 4 = 12$ because they know $(3 \bullet 2) + (3 \bullet 2) = 12$ Students learn $3 \bullet 7 = 21$ because they know $(3 \bullet 5) + (3 \bullet 2) = 21$ Specification: Students should demonstrate *mastery* of this standard by the end of 3rd grade.
Cluster D: Solve problems involving the four operations, and identify and explain patterns in arithmetic.	
AR.Math.Content.3.OA.D.8	Solve two-step word problems using the four operations (add, subtract, multiply, divide). ● Represent these problems using *equations* with a *variable* standing for an unknown quantity. ● Assess the reasonableness of answers using mental computation and estimation strategies including rounding. Teacher Note: This standard is limited to problems posed with *whole numbers* and having whole-number answers; students should know how to perform operations in the conventional order when there are no parentheses to specify a particular order (Order of Operations).
AR.Math.Content.3.OA.D.9	Identify arithmetic patterns (including, but not limited to, patterns in an addition table or multiplication table), and explain using *properties of operations* appropriate to the pattern. Teacher Note: Example: Observe that four times a number is always even and explain why four times a number can be decomposed into two equal *addends*.

Number and Operations in Base Ten

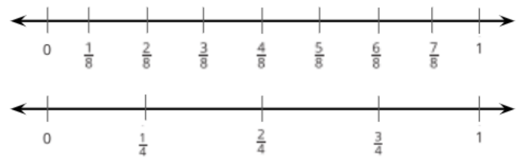
Cluster A: Use place value understanding and properties of operations to perform multi-digit arithmetic.

AR.Math.Content.3.NBT.A.1	Use *place value* understanding to round *whole numbers,* up to four digits, to the nearest 10 or 100. Teacher Note: Numbers should be rounded to the nearest tens place or nearest hundreds place based on the number's position on the number line. Examples: ● 1,757 rounds to 1,760 when rounding to the nearest tens place. ● 2,757 rounds to 2,800 when rounding to the nearest hundreds place.
AR.Math.Content.3.NBT.A.2	Using *computational fluency*, add and subtract three-digit *whole numbers* using strategies and *algorithms* based on *place value*, *properties of operations*, and the relationship between addition and subtraction. Teacher Note: ● *Computational fluency* - refers to having efficient and accurate methods for computing. Students exhibit computational *fluency* when they demonstrate flexibility in the computational methods they choose,understand and can explain these methods, and produce accurate answers efficiently. ● *Algorithms* - can be viewed as any valid base ten strategy.
AR.Math.Content.3.NBT.A.3	Multiply one-digit *whole numbers* by multiples of 10 in the range 10 - 90 (e.g., $9 \bullet 80, 5 \bullet 60$) using strategies based on *place value* and *properties of operations.*
AR.Math.Content.3.NBT.A.4	Understand that the four digits of a four-digit number represent the amounts of thousands, hundreds, tens, and ones (e.g., 7,706 can be portrayed in a variety of ways according to *place value* strategies). Understand the following as special cases: ● 1,000 can be thought of as a group of ten hundreds - called a thousand. ● The numbers 1,000, 2,000, 3,000, 4,000, 5,000, 6,000, 7,000, 8,000, 9,000 refer to one, two, three, four, five, six, seven, eight, or nine thousands.
AR.Math.Content.3.NBT.A.5	Read, write, and compare numbers. ● Read and write numbers up to 10,000 using base-ten numerals, number names, and *expanded form(*s). ● Compare two, four-digit numbers based on meanings of the thousands, hundreds, tens, and ones digits using symbols (<, >, =) to record the results of comparisons. Teacher Note: Teachers and students should use the correct terminology of symbols to record the results of comparisons. Example: ● Using base-ten numerals (standard form or numerical form): 347 ● Number name form (word form): three-hundred forty-seven ● *Expanded form(s)*: 300 + 40 + 7 = 347 or $(3 \bullet 100)$ + $(4 \bullet 10)$ + $(7 \bullet 1)$ = 347

Number and Operations – Fractions

Cluster A: Develop understanding of fractions as numbers. Note: Grade 3 expectations in this domain are limited to *fractions* with *denominators* 2, 3, 4, 6, and 8	
AR.Math.Content.3.NF.A.1	Develop fraction understanding. ● Understand a *fraction* **1/b** as the quantity formed by 1 part when a whole is partitioned into **b** equal parts. ○ Example: *Unit fractions* are *fractions* with a *numerator* of 1 derived from a whole partitioned into equal parts and having 1 of those equal parts (1/4 is 1 part of 4 equal parts). ● Understand a *fraction* **a/b** as the quantity formed by **a** parts of size **1/b**. ○ Example: Unit fractions can be joined together to make non-unit fractions (1/4 + 1/4 + 1/4 = 3/4). Teacher Note: Student understanding of fractions should include parts of a whole and parts of a collection or set. Examples: ● Parts of a whole - David cut his whole pizza into six slices. He ate two slices. What fraction of the pizza did David eat? ● Parts of a collection or set - Tara has eight sweaters. She has three purple sweaters. What fraction of Tara's sweaters are purple?
AR.Math.Content.3.NF.A.2	Understand a *fraction* as a number on the number line and represent *fractions* on a *number line diagram*. ● 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. ● Represent a *fraction* **a/b** on a *number line diagram* by marking off a length **1/b** from 0. ○ Example:  ● Recognize that the resulting *interval* has size **a/b** and that its endpoint locates the number **a/b** on the number line. ○ Example:  Teacher Note: Specification: Students should demonstrate *mastery* of this standard by the end of 3rd grade.
AR.Math.Content.3.NF.A.3	Explain equivalence of *fractions* in special cases and compare *fractions* by reasoning about their size (special cases refer to contextual situations where students must determine fraction equivalence in real-world problems).

- Understand two *fractions* as equivalent (equal) if they are the same size or the same point on a number line (e.g., 3/4 and 6/8 are equivalent).



- Recognize and generate simple equivalent *fractions* (e.g., 1/2 = 2/4, 4/6 = 2/3). Explain why the *fractions* are equivalent (e.g., By using a *visual fraction model or* number line).

- Express *whole numbers* as *fractions* and recognize *fractions* that are equivalent to *whole numbers* (e.g., Express 3 in the form 3 = 3/1, recognize that 16/4 = 4, locate 4/4 and 1 at the same point of a *number line diagram*).
- 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 symbols (>, =, <) and justify the conclusions (e.g., By using a *visual fraction model*).

Teacher Note: Teachers and students should use the correct terminology of symbols to record the results of comparisons.

Measurement and Data

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

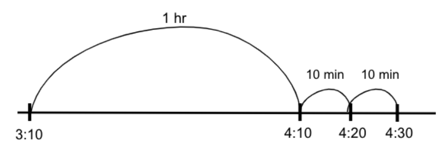
AR.Math.Content.3.MD.A.1

Tell time and solve elapsed time problems.

- Tell time using the terms quarter and half as related to the hour (e.g., Quarter-past 3:00, half-past 4:00, quarter till 3:00).
- Tell and write time to the nearest minute.
- Solve word problems involving addition and subtraction of time *intervals* or elapsed time in minutes.

Teacher Note: K-3 Learning Progression for Time.

Progression of Time Skills	
Grade Level	Time Learning Expectation
Kindergarten	Tell time to the nearest hour
First Grade	Tell time to the nearest half-hour
Second Grade	Tell time to the nearest 5 minutes
Third Grade	Tell time to the nearest quarter hour Tell time to the nearest minute Solve word problems involving time



Example: Representing a time problem on a *number line diagram.*

Specification: Students should demonstrate *mastery* of this standard by the end of 3rd grade.

AR.Math.Content.3.MD.A.2

Explore and solve problems involving liquid *volumes* and *masses* of objects.

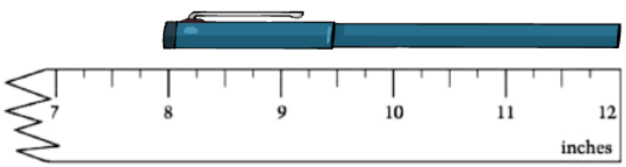
- Measure and estimate liquid *volumes* and *masses* of objects using standard units such as:

Customary	cups (c)	pints (pt)	quarts (qt)	gallons (gal)
Metric	liters (l)	grams (g)	kilograms (kg)	

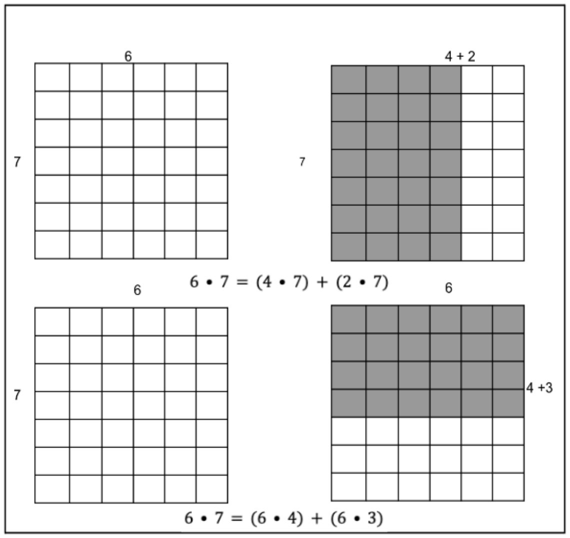
- Solve one step word problems using one of the four operations (add, subtract, multiply, or divide) involving liquid *volumes* and *masses* of objects that are given in the same units (e.g., Use drawings such as a beaker with a measurement scale to represent the problem).

Teacher Note:

- Conversions can be introduced but not assessed.
- Excludes compound units such as cubic centimeters and finding the geometric *volume* of a container. Excludes *multiplicative comparison* problems (problems involving notions of 'times as much').

<table>
<tr><td colspan="2">Cluster B: Represent and interpret data.</td></tr>
<tr><td>AR.Math.Content.3.MD.B.3</td><td>Represent data and solve one and two-step problems.
Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories (e.g., Draw a bar graph in which each square in the bar graph might represent five pets).
Solve one and two-step ‘how many more and how many less’ problems using information presented in scaled picture graphs and scaled bar graphs.</td></tr>
<tr><td>AR.Math.Content.3.MD.B.4</td><td>Measure and solve problems with a line plot.
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.
Teacher Note: Measurement starting at a number other than zero is introduced in grade 3.
Example: Using the ruler provided, what is the length of the pen?

</td></tr>
<tr><td colspan="2">Cluster C: Geometric measurement: understand concepts of area and relate area to multiplication and to addition.</td></tr>
<tr><td>AR.Math.Content.3.MD.C.5</td><td>Recognize area as an attribute of plane figures and understand concepts of area measurement.
A square with a side length of 1 unit, called ‘a unit square,’ is said to have ‘one square unit’ of area and can be used to measure area.
A plane figure, which can be covered without gaps or overlaps by n unit squares, is said to have an area of n square units.</td></tr>
<tr><td>AR.Math.Content.3.MD.C.6</td><td>Measure areas by counting unit squares [e.g., Square cm (cm^2), square m (m^2), square in (in^2), square ft (ft^2), and improvised units (u^2)].</td></tr>
<tr><td>AR.Math.Content.3.MD.C.7</td><td>Relate area to the operations of multiplication and addition.
Find the area of a rectangle with whole number side lengths by tiling it and show that the area is the same as would be found by multiplying the side lengths.
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.
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 × b and a × c.
Use area models to represent the distributive property in mathematical reasoning.
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.</td></tr>
</table>

Teacher Note:
Example: Your classroom is planting a community garden. The garden will have 6 columns of corn and 7 rows of carrots. Find two different ways to split the corn from the carrots. [$6 \bullet 7 = (6 \bullet 4) + (6 \bullet 3)$ or $(4 \bullet 7) + (2 \bullet 7)$]



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

AR.Math.Content.3.MD.D.8	Solve real-world and mathematical problems involving perimeters of *polygons*, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.

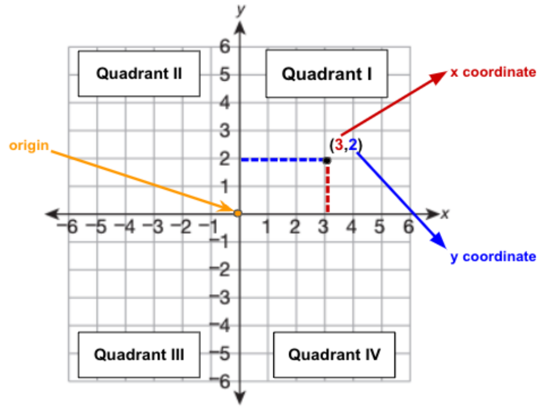
Geometry

Cluster A: Reason with shapes and their attributes.

AR.Math.Content.3.G.A.1	Understand attributes of shapes. ● Understand that quadrilaterals in different categories may share *attributes.* Those *attributes* can define a larger category or subcategory (e.g., Quadrilaterals are four-sided shapes. Squares are four-sided shapes with four equal sides and four right angles. The attributes of a square classify it as part of both the larger category of quadrilaterals and the subcategory of squares). ● Shapes to include: ○ Quadrilaterals: *trapezoid*, parallelogram, rectangle, square, rhombus ○ Non-Quadrilaterals: triangles, pentagons, hexagons, circles ● Identify perpendicular and parallel lines, as well as right angles. ● Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories. ● Teacher Note: *Trapezoids* are defined to be a quadrilateral with at least one pair of opposite sides parallel.

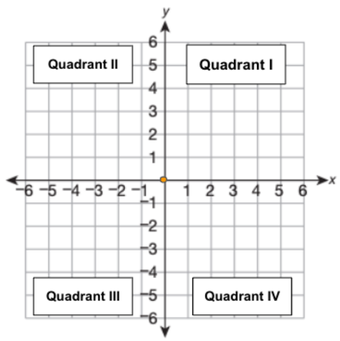
AR.Math.Content.3.G.A.2	Partition shapes: ● Partition shapes into parts with equal areas. ● Express the area of each part as a *unit fraction* of the whole. Teacher Note: Example: Partition a shape into four parts with equal area, and describe the area of each part as 1/4 of the shape's area. | 1/4 | 1/4 | 1/4 | 1/4 |

K-5 Glossary	
Addend	Any of the numbers added to find a sum
Additive Comparison	Compare two amounts by asking how much more or less is one amount than the other.
Additive inverses	Two numbers whose sum is 0 are additive inverses of one another; example: 3/4 and (-3/4) are additive inverses of one another because 3/4 + (- 3/4) = 0
Algorithm	An explicit step-by-step procedure for performing a mathematical computation or for solving a mathematical problem.
Associative Property of addition	A property of real numbers that states that the sum of a set of numbers is the same, regardless of how the numbers are grouped. Example: (4 + 8) + 3 = 4 + (8 + 3)
Associative Property of multiplication	A property of real numbers that states that the product of a set of numbers is the same, regardless of how the numbers are grouped. Example: $(4 \bullet 8) \bullet 3 = 4 \bullet (8 \bullet 3)$
Attributes	Characteristics or properties of an object
Axis	A vertical or horizontal number line, both of which are used to define a coordinate grid. The horizontal axis is the x-axis, and the vertical axis is the y-axis. The plural of axis is axes.
Benchmark Fraction	A common fraction used when comparing other fractions (e.g., 1/2 , 1/4)
Cardinality	The understanding that when you count items, the number word applied to the last object counted represents the total amount.
Commutative Property of addition	A property of real numbers that states that the sum of two terms is unaffected by the order in which the terms are added; i.e., the sum remains the same. Example: $5 + 9 = 9 + 5$
Commutative Property of multiplication	A property of real numbers that states that the product of two factors is unaffected by the order in which the factors are multiplied, i.e., the product remains the same. Example: $5 \bullet 9 = 9 \bullet 5$
Composite	A number with more than two factors.
Composite Shape	Shapes composed of two or more shapes.
Congruent	Identical in form
Coordinate	An ordered pair of numbers in the form (*x, y*) that describes the location of a point on a coordinate plane.
Coordinate Plane	A plane divided by perpendicular number lines creating four quadrants. The perpendicular number lines represent the axes and where they intersect represents the origin (0,0). Points can be identified using coordinates (x,y) found within the quadrants (example below).

K-5 Glossary	
	
Counting Back	A strategy for finding the difference using backward counting. For example, if a stack of books has 12 books and someone borrows 4 books to read, how many books are left? A student may start at 12 and count back for spaces or numbers saying 12…11, 10, 9, 8; there are 8 books left in the stack.
Counting On	A strategy for finding the number of objects in a group without having to count every member of the group. For example, if a stack of books has 8 books and 3 more books are added to the top, it is unnecessary to count the stack all over again. One can find the total by *counting on* pointing to the top book and saying "eight", following this with "nine, ten, eleven." There are eleven books now.
Data Set	A collection of numbers related to a topic.
Decompose	Breaking a quantity into smaller quantities/units in order to assist computation.
Denominator	The term of a fraction, usually written under the line, that indicates the number of equal parts into which the unit is divided; divisor
Difference	The distance between two values; result of a subtraction problem.
Distributive Property	When a single-term expression is being multiplied by a sum or difference, the single-term expression can be multiplied by each term before finding the sum or difference. Examples: $3(7 + 5) = 3 \bullet 7 + 3 \bullet 5$ $w(5 - 2) = 5w - 2w$
Dividend	A number that is being divided by another number (divisor)
Divisor	The number by which another number is being divided
Equation	A statement that has one number or expression equal to another number or expression, such as 8 + 3 = 11 or 2x- 3 = 7.
Evaluate	Calculate or solve
Expanded form	A multi-digit number is expressed in expanded form when it is written as a sum of the single-digit multiples of powers of ten. For example, 643 = 600 + 40 + 3
Exponent	A symbol that is written above and to the right of a number to show how many times the number is to be multiplied by itself
Expression	A mathematical phrase consisting of numbers, variables, and operations

K-5 Glossary	
Fluency	There are different types of ***fluency***. All of them require students to be accurate, efficient, and flexible. The types are defined as follows: Basic fact fluency - fluency with operations involving single digit numbers. Computational fluency - having efficient and accurate methods for computing. Students exhibit computational fluency when they demonstrate flexibility in the computational methods they choose, understand, and can explain these methods as well as produce accurate answers efficiently. Procedural fluency - Procedural fluency is the ability to apply procedures accurately, efficiently, and flexibly; to transfer procedures to different problems and contexts; to build or modify procedures from other procedures, and to recognize when one strategy or procedure is more appropriate to apply than another. (NCTM)
Factor	One or more numbers (or variables) that are multiplied together to get a product (5 and 2 are both factors because 5 • 2 =10)
Fraction	A number expressible in the form *a/b* where *a* is a whole number and *b* is a whole number. (The word fraction in these standards, K-5, always refers to a non-negative number.) This includes all forms of fractions - fractions less than one, fractions greater than one (improper fractions), and mixed numbers. *See also*: rational number
Identity property of 0	The property that asserts the sum of an original addend plus zero is equal to the original addend. Example: $58 + 0 = 58$
Identity property of 1	The property that asserts the product of an original factor times one is equal to the original factor. Example: $58 \bullet 1 = 58$
Inequality Symbols	Symbols used to show a comparison between quantities. Also known as the greater than and less than symbols (<,>).
Interval	Includes all the numbers that come between two particular numbers.
Inverse (Operation)	An operation that is the opposite of, or undoes, another operation. Addition and subtraction are inverse operations as are multiplication and division.
Iterating	Repeating; repetition of a process in order to generate a sequence of outcomes.
Line plot	A method of visually displaying a distribution of data values where each data value is shown as an X or mark above a number line. Also known as a dot plot.
Mass	The amount of matter in an object. Often measured by the amount of material it contains which causes it to have weight. However, mass is not to be confused with weight. Weight is determined by the force of gravity on an object while mass is not. For example, an watermelon on Jupiter would have a greater weight than one on Earth because Jupiter's gravity is stronger than Earth's. The mass of the watermelon would be the same on both planets.
Mastery	Refers to teaching in a way that students learn to develop a deep understanding of mathematical concepts rather than memorizing key procedures or resorting to rote learning of steps or facts.
Multiplicative Comparison	Compare two amounts by asking how many times larger or smaller is one amount than the other.
Multiplicative inverses	Two numbers whose product is 1 are multiplicative inverses of one another. Examples: 3/4 and 4/3 are multiplicative inverses of one another because 3/4 • 4/3 = 1 6 and $\frac{1}{6}$ are also multiplicative inverses because $6 \bullet \frac{1}{6}$ = 1

K-5 Glossary

Natural Numbers	Counting numbers 1, 2, 3, 4, 5, 6…
Number line diagram	A diagram of the number line used to represent numbers and support reasoning about them. In a number line diagram for measurement quantities, the interval from 0 to 1 on the diagram represents the unit of measure for the quantity
Numerator	The number in a fraction that is above the fraction line and that is divided by the number below the fraction line
Order of Operations	A specific sequence in which operations are to be performed when an expression requires more than one operation.
Origin	The point in a Cartesian coordinate system where axes intersect
Place value	The value of the place of a digit in a numeral; the relative worth of each number that is determined by its position
Polygons	A closed two-dimensional figure made up of straight sides.
Prime	A number with only two factors, 1 and itself.
Prism	A three-dimensional (solid) figure that has two congruent and parallel faces that are polygons called bases. The remaining faces, called lateral faces, are parallelograms (often rectangles). Prisms are named by the shape of their bases.
Product	The number or expression resulting from the multiplication together of two or more numbers or expressions (factor • factor = product)
Properties of operations	Rules that apply to the operations with real numbers. (See Table 1 below)
Quadrant	One of the four sections of a coordinate plane separated by horizontal and vertical axes. 
Quotient	The number that results when one number is divided by another
Rational Numbers	A real number which can be written in the form $\frac{a}{b}$, where a and b are integers and $b \neq 0$. The set of rational numbers include the set of integers.
Rectangular array	A set of quantities arranged in rows and columns
Rectangular Prism	A three-dimensional figure whose six faces are rectangles.
Rectilinear Figures	A polygon with all right angles.
Subitize	Instantly see how many objects are in a group without counting.
Sum	The result of adding two or more numbers
Trapezoid	A quadrilateral with *at least* one pair of parallel sides
Unit fraction	A fraction where the numerator is 1 and the denominator is the positive integer
Value	Numerical worth or amount
Variable	A symbol used to represent an unknown value, usually a letter such as x

K-5 Glossary	
Vertices	A point where two or more line segments meet. (vertex is singular, plural is vertices)
Visual fraction model	A tape diagram, number line diagram, or area model
Volume	Amount of space occupied by a 3D object, measured in cubic units
Whole numbers	The numbers 0, 1, 2, 3…..

Appendix

Table 1: Properties of Operations

Associative property of addition	$(a + b) + c = a + (b + c)$
Commutative property of addition	$a + b = b + a$
Additive identity property of 0	$a + 0 = 0 + a = a$
Existence of additive inverses	For every a there exists –a so that $a + (-a) = (-a) + a = 0$
Associative property of multiplication	$(a \bullet b) \bullet c = a \bullet (b \bullet c)$
Commutative property of multiplication	$a \bullet b = b \bullet a$
Multiplicative identity property 1	$a \bullet 1 = 1a = a$
Existence of multiplication inverses	For every $a \neq 0$ there exists $1/a$ so that $a \bullet 1/a = 1/a \bullet a = 1$
Distributive property of multiplication over addition	$a \bullet (b + c) = a \bullet b + a \bullet c$

Table 2: Properties of Equality

Reflexive property of equality	$a = a$
Symmetric property of equality	If $a = b$, then $b = a$.
Transitive property of equality	If $a = b$ and $b = c$, then $a = c$.
Addition property of equality	If $a = b$, then $a + c = b + c$.
Subtraction property of equality	If $a = b$, then $a - c = b - c$.
Multiplication property of equality	If $a = b$, then $a \bullet c = b \bullet c$.
Division property of equality	If $a = b$ and $c \neq 0$, then $a \div c = b \div c$.
Substitution property of equality	If $a = b$, then b may be substituted for a in any expression containing a.

Table 3: Properties of Inequality

Exactly one of the following is true: $a < b$, $a = b$, $a > b$.
If $a > b$ and $b > c$, then $a > c$.
If $a > b$, $b < a$.
If $a > b$, then $a \pm c > b \pm c$.
If $a > b$ and $c > 0$, then $a \bullet c > b \bullet c$.
If $a > b$ and $c < 0$, then $a \bullet c < b \bullet c$.
If $a > b$ and $c > 0$, then $a \div c > b \div c$.
If $a > b$ and $c < 0$, then $a \div c < b \div c$.

Table 4: Common Problem Types for Addition and Subtraction

	RESULT UNKNOWN	CHANGE UNKNOWN	START UNKNOWN
ADD TO	Two bunnies sat on the grass. Three more bunnies hopped there. How many bunnies are on the grass now? 2 + 3 = ?	Two bunnies were sitting on the grass. Some more bunnies hopped there. Then there were five bunnies. How many bunnies hopped over to the first two? 2 + ? = 5	Some bunnies were sitting on the grass. Three more bunnies hopped there. Then there were five bunnies. How many bunnies were on the grass before? ? + 3 =5
TAKE FROM	Five apples were on the table. I ate two apples. How many apples are on the table now?5-2 = ?	Five apples were on the table. I ate some apples. Then there were three apples. How many apples did I eat? 5 – ? = 3	Some apples were on the table. I ate two apples. Then there were three apples. How many apples were on the table before?? -2 = 3
	TOTAL UNKNOWN	**ADDEND UNKNOWN**	**BOTH ADDENDS UNKNOWN**
PUT TOGETHER / TAKE APART	Three red apples and two green apples are on the table. How many apples are on the table? 3 + 2 = ?	Five apples are on the table. Three are red and the rest are green. How many apples are green? 3 + ? = 5, 5-3 = ?	Grandma has five flowers. How many can she put in the red vase and how many in her blue vase? 5 = 0 + 5, 5 + 0 5 = 1 +4, 5 = 4 +1 5 = 2 + 3, 5 = 3 + 2
COMPARE	**DIFFERENCE UNKNOWN**	**BIGGER UNKNOWN**	**SMALLER UNKNOWN**
	(“How many more?” version):Lucy has two apples. Julie has five apples. How many more apples does Julie have than Lucy?(“How many fewer?” version): Lucy has two apples. Julie has five apples. How many fewer apples does Lucy have then Julie? 2 + ? = 5, 5 – 2 = ?	(Version with “more”): Julie has three more apples than Lucy. Lucy has two apples. How many apples does Julie have? (Version with “fewer”): Lucy has 3 fewer apples than Julie. Lucy has two apples. How many apples does Julie have? 2 + 3 = ?, 3 + 2 = ?	(Version with “more”):Julie has three more apples than Lucy. Julie has five apples. How many apples does Lucy have?(Version with “fewer”): Lucy has 3 fewer apples than Julie. Julie has five apples. How many apples does Lucy have? 5 – 3 = ?, ? + 3 = 5

Table 5: Common Problem Types for Multiplication and Division

	UNKNOWN PRODUCT	GROUP SIZE UNKNOWN ("HOW MANY IN EACH GROUP?" DIVISION)	NUMBER OF GROUPS UNKNOWN ("HOW MANY GROUPS?" DIVISION)
	3 • 6 = ?	3 • ? = 18, and 18 ÷ 3 = ?	? • 6 = 18, and 18 ÷ 6 = ?
EQUAL GROUPS	There are 3 bags with 6 plums in each bag. How many plums are there in all? *Measurement example.* You need 3 lengths of string, each 6 inches long. How much string will you need altogether?	If 18 plums are shared equally into 3 bags, then how many plums will be in each bag? *Measurement example.* You have 18 inches of string, which you will cut into 3 equal pieces. How long will each piece of string be?	If 18 plums are to be packed 6 to a bag, then how many bags are needed? *Measurement example.* You have 18 inches of string, which you will cut into pieces that are 6 inches long. How many pieces of string will you have?
ARRAYS, AREA	There are 3 rows of apples with 6 apples in each row. How many apples are there? *Area example.* What is the area of a 3 cm by 6 cm rectangle?	If 18 apples are arranged into 3 equal rows, how many apples will be in each row? *Area example.* A rectangle has area 18 square centimeters. If one side is 3 cm long, how long is a side next to it?	If 18 apples are arranged into equal rows of 6 apples, how many rows will there be? *Area example.* A rectangle has area 18 square centimeters. If one side is 6 cm long, how long is a side next to it?
COMPARE	A blue hat costs $6. A red hat costs 3 times as much as the blue hat. How much does the red hat cost? *Measurement example.* A rubber band is 6 cm long. How long will the rubber band be when it is stretched to be 3 times as long?	A red hat costs $18 and that is 3 times as much as a blue hat costs. How much does a blue hat cost? *Measurement example.* A rubber band is stretched to be 18 cm long and that is 3 times as long as it was at first. How long was the rubber band at first?	A red hat costs $18 and a blue hat costs $6. How many times as much does the red hat cost as the blue hat? *Measurement example.* A rubber band was 6 cm long at first. Now it is stretched to be 18 cm long. How many times as long is the rubber band now as it was at first?
GENERAL	a • b = ?	a • ? = p and p ÷ a = ?	? • b = p, and p ÷ b = ?